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RESEARCH

Climate experiences to adaptation participation: a survey study in Catalonia

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Abstract
Climate change is a major threat to regions worldwide. The Mediterranean Basin is considered a notable hotspot for climate impacts, experiencing intense droughts, longer summers, changes in rainfall patterns, and increased heat. Catalonia, a north-eastern Spanish autonomous community located in the Mediterranean region, has experienced extreme drought resulting from climate change during the past decade, with the negative impacts becoming more evident since 2022. Understanding local perspectives on climate change and increasing community engagement in climate initiatives have been shown to foster successful adaptation solutions. Many studies in the literature link climate change experiences with a heightened willingness to participate in climate adaptation initiatives. Some studies state that the link contains nuance and climate experiences do not directly result in an increased willingness to participate. However, there is limited research on how perspectives can be influenced during a natural disaster. To gain an understanding of local climate perspectives and attempt to fill the research gap on how active climate events shape an individual's perspectives, a survey was conducted in Catalonia, Spain, that asked participants their views on local climate adaptation solutions, trust in local authorities, and their willingness to participate in climate adaptation initiatives. Results from the survey showed skepticism towards the effectiveness of adaptation policies, a low level of trust in authorities, and significant variations in non-monetary and financial willingness to participate in climate adaptation. The results of the survey stress the need for varied engagement methods by authorities to effectively engage citizens in climate adaptation solutions.

1 Introduction

Over the past couple of decades, climate change has become an increasingly significant issue. While climate change has occurred naturally over Earth's history, many scientists have categorized the climate change being experienced today as anthropogenic, or human-caused (Abbass et al. 2022; Michetti et al. 2022; Reyes-García et al. 2023; Torres et al. 2021). The Sixth Assessment Report (AR6) released by the Intergovernmental Panel on Climate Change (IPCC) highlighted that "human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperatures reaching 1.1 C above 1850–1900 in 2011–2020" (IPCC 2023). Furthermore, the AR6 states that anthropogenic climate change has already impacted various weather and climate extremes in all regions across the globe (IPCC 2023).

In the Mediterranean Basin, these impacts from climate change include increased heat, longer summers, changes in rainfall patterns, and a reduction in precipitation (Antronico et al. 2020; Becker and Sparks 2020; Linares et al. 2020). These impacts culminate in drought events and water scarcity (Noto et al. 2023). Impacts from climate change go further than just impacts on the environment, as it influences human health in many ways and can impact certain demographics of people more severely than others, like the elderly or people of lower socio-economic status (Neira et al. 2023). Other significant consequences on people's well-being include heat/cold stress, heatstroke and dehydration,

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or respiratory diseases (Moretti and Loprencipe 2018). When it comes to climate change, geographical positioning and geological factors, i.e. elevation, distance from the seacoast, etc., play an important role in the type and intensity of impacts that will affect an area (Salvati et al. 2019). The Mediterranean Basin is a sensitive region as it is located between two climatic systems, tropical and polar. This makes the region a hotspot for climate change impacts (Noto et al. 2023; Prada et al. 2024; Salvati et al. 2019; Torres et al. 2021).

Catalonia, a north-eastern Spanish autonomous community located in the Mediterranean region, has experienced extreme drought resulting from climate change during the past decade, with the negative impacts being more evident since 2022 (Ministry of European Union and Foreign Action 2024). Projections by the Meteorological Service of Catalonia have estimated a mean temperature increase of up to 4 °C by the end of the present century (Pascual et al. 2015), and drought intensification is anticipated to be particularly evident in the Spanish Mediterranean region, due to this rise in temperatures (Rozas et al. 2024). Furthermore, some warn that if no adaptation measures are taken, potentially huge economic and social losses could occur (Portillo Juan et al. 2022). Drought has many definitions but is generally defined as "a lack of water compared to normal conditions which can occur in different components of the hydrological cycle" (Van Loon et al. 2016). The various definitions of drought showcase the complexity of the event. Van Loon et al. (2016) revisits the definitions of drought, the highlighting humans' role in causing the weather event. Impacts from climate change are multilateral, impacting social, economic, and environmental sectors that will affect millions of people worldwide.(

The climate change currently being experienced worldwide cannot be linked to one individual, event, or industry; it is the result of multiple sectors and industries that span social, political, cultural, and scientific facets. Therefore, the solutions to climate change need to be multilateral and include scientific, social, political, and cultural approaches (Antronico et al. 2020). For droughts specifically, it is paramount to understand and assess drought risks comprehensively and be mindful of their diverse impacts and interconnectedness with various sectors and systems (Rossi et al. 2023). Climate adaptation refers to "any actions or adjustment implemented to minimize the impacts of current or expected climate change" (Habtemariam et al. 2020). While climate adaptation strategies have been implemented more frequently in the past decades, it is understood that successful climate adaptation requires the willingness and capacity for resources to be converted into truly effective adaptation actions (Abunyewah et al. 2023).

Much like climate solutions, implementing adequate adaptation requires gathering and understanding multiple perspectives of climate change, including scientific, political, and social aspects. Gaining public awareness and understanding of climate change risks from local communities is important to secure support for public measures and to encourage adaptation by households, community groups, and private enterprises (Ngo et al. 2020). Public opinion and support have the power to incentivize or disadvantage political, social, and economic initiatives aimed at tackling climate change (Antronico et al. 2020). Furthermore, climate adaptation solutions go beyond political or economic incentives. For solutions to be truly effective, they require the behavioral transformation of millions of people (Antronico et al. 2020). To achieve this, it is necessary to understand citizens' current perception of climate change and willingness to participate in climate adaptation initiatives, and how these perceptions might differ if they are living with the direct impacts of climate-related risks. This study investigates the factors that influence citizens' willingness to participate in climate actions during the herein-described contexts. Through a literature review, it was found that various studies suggest that experience with climate change can influence the perspectives of citizens and increase their willingness to participate. To understand this potential connection between experiencing climate change and participation in climate actions, a survey conducted in Catalonia was analysed and compared against the literature.

1.1 Literature review

The following literature review synthesizes key research findings that underpin this study, focusing on how local experiences with climate change – particularly drought – and the integration of local knowledge inform public engagement in adaptation initiatives. Drawing on studies from the Mediterranean region and other contexts, the review explores how experiential factors and socio-cultural dynamics shape citizens' perceptions and willingness to participate in climate adaptation efforts.

1.2 Drought impacts & local knowledge importance

While drought is a common natural weather event, it has been increasing in intensity over the past decades, and many scientists have found evidence that this increase in drought intensity is related to climate change (Giordano et al. 2013). Impacts from droughts are typically non-structural, can spread over a wide geographical area, and have far-reaching economic, environmental, and social consequences (Bryan et al. 2020; Rossi et al. 2023). Overall, drought is referred to as a "lack of precipitation over a longer period of time,

leading to a shortage of water for some group, sector or activity (Becker and Sparks 2020). However, different disciplinary perspectives can be affected by drought, and the complexity of the weather event has led to many sources referring to these affected perspectives as having different definitions. These include agricultural, meteorological, economic, hydrological, and socioeconomic droughts (Bryan et al. 2020; Van Loon et al. 2016). It is important to understand the categorizations of drought, their definitions, and when they are applicable, as the definitions of droughts also aid in accurately monitoring and managing the weather event. Bryan et al. (2020) highlight that the various definitions of drought emphasize the relationship between human activities and water and the overlapping of drought perspectives. This is also supported by Van Loon et al. (2016), who revisits various definitions of drought to showcase humans' role in causing the weather event. For instance, soil moisture and hydrological drought result from low inputs to the hydrological system, high outputs, and limited storage. While some of these are influenced naturally, like snow melt, evapotranspiration, and reservoirs, as Van Loon et al. (2016) explains, human activities influence water input, output, and storage, therefore, impacting the propagation and even causing droughts to occur.

Gaining a deeper understanding of local vulnerabilities and impacts during drought events has been shown in the literature to aid in properly monitoring, warning, and managing droughts (Becker and Sparks 2020; Bryan et al. 2020; Enenkel et al. 2020; Giordano et al. 2013). Giordano et al. (2013) illustrate how integrating local knowledge within drought monitoring and warning systems benefits both risk management agencies and local communities. These benefits of including local knowledge within weather monitoring systems include: developing local indicators, describing impacts on a local scale, having a deeper analysis of those drought impacts and taking into account the impacts that are neglected by the traditional drought monitoring system, having a wider knowledge base for drought risk management and the facilitation of communication between authorities and local communities (Giordano et al. 2013).

While the benefits of integrating local knowledge have been widely documented in the literature, in reality, local knowledge is seldom used for drought monitoring. This is due in part to skepticism from both decision-makers and local communities, as Giordano et al. (2013) points out that local communities do not consider themselves as sources of knowledge and decision-makers typically refer to scientific knowledge. Several studies have outlined the importance of including local knowledge and experiences for effective climate monitoring (Bryan et al. 2020; Enenkel et al. 2020; Giordano et al. 2013).

Using local knowledge and experiences can deepen scientists' understanding of droughts and vulnerable communities, influence the design of monitoring systems, and enable local communities to present their experiences that explore relationships and contexts (Bryan et al. 2020; Enenkel et al. 2020; Giordano et al. 2013). Bryan et al. (2020) showcases how narrative approaches can be used as communication tools that allow for scientific data to be more comprehensible and for local knowledge to be translated into policy-relevant data. Enenkel et al. (2020) state that most of the climate monitoring and forecasting currently focuses on hazards instead of focusing, more importantly, on the impacts of climate events. To effectively predict and respond to those who are at risk, disaster risk management strategies need to understand and consider the vulnerable communities (Enenkel et al. 2020).

It is important to note that the successful implementation of local knowledge in climate monitoring is dependent on the social, cultural, and institutional contexts (Giordano et al. 2013). The willingness of local communities to engage in monitoring activities and the willingness of decision-makers to base their decisions on information obtained by communities needs to be considered. Outdated information on vulnerable communities can result in limitations in disaster predictions and can hinder the evaluation of disaster mitigation strategies (Enenkel et al. 2020). Furthermore, assessing climate along with socioeconomic data can help create more tailored warnings and management strategies that will benefit vulnerable communities (Enenkel et al. 2020).

1.3 Climate change experiences & willingness to participate

Studies by Osaka and Bellamy (2020) and Becker and Sparks (2020) detailed the drought that plagued the state of California in the United States from December 2011 until March 2017. This drought was considered the most severe drought to hit California in over a millennium and in early 2014, Governor Jerry Brown implemented the state's first mandatory water restrictions in an effort to lessen the impacts of the extreme drought. The restrictions lasted two years, resulting in positive behavior changes in residents that decreased water consumption in the area (Osaka and Bellamy 2020). At certain points, the drought made international headlines, and the behavior changes among residents sparked a dialogue in the sociology community on how the passage of time can influence perceptions of what is considered normal. For example, those who experience droughts regularly or in the past might be less inclined to view the event as unusual (Becker and Sparks 2020). Understanding people's experiences with climate change can help scientists and decision-makers better comprehend societal reactions

to climate change and its impacts (Becker and Sparks 2020). Furthermore, Dobbin et al. (2023) referenced an analysis of the 2018 drought that impacted Cape Town, South Africa, which illustrated how water conservation behaviors in households ended up being partly responsible for the city avoiding a shutdown of the municipal water network.

It is also suggested in the literature that those who have lived through climate change impacts could show a greater likelihood of adopting pro-environmental behaviors and participating in climate adaptation initiatives (Abunyewah et al. 2023; Demski et al. 2017; Deng et al. 2017; Habtemariam et al. 2020; Hurley and Molloy 2025; Osaka and Bellamy 2020; Williams and Kay 2024). Demski et al. (2017) focuses on a study that examines extreme weather experiences and climate change engagement in the United Kingdom. Regions across Wales and England were plagued by major flood events following a series of intense storms. These flooding events were consistent with the projected flood risks under climate change for the area (Demski et al. 2017). It was proposed that UK citizens would be more inclined to adopt climate adaptation behaviors following the experienced flooding, stating that "experiences of an extreme weather event might make climate risk more cognitively available or salient in people's minds", and that "the increased salience of climate change deriving from direct experience might also manifest in terms of other forms of engagement" (Demski et al. 2017).

It was further stated by Deng et al. (2017) that an individual's adaptive behaviors can be shaped by their perceptions of climate change and disaster-related experiences. The authors further build upon this point, suggesting that perceptions of climate change can be influenced by "experiential factors such as affect, imagery, and values" (Deng et al. 2017). In this sense, affect relates to the "good or bad feedback obtained from a specific object", imagery relates to "representations or cognitive processes", and value relates to "how individuals interpret the world" (Deng et al. 2017). Individuals with previous negative experiences with natural disasters, such as earthquakes and drought, are more likely to "be concerned about climate change than non-victims, because their experiences would influence their perceptions" (Deng et al. 2017). However, in their own study of senior high school students in China, Deng et al. (2017) found that even though most of the participants had previous experiences with drought, they still doubted that their personal adaptive behaviours would have an impact on mitigating the local water shortages.

The literature also showcases instances where the link between climate change experiences and an increased willingness to participate is not so obvious (Abunyewah et al. 2023; Osaka and Bellamy 2020). Ngo et al. (2020) showcased a study in Sweden that found that participants who experienced more climate incidents in their lifetime perceived the risks as less severe compared to other respondents. Gärtner and Schoen (2021) also concluded that "it cannot be taken for granted that personally experiencing extreme weather phenomena makes a difference in perceptions of climate change and related policy preferences". The authors highlight the need for further studies to test in other frameworks the perception and willingness of citizens. Recently, a study by Mobeen et al. (2025) found that while farmers in Pakistan experienced climate impacts, many did not adopt adaptation strategies. This was largely due to financial constraints (Mobeen et al. 2025). It was also noted that experiences with extreme weather might only be linked to climate change if the individual already has a pro-environmental worldview (Osaka and Bellamy 2020), and identified future research should also focus on the knowledge citizens may have prior to the exposure of climate related risks.

There is a lack of research on how citizens' perspectives and willingness to participate in climate change adaptation initiatives are influenced while a major climate event is occurring. The present research addresses the gaps identified by Gärtner and Schoen (2021) as well as Mobeen et al. (2025) by tackling the perception of citizens exposed to climate related risks and their likelihood to participate in co-creation, co-production, co-evaluation of adaptation plans or strategies. In particular, the knowledge citizens have is analyzed, together with their socio-economic background and other relevant variables, in order to determine more accurately the likelihood of engagement as well as the trust in local institutions. To achieve this objective, a survey was conducted in Spain on climate adaptation related to drought that was affecting the Catalonia region at the time.

It was hypothesized that participants actively experiencing a climate event (i.e. drought) would increase their desire to participate in climate adaptation initiatives. This survey gathered a deeper understanding of participants' knowledge of climate change impacts in their area, climate adaptation initiatives and policies, and their willingness to participate in adaptation initiatives. This research also attempts to fill the gap on how actively experiencing a climate change event can influence one's willingness to participate in climate adaptation initiatives. In the subsequent section, the methodology and data gathering are outlined, followed by discussion and analysis of the results obtained in relation to the abovementioned context and research gap identified. Finally, conclusions are presented both with a focus on practitioners and academia. This will be our contribution.

2 Methodology and data gathering

This section outlines the methodology and data gathering strategies implemented to capture a comprehensive picture of how Catalan citizens perceive and respond to climate change adaptation efforts amid escalating drought conditions. A structured survey was designed and administered both online and in face-to-face settings to ensure diverse demographic representation. The mixed methods approach not only facilitated the collection of quantitative data on public knowledge, trust in policies, and willingness to participate in adaptation initiatives but also allowed for a nuanced analysis through descriptive statistics, inferential tests, and clustering techniques.

2.1 Data collection

The survey was conducted during the spring of 2024 in the Catalonia region of Spain to gather citizen's perspectives on climate change and its impacts, focusing specifically on the drought emergency affecting the area. The questionnaire was shared one month after the region had started implementing the climate change adaptation plan for drought. The survey sought to understand citizen's knowledge of climate change impacts, their trust in policies and authorities, and their willingness to participate in climate adaptation initiatives. The survey also gathered information on which engagement methods were most appealing to respondents, including a mix of multiple-choice and Likert scale questions.

The survey was administered in an online, anonymous format without requiring a personal login. Participants were recruited through convenience sampling method that combined online distribution via local organizations, citizen groups, and neighborhood associations with face-to-face interactions in public spaces across the metropolitan area of Barcelona. While this approach enabled the researchers to access a diverse range of demographic groups and capture varied local perspectives, it also introduced potential biases, including selection bias where certain groups may be overrepresented and self-selection bias, as respondents who elected to participate might inherently differ from the broader population.

The fact that the survey was carried out right before the regional election during 2024 stressed the willingness of citizens to respond to surveys in general yet there was a common feeling of apathy as when interacting face to face with individuals, they all questioned how the survey would be used and if it would have any effect on real decisions. Some citizens asked questions whether these data points would be used for political purposes and to design any of the proposals that the political parties were creating[1].

This survey had no support from any political party, nor was it linked to any of the developments of political party proposals. However, the fact that respondents asked these questions raised some interesting qualitative feedback points as it could be the case in the future that decision-makers implement similar surveys as tools to engage and start conversations with citizens. Additionally, it can serve as a mechanism to identify the profiles of individuals living in a region that is more prone to participate, and it may contribute to signaling any specific barriers to using this specific methodology. It should be noted that these perceptions were gathered through an active observation carried out while respondents that provided their answers face to face by completing the survey in a tablet. The researcher facilitating the survey only interacted with the respondents whenever they chose to ask questions or make comments and took notes of all the interactions. The qualitative answers correspond to 11,6% of the total number of respondents, and the observations were gathered and studied in conjunction with previous findings reflected in the literature.

Furthermore, the experience allowed us to signal out another qualitative element which was the generalized feeling most citizens manifested as the usefulness of surveys. Their perception was that partaking in these types of citizen engagement initiatives had not in their experience had a direct effect on their day-to-day lives. When asked to further develop on this perception, the general response was that they felt they had replied to surveys before but were never informed of the general outcomes or results, how those would be used and for which purpose, and more importantly, they perceived they had not had any impact on the design of policies or strategies. This was highly valuable feedback as it highlighted the relevance of explaining clearly the goals of surveys, the usage of data and the interconnection with decision-making processes. The survey carried out within this project particularly stressed these factors, and in the face-to-face interactions, it was possible to discuss further some of these matters with participants[2]. They generally displayed high interest in being more involved in citizen engagement initiatives but felt there was no clear channel to contact or follow up with the decision-makers.

Continuing with the survey process, 172 valid responses were collected from both face-to-face and online responses.

[1] These reflections were gathered informally during survey administration and were not part of the recorded dataset. They represent the general impressions of the researchers based on direct interactions with participants.

[2] These informal conversations were not systematically recorded or included in the dataset. The insights presented here are based on the observations of the researchers conducting the surveys.

While this sample size may not capture the full diversity of the broader population, the findings offer a promising, exploratory insight into the topic rather than definitive conclusions. The respondents were between the ages of 18–65+, with the majority selecting the age ranges of 26–35 (33%) and 36–45 (28%). The mean age was 40.70[3]. In Catalonia, the mean age of population older than 18 years is 49.47[4], with 14.66% in the age range 26–35 and 17.38% in the age range 36–45. Thus, the group studied here is younger on average than the adult population of Catalonia. The gender distribution overwhelmingly favored female respondents, with 62% female, 33% male, and 5% writing non-binary or prefer not to say. In Catalonia, among the population older than 18 years old 49% are male, and 51% are female (Instituto Nacional de Estadística 2025). The survey also collected demographic information relating to the highest academic degree obtained, employment type, place of residence, citizenship country, and living situation.

2.2 Data analysis

First, a descriptive analysis was conducted to summarize respondents' perceptions, knowledge, and engagement regarding climate change adaptation. Frequency distributions, percentages, and basic measures of central tendency (e.g., mean willingness to pay) were calculated to capture the prevalence of various viewpoints and behaviours. These descriptive statistics provided an overview of respondents' levels of awareness, trust in policy measures, and readiness to participate in adaptation initiatives.

Second, Fisher's exact test was used to compare the distribution of categorical outcomes between groups. Given that the assumptions of the Chi-square test (specifically, having sufficiently large, expected cell counts) were not satisfied and the small sample size, Fisher's exact test was particularly suitable (Freeman and Campbell 2007; McHugh 2013). Unlike parametric tests, Fisher's exact test does not rely on assumptions about the normality of data; instead, it calculates an exact p-value based on the observed frequencies, ensuring accurate results even with unbalanced groups or low cell counts.

Third, for those Fisher's exact tests that were significant, a further analysis was conducted to determine which groups differed significantly and how. For example, in the case of willingness to pay for climate change initiatives, the analysis examined differences across age groups, identifying which groups were significantly more or less willing to pay. To facilitate the analysis, all categorical survey responses were transformed into ordinal numerical scales. This recoding enabled to apply Spearman's correlation analyses to assess the strength and direction of relationships among these ordinal variables, ensuring that the comparisons across different aspects of climate adaptation participation and financial commitment were made on a consistent and quantifiable scale.

K-means clustering was applied to segment respondents into distinct groups based on their standardized opinions, knowledge, commitment, willingness to participate, trust, and willingness to pay at various monetary levels. The K-means algorithm was employed, systematically testing different numbers of clusters and using the Calinski-Harabasz criterion as the decision metric. The analysis indicated that a three-cluster solution yielded the highest Calinski-Harabasz score, thereby suggesting that three clusters represent the optimal segmentation of the sample. Following this, cluster assignments were generated, and a detailed comparison of the clusters was conducted, analyzing mean scores and standard deviations for each variable.

Decision trees were constructed using Minitab® statistical software to explore the determinants of participation among respondents. It facilitated the systematic partitioning of the data based on various predictor variables and allowed to identify the key factors that differentiate respondents who are willing and not willing to participate.

3 Discussion and results

The results of the Catalonia survey offer a comprehensive snapshot of how citizens perceive and respond to climate change adaptation efforts in the region. Using online and face-to-face methods, the survey obtained 172 responses from Catalonian residents. Nearly all respondents acknowledge the reality of climate change, yet there is widespread skepticism about the effectiveness of current adaptation policies and a low level of trust in the authorities managing

[3] $Mean\ age = \frac{(21.5\times 10)+(30.5\times 33)+(40.5\times 28)+(50.5\times 17)+(60.5\times 8)+(74.34\times 5)}{100} = 40.70$. To calculate the mean age, the midpoints of each age category were used. For closed intervals such as 26–35 or 36–45, the midpoint was calculated as the average of the lower and upper bounds, for example, (26+35)/2=30.5. These midpoints serve as representative ages for individuals within each group. For the open-ended 65+ category, where no upper bound is specified, the life expectancy in Catalonia was used as a proxy for the upper limit. With a life expectancy of 83.68 years (Special Institute of Catalonia, 2025), the midpoint for this group was calculated as (65+83.68)/2=74.34.

[4] The calculation was performed by multiplying each age by its corresponding frequency (Instituto Nacional de Estadística 2025) within the 18+population. This provided a weighted sum of ages, which was then divided by the total number of individuals to obtain the average age. For individuals aged 65 and over, the group was treated as a single category. Since this group does not have an upper age limit, the life expectancy of 83.68 years was used as the upper bound. The midpoint of the 65+group was calculated as the average of 65 and 83.68. This midpoint was then multiplied by the total number of individuals in the 65+group.

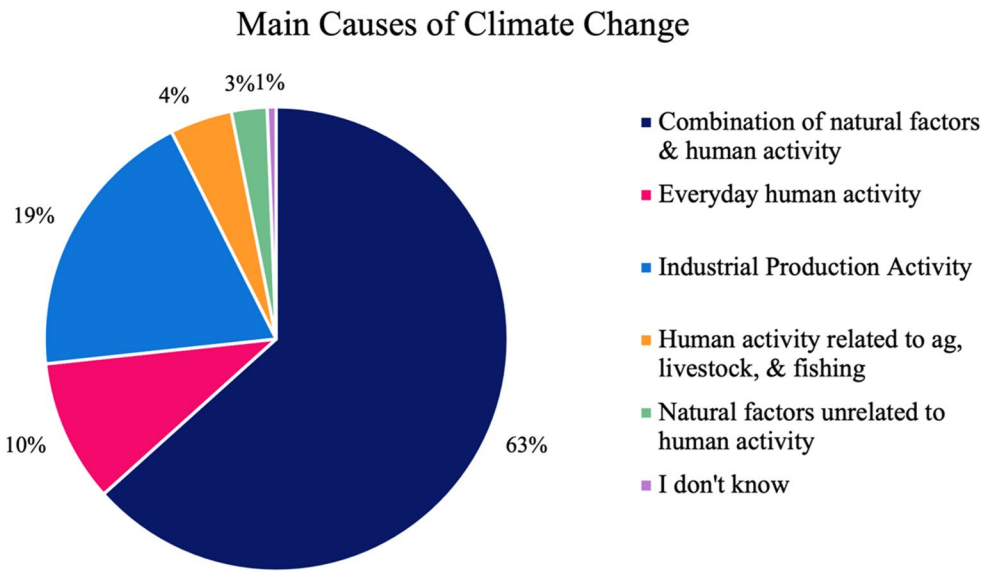


Fig. 1 Question 2 of the survey asked respondents what they felt were the main causes of climate change

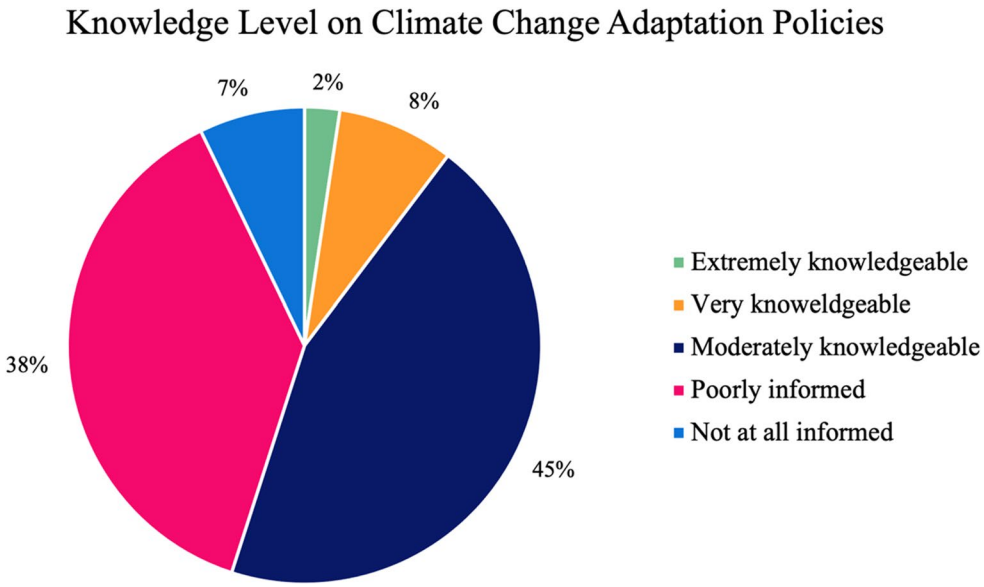


Fig. 2 Question 3 of the survey asked respondents their knowledge of climate change adaptation policies

these initiatives. In addition to highlighting these critical attitudes, the analysis reveals significant variations in both non-monetary and financial willingness to participate in climate adaptation measures – variations that are strongly influenced by demographic factors such as age and education. These findings not only underscore the complexity of public engagement in climate change issues but also provide valuable insights for tailoring future adaptation strategies that better resonate with and mobilize local communities.

3.1 Perceptions and knowledge of climate change and adaptation policies

Most respondents recognize the existence of climate change (97%). A small share of skeptics (3%) indicates almost unanimous support for this viewpoint among respondents.

Most respondents believe that both natural and anthropogenic factors are involved in climate change (63%), with industrial production playing a significant role (19%) (Fig. 1). The small number of those who see the cause only in natural processes (3%) or find it difficult to answer (1%) indicates the prevalence of belief in the leading role of human activity.

The largest proportion of the respondents rate their level of knowledge about climate change adaptation policies as moderate (45%), though the large proportion of those who are "poorly" (38%) or "not at all" (7%) informed suggests a need for more public outreach (Fig. 2). A small group describe themselves as "very" (8%) and "extremely" (2%) well-informed.

3.2 Evaluation of current adaptation policies

According to the results, 48% of the respondents have a low level of confidence in the authorities regarding climate change adaptation measures, and another 20% indicated "I have no trust", meaning they do not trust the authorities at all (Fig. 3). At the same time, 27% maintain a neutral position, 5% are "pretty confident", and not a single respondent declared "full confidence". This pattern indicates significant scepticism in society: most people are either negatively inclined or are not confident in the authorities' ability to effectively address climate change.

It is noteworthy that the level of trust in authorities regarding climate adaptation policies is remarkably low compared to the overall trust levels in Spain, where trust in local government stands at 44% and in the central government at 37% (OECD 2024). This may indicate a specific dissatisfaction with how climate adaptation measures are being implemented or communicated, as 58% of Spanish respondents doubt that the country will meet its Paris Agreement targets (European Investment Bank 2021), and stakeholders report low acceptance of adaptation plans (Esteve et al. 2018) suggesting that the public perceives these efforts as insufficient or ineffective. Moreover, research shows that citizens' support for climate policies in Spain is strongly linked to their perceptions of government response efficacy (Rubio Juan and Revilla 2021). Additionally, it is worth mentioning that the extreme drought could have contributed to this response, as respondents may have perceived that the authorities failed to manage the situation effectively.

About half (49%) consider existing policies to be rather "ineffective", and another 12% consider them "very ineffective" (Fig. 4). Only 4% believe that the measures are actually "effective", and none described them as "highly effective". Meanwhile, 29% took a neutral position and 6% found it difficult to make an assessment. These figures indicate that most respondents do not see tangible results from existing climate change adaptation measures.

At the 5% significance level, more informed individuals are also more committed to adaptation efforts. Moreover, those who have a higher level of trust in authorities, also have a higher opinion of the policy effectiveness at the 1% significance level. This suggests that greater awareness and understanding of climate policies may lead to higher confidence in their effectiveness and a stronger willingness to engage in adaptation initiatives. This finding is in line with systematic reviews, which show that increasing knowledge boosts public engagement in adaptation (Khatibi et al. 2021), while Spanish research finds trust in science substantially mediates the link between climate perception and readiness to act (Vecina et al. 2024). Targeted information campaigns that enhance collective efficacy beliefs and build trust in relevant institutions and experts could increase public participation in climate change adaptation (Thaker et al. 2019).

3.3 Public commitment and willingness to engage in adaptation efforts

According to the results, more than half of the respondents (52%) do not participate in climate change adaptation initiatives (Fig. 5). At the same time, 30% have already had an experience of participating (e.g., in events, town hall roundtables, demonstrations) or making financial donations.

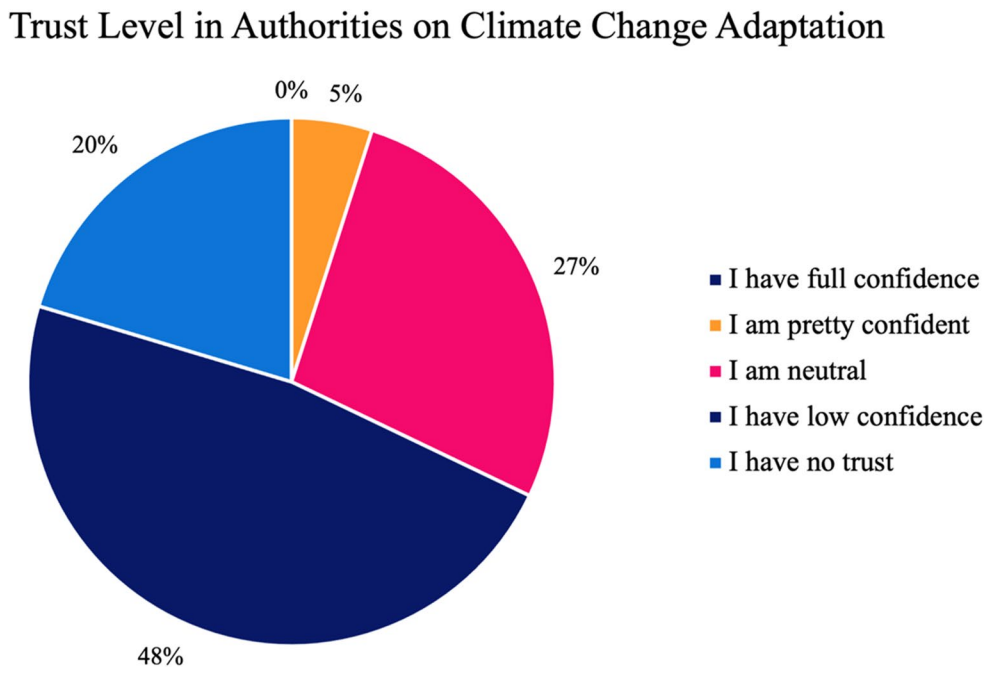


Fig. 3 Question 4 of the survey gauged participants' trust in local authorities on climate change adaptation

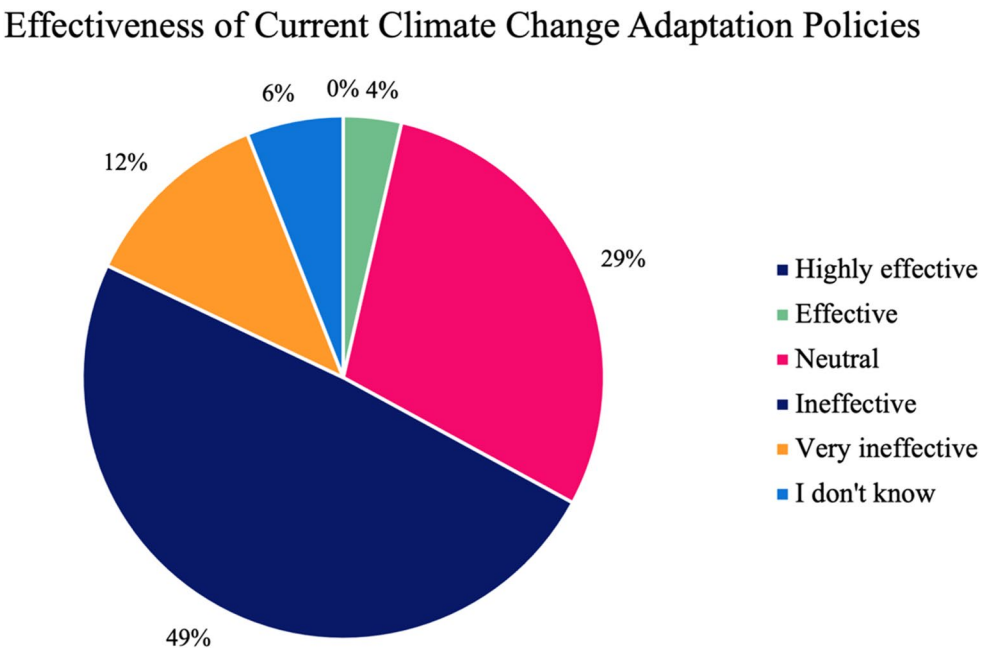


Fig. 4 Question 5 of the survey asked participants the effectiveness of current climate change adaptation policies

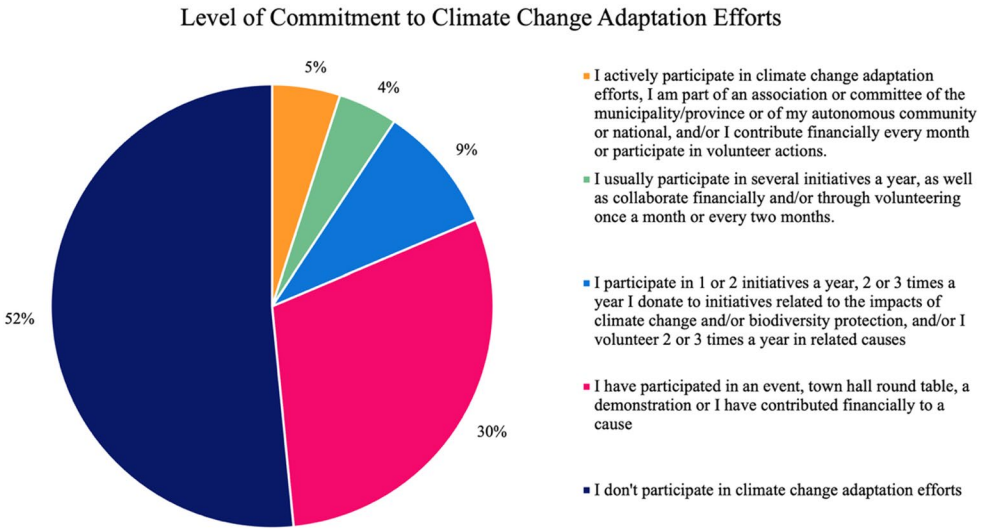


Fig. 5 Question 6 of the survey asked participants about their current participation in climate change adaptation initiatives

Another 9% limit themselves to participation in one or two initiatives per year, donation two or three times, and/or volunteering 2 or 3 times a year, while 5% are more active – they are members of specialized associations and make regular contributions, be it financial support or volunteering. Finally, 4% of respondents participate in several projects per year, combining financial donations and volunteering.

Among the respondents, 54% said they are ready to join climate change adaptation measures, 33% are ready to join if the situation with drought or other extreme events worsens, and only 13% do not intend to participate (Fig. 6).

As the first highest priority form of participation (Question 8), 25.68% chose "Integrate actions within my work environment", while 24.32% chose "Volunteering"; in third place was "Respond to citizen participation surveys and inquiries" (16.89%). The second highest priority was "Attending workshops" (25.68%), followed by "Volunteering" (17.57%) and integrating actions within the work environment (13.51%). "Attending workshops" again leads in the third priority (24.32%), followed by leading/organizing workshops (13.51%) and integrating actions in the work environment (12.84%). This arrangement shows that people are most interested in actions they can implement in their professional environment, as well as in practical forms of participation – volunteering and training events. At the 1% significance level, those who have a higher level of commitment, are also more willing to participate in climate change adaptation initiatives.

Willingness to pay is considered a strong indicator of engagement because it measures not only abstract support,

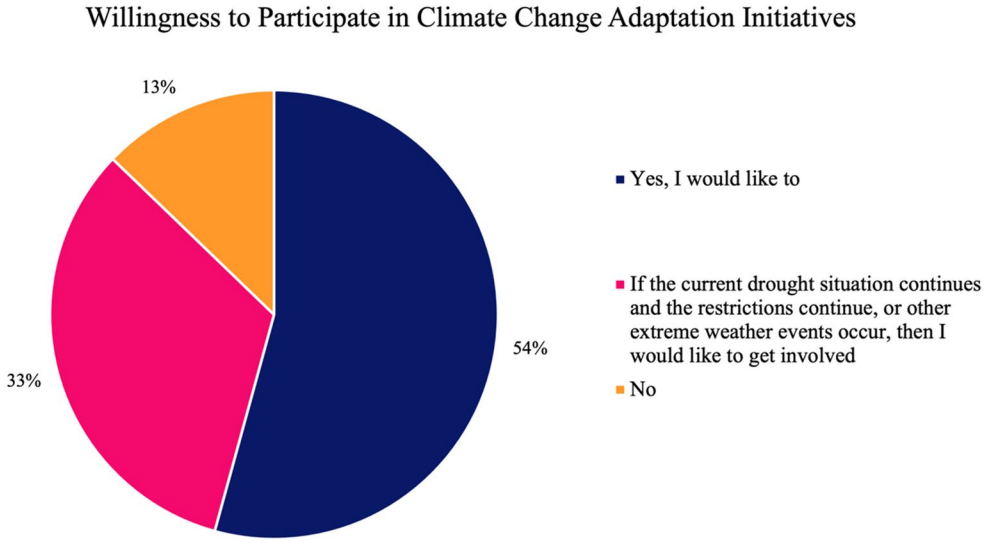


Fig. 6 Question 7 of the survey gauged participants' willingness to participate in future climate change adaptation initiatives

Table 1 Question 9 of the survey gauged participants financial commitment to climate adaptation initiatives. This table shows the percentage of respondents that chose each monetary value based on how much they would be willing to pay

Per month	€ 1	€ 2	€ 5	€ 10	€ 20	€ 50	€ 100	> €100
I would be willing to pay (%)	62.50	62.88	45.93	33.58	12.98	5.43	3.10	2.33
I would not be willing to pay (%)	24.31	25.00	29.63	40.30	58.78	73.64	82.95	85.27
It depends on how the situation continues (%)	13.19	12.12	24.44	26.12	28.24	20.93	13.95	12.40

but also individuals' willingness to make costly personal contributions to a common good such as climate adaptation (Andre et al. 2024). This approach is grounded in behavioural science theory, which emphasizes that readiness to incur personal costs is a validated and quantifiable marker of genuine commitment to collective action. However, it should be emphasized that stated willingness to pay does not necessarily equate to actual payment, as respondents may lack the financial means to fulfil their stated preferences (Champ et al. 2009; Schmidt and Bijmolt 2020). Moreover, willingness to pay measures are subject to hypothetical bias, with individuals often overstating their true payment intentions. In this study, most respondents are willing to pay minimal amounts (€1-€2), as evidenced by the highest shares in the "I would be willing to pay" category (Table 1). The willingness decreases significantly with increasing amounts, with only a small proportion of respondents indicating an amount of €50 or more. The "More than €100" category has the lowest number of consents, which is expected due to the high cost. It is noteworthy that for most of the larger amounts, the proportion of respondents indicating "I would not be willing to pay" increases. The share of those who are undecided ("It depends on how the situation continues") varies but generally maintains moderate values, indicating uncertainty among some respondents about their willingness to participate in financial support. If we assume a value of €150 for the "More than €100" group, the mean value of willingness to pay is approximately €8.50[5]. However, if we exclude this group from the calculation due to the low number of respondents who supported payments of this amount, the mean value drops to approximately €7.04[6]. A recent study shows Andre et al. (2024) that 69% of the global population expresses a willingness to contribute 1% of their household income every month to fight global warming, 6% would contribute a smaller amount, and 26% would not be willing to contribute any amount. The share of those willing to contribute 1% varies considerably by country (from 30 to 93%), but in the vast majority of countries (114 of 125) the proportion is greater than 50%, and in 81 countries it is greater than two-thirds. For Spain, the figure is 65.1%. Given that the sample in the present study includes a high share of respondents from both the younger and older age groups – demographics which tend to have lower incomes – this may help explain the greater willingness to pay only smaller amounts.

Further analysis reveals significant relationships between willingness to pay for climate adaptation initiatives and

[5] $$Mean\ willingness\ to\ pay = \frac{(1\cdot 0.6250)+(2\cdot 0.6288)+(5\cdot 0.4593)+(10\cdot 0.3358)+(20\cdot 0.1298)+(50\cdot 0.0543)+(100\cdot 0.0310}{0.6250+0.6288+0.4593+0.3358+0.1298+0.0543+0.0310+0.0233} = 8.50.$$

[6] $$Mean\ willingness\ to\ pay = \frac{(1\cdot 0.6250)+(2\cdot 0.6288)+(5\cdot 0.4593)+(10\cdot 0.3358)+(20\cdot 0.1298)+(50\cdot 0.0543)+(100\cdot 0.0310}{0.6250+0.6288+0.4593+0.3358+0.1298+0.0543+0.0310} = 7.04$$

various factors, including perceptions of policy effectiveness, trust in authorities, and participation intentions. Specifically, individuals who hold a higher opinion of the effectiveness of adaptation policies are significantly more willing to pay €1 (statistical significance at the 5% level[7]). Those who are more willing to participate in climate adaptation efforts are also more inclined to pay €5 (5% significance) and €20 (10% significance), suggesting that engagement in adaptation activities correlates with financial contributions. Trust in the authorities is also a key factor, as individuals with a higher level of trust are significantly more willing to pay €1 (5% significance), €2 (5% significance), and €5 (1% significance).

Additionally, strong correlations exist between different levels of financial commitment. Those willing to pay €1 are significantly more likely to pay €2, €5, and €20 (all at 1% significance) and €50 (5% significance). Similarly, those willing to pay €2 are also more willing to contribute €5 and €20 (both at 1% confidence) and €50 (5% significance). Higher amounts follow a similar pattern of association: those willing to pay €5 are also more likely to pay €20 and €50 (both at 1% significance). Those who express a willingness to pay €20 are significantly more likely to pay €50, €100, and more than €100 (all at 1% significance). Moreover, respondents willing to pay €50 are also more likely to pay €100 and amounts exceeding €100 (both at 1% significance). Finally, those already inclined to pay €100 are significantly more likely to contribute beyond €100 (1% significance).

These findings highlight a progressive structure in financial commitment, where smaller amounts are predictive of willingness to contribute larger sums. However, it should be noted that this progressive structure may be influenced by the sequential presentation of increasing payment amounts in the survey, i.e., an ordering effect (Voltaire et al. 2017). Future research could consider alternative formats, such as randomized or open-ended payment questions, to test the robustness of these findings. The positive associations with participation and trust suggest that fostering engagement and strengthening confidence in policy effectiveness may enhance financial contributions toward climate adaptation initiatives.

The high self-reported willingness to participate in adaptation efforts (54%) and the relatively low financial commitment suggests a preference for non-monetary participation. The significant increase in rejection rates for higher financial contributions could indicate financial constraints or a lack of trust in the effectiveness of monetary support[8]. Furthermore, in general, Spanish people donate an average of €149 annually (Asociación Española de Fundraising 2023). This could also indicate that they are already contributing to other causes, donating significant amounts and not willing to give more, or prioritizing other goals they consider more important. Given recent research by Andre et al. (2024) that 69% (65.1% in Spain) of the global population expresses a willingness to contribute 1% of their household income to fight global warming, given a monthly salary of €1,800, a 1% contribution would amount to €18 per month.

Clustering respondents revealed the following three clusters:

- Cluster 1 (15%) is composed of respondents who are not only reasonably positive about adaptation policies and well-informed but also exhibit high personal commitment and a strong willingness to participate. Their readiness to pay remains robust even at higher monetary levels, making them potential key supporters of financial contributions.
- Cluster 2 (56%) is characterized by very positive attitudes and trust in adaptation policies, with respondents showing exceptional willingness to make small financial contributions. Despite this, their readiness to pay diminishes sharply for larger amounts, indicating that while they are enthusiastic about the initiative in principle, they are cautious about committing substantial funds.
- Cluster 3 (29%) is clearly distinct in its consistent opposition to financial contributions. Even though their opinions and knowledge are moderately positive, their lower commitment, reduced willingness to participate, and especially their flat refusal to pay higher amounts suggest that this group is not inclined to support the adaptation initiatives monetarily. They might require alternative forms of engagement, such as volunteer work or informational support, rather than financial contributions.

3.4 Demographic insights

Respondents with different levels of education varied significantly in how well-informed they felt about adaptation policies ($p=0.043$), their commitment to adaptation efforts ($p=0.007$), and their willingness to participate in adaptation initiatives ($p=0.014$) (Table 2). Furthermore, citizenship was significantly related to levels of trust in the authorities

[7] The p-value tells us how likely it is that the observed relationship between two variables (e.g., willingness to pay and trust in authorities) could have happened by chance. If $p<0.05$ (5% level), the relationship is considered statistically significant meaning there is only a 5% chance that the observed effect is due to random variation.

[8] It should be noted that the highest donation tier included in the questionnaire (≥€100 per month) corresponds to an annual commitment of at least €1,200, which represents a substantial financial burden for the majority of individuals in Spain and comparable contexts. This may account for the reluctance to commit to higher levels of giving, reflecting broader economic considerations and prioritization of household resources.

($p=0.012$), indicating that citizens and non-citizens may differ in how they perceive government initiatives and interventions related to climate change[9].

Differences also appeared along gender and age lines. Gender significantly impacted opinions on the effectiveness of current adaptation policies ($p=0.014$) and willingness to donate €20 ($p=0.006$). Meanwhile, age played a notable role in the likelihood of making smaller donations (€1, €2, and €5), with each of these donation tiers showing a significant p-value (all $p<0.05$). This suggests that younger and older respondents may differ in their inclination to support climate change initiatives with smaller monetary contributions, which is perhaps unsurprising given that younger individuals are more likely to experience financial difficulties and would find it challenging to pay higher amounts (e.g., €1,200 a year in the case of a €100 contribution a month). By contrast, variables such as work dependency, number of children, length of residency in the region, and living situation did not show significant effects on any of the outcomes measured.

Further exploration of pairwise differences observed based on Fisher's exact tests and follow-up mean comparisons across demographic categories led to the following significant results.

Among gender groups, males expressed a more favorable opinion on the effectiveness of current climate change adaptation policies compared to females. They were also more inclined to pay €20 toward a climate initiative, whereas those preferring not to disclose their gender were likewise more willing to pay €20 than females.

Among educational levels, individuals holding a bachelor's degree reported feeling more informed about climate change adaptation than those with a doctorate, while those with a high school diploma similarly felt more informed than doctorate holders. Individuals with higher levels of education may be more critical and reflective, making them less likely to claim certainty about their knowledge. Highly educated individuals, particularly those with doctorates, may approach complex topics like climate adaptation with greater scepticism or recognize the nuances and uncertainties within policy discussions, leading them to self-assess as less informed despite possibly having more exposure to the subject.

Nonetheless, doctorate holders showed a stronger commitment to climate change adaptation efforts than both bachelor's and high school respondents. This cohort was more likely to participate in climate initiatives than either bachelor's or master's graduates.

[9] The differences between EU and non-EU citizens were also examined, and similar patterns were found. However, this should be interpreted with caution, as of the 126 EU citizens in the sample, only 22 were non-Spanish citizens.

Among citizenship groups, Spanish citizens expressed a higher level of trust in the authorities' climate change adaptation measures than non-citizens.

Among age groups, younger participants (particularly those aged 18–25) demonstrated a greater willingness to donate €1, €2, and €5 compared to older cohorts (36–45, 46–55, and 56+). Those aged 26–35 also showed a higher willingness to contribute €1 and €2 than some older groups. Younger individuals might be more engaged in climate action but have financial limitations. On the other hand, older respondents may require different incentives to encourage financial support, such as tax benefits for donations or targeted campaigns that highlight the tangible impact of their contributions. These differences suggest the need for a diversified engagement strategy that considers both generational financial constraints and motivational factors to maximize participation in climate adaptation initiatives.

3.5 Decision to participate

To analyze the decision to participate in climate change adaptation initiatives, decision trees were constructed. The optimal tree identified commitment as the sole significant predictor of participation (Fig. 7). Among respondents who expressed any form of commitment to participating, only 2.6% indicated that they would not participate at all, while a substantial majority (69.2%) were willing to engage, and the remaining respondents reported that their participation would depend on the situation. In contrast, among those who did not show commitment, 22.1% were not willing to participate, 40.7% would participate, and the rest remained uncertain, with their willingness to participate contingent upon the future situation. These findings underscore that individuals already participating in any form are also more likely to engage further, emphasizing the reinforcing nature of initial commitment to continued participation in climate change adaptation measures.

To analyze the determinants of non-participation among respondents lacking commitment, decision trees with a greater number of nodes were constructed to better identify the variables that differentiate those not willing to participate. The most complex tree, comprising 65 nodes, provided the best division of the data into various subgroups. Although such a tree is overfitted and would not be suitable for predictive purposes in other contexts, its purpose here is solely exploratory – to elucidate the factors influencing the decision to participate. The analysis revealed a ranked order of variable importance: age emerged as the most critical factor (100% relative importance), followed by how well-informed respondents are about climate adaptation (66.1%), length of residency (60.6%), and their views on the reasons behind climate change (55.5%). This ranking was further

Table 2 Fisher's exact test p-values for associations between climate change responses and demographic factors

(Prob > F)	Gender	Highest level of education obtained [a]	Work dependency	Age range [b]	Children	Citizenship [c]	How long have you lived in that region/city? [d]	Living situation
What do you think is the main cause of climate change?	0.728	0.462	0.087	0.344	0.314	0.670	0.838	0.771
How well-informed do you feel about climate change adaptation policies?	0.119	0.043	0.664	0.598	0.379	0.368	0.564	0.169
What is your level of trust in the authorities regarding climate change adaptation measures?	0.137	0.100	0.222	0.353	0.683	0.012	0.921	0.458
What is your opinion on the effectiveness of current climate change adaptation policies?	0.014	0.853	0.113	0.473 [e]	0.945	0.397	0.345	0.519

Table 2 (continued)

What is your level of commitment to climate change adaptation efforts?	0.089	0.007	0.921	0.656	0.917	0.153	0.494	0.835
Would you participate in a climate change adaptation initiative?	0.446	0.014	0.669	0.160	0.435	0.525	0.315	0.533
€1	0.708	0.378	0.552	0.005	0.082	0.787	0.224	0.702
€2	0.468	0.231	0.656	0.003	0.209	0.377	0.754	0.915
€5	0.677	0.894	0.383	0.039	0.637	0.054	0.055	0.395
€10	0.377	0.276	0.320	0.490	0.685	0.863	0.596	0.740
€20	0.006	0.888	0.152	0.666	0.630	0.762	0.992	0.830
€50	0.123	0.968	0.366	0.872	1.000	1.000	0.917	0.252
€100	0.384	0.955	0.729	0.330	0.463	0.629	0.476	0.767
More than €100	0.204	0.821	0.891	0.505	0.377	0.517	0.898	0.973

[a]ESO or EGB category was excluded for computational purposes

refined by education (51.4%), commitment (51.2%), opinion on the effectiveness of policies (47.9%), trust (39.4%), living situation (36.8%), gender (29%), work dependency (20.6%), citizenship (17.7%), number of children (14.1%), and belief in climate change (10.7%).

3.6 Results vs. literature

The results from the decision tree align with what was found in the literature and confirm the relationship between climate change knowledge, personal views, and an individual's willingness to participate. Most sources highlight that knowledge of climate change and its impacts is correlated with an increased concern for climate issues and willingness to participate in adaptation initiatives (Ngo et al. 2020). Other authors such as Deng et al. (2017) had showed that an individual's perceptions of climate change have the potential to influence behavioral change through awareness and concern. A study in India concluded that female farmers who were better informed on climate change issues showed a greater likelihood of choosing adaptation strategies, as they were more likely to understand and appreciate early warning signs (Abunyewah et al. 2023). This study confirms these findings. In addition they are aligned with Giordano et al. (2013) who stated that education can be useful in bridging the gap when individuals and stakeholders are unable to perceive climate impacts for themselves.

Gärtner and Schoen (2021) highlighted that perceptions and attitudes are often affected by pre-existing views. They further stated that "long-standing political preferences

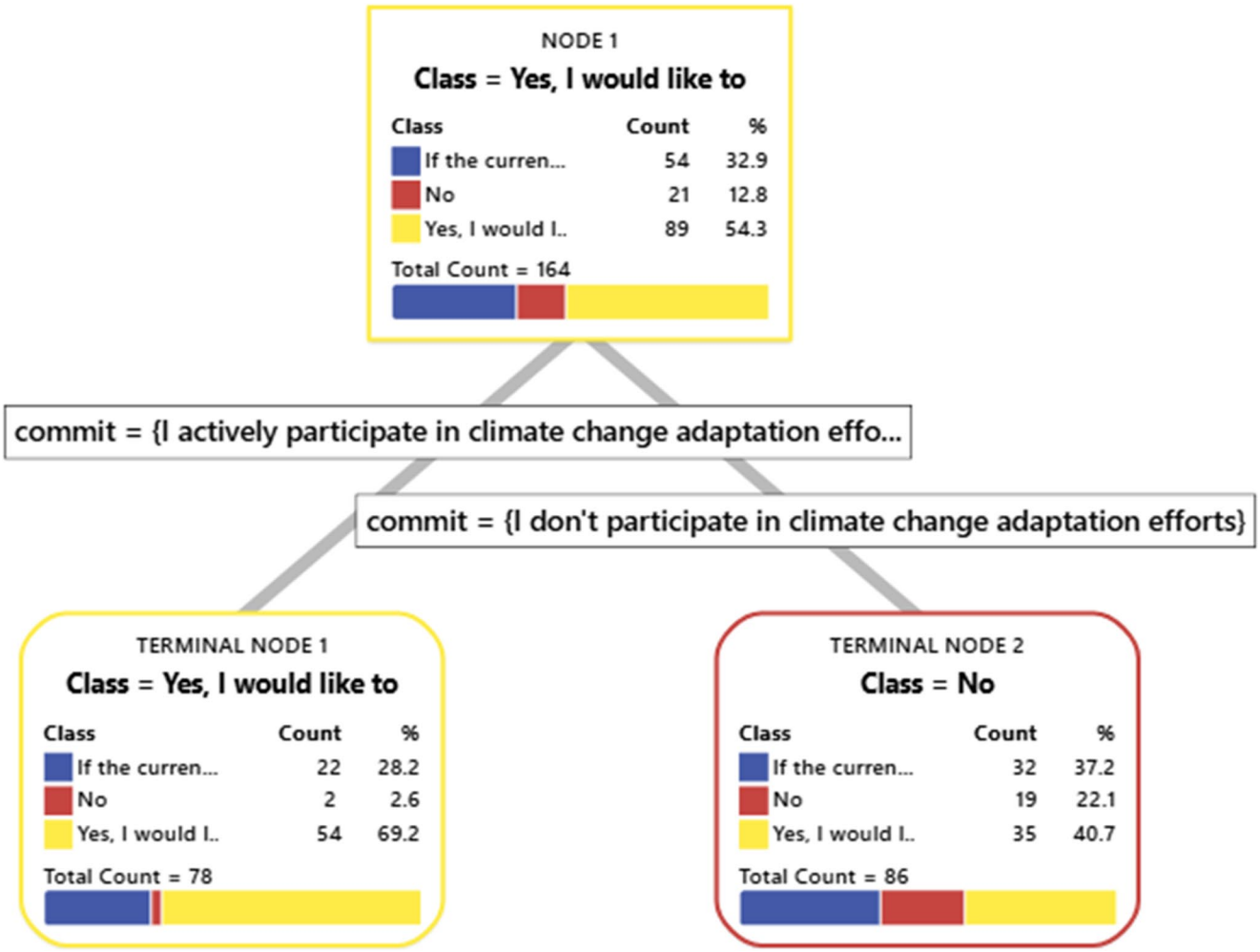


Fig. 7 Analysis of survey participants' desire to participate in future climate adaptation initiatives (Q7: Would you participate in a climate change adaptation initiative? Q8: What is your level of commitment to climate change adaptation efforts?)

may thus attenuate the responsiveness of citizens' attitudes towards climate change and related policies to local weather phenomena" (Gärtner and Schoen 2021). Age was also seen in the survey results to be a major determinate in participant's willingness to participate, which agreed with some of the sources in the literature (Huggel et al. 2022; Rikner Martinsson and Ojala 2024). Huggel et al. (2022) highlights various youth movements, such as 'Fridays for Future' and the 'Extinction Rebellion', and notes that youth climate activism has been linked to risk perception. It can also be inferred that younger generations are more inclined to participate in climate adaptation initiatives since climate change directly impacts their future (Rikner Martinsson and Ojala 2024).

Furthermore, experiencing climate change has also been documented to influence an individual's perception or view on climate change (Demski et al. 2017; Deng et al. 2017; Matos 2025; Moser 2014; Osaka and Bellamy 2020; Williams and Kay 2024). Demski et al. (2017) proposed that experiences are facilitated through emotional responses that increase the importance of the event, pointing to the notion that flood experiences cause individuals to buy insurance due to their heightened perception of floods. However, other studies point out the nuance between climate change experiences and increased willingness to participate in climate adaptation. Ngo et al. (2020) showcased a study in Sweden which found that men who experienced more climate events in their lifetime perceived the events as less severe. Gärtner and Schoen (2021) concluded that personal experiences with climate change cannot be directly linked to changes in perceptions of climate change.

Climate change awareness has increased over the past decades due to the heightened intensity of impacts. These impacts affect billions of people worldwide, creating long-lasting social, economic, and environmental damage. Climate adaptation strategies have been implemented from local to international levels, but the need for individual participation in adaptation initiatives is apparent. Some

studies suggest that increased experience with climate change impacts can influence an individual's willingness to participate in climate adaptation initiatives. These studies point out that an increased level of risk awareness encourages individuals to take action and can influence their willingness to participate in climate adaptation initiatives. However, other studies showed nuance and suggested the link between climate experiences and participation in climate adaptation was not straightforward. There can be many outside factors that influence one's perceptions of climate change. Political, religious, and socio-demographic factors have a potential impact on one's desire to participate in climate adaptation events. Some studies highlight that experience with climate events can cause individuals to normalize the event and lower their risk perception of climate change. The nuance in the literature highlights the need for further research investigating the link between climate experience and participation in climate adaptation initiatives. Furthermore, there is limited research focusing on understanding how perceptions of climate change are influenced during natural disaster events.

Thus, a survey was conducted in the Catalonia region of Spain to gain a deeper understanding of the correlation between climate experiences and citizens' willingness to participate. During the time of the survey, participants who lived in the Catalonia region were experiencing a drought event, and it was hypothesized that actively experiencing a climate event would increase participants' willingness to participate in climate adaptation initiatives. It should be noted that this study did not include a control group from an area not actively experiencing drought. The lack of a comparative control sample restricts the ability to establish causal links between drought experience and citizens' willingness to participate in adaptation measures. Thus, the findings should be viewed as exploratory. Future research should incorporate control groups from unaffected areas to robustly isolate the impact of active climate events on adaptation willingness.

The majority of survey respondents showed scepticism towards the effectiveness of adaptation policies, a low level of trust in authorities, and significant variations in non-monetary and financial willingness to participate in climate adaptation. The variations towards willingness to participate were dependent on factors such as age, perceptions of climate change, awareness of climate change, and education. This was consistent with the literature regarding willingness to participate in climate adaptation (Huggel et al. 2022; Matos 2025; Rikner Martinsson and Ojala 2024; Williams and Kay 2024). Many sources also highlighted perceptions and awareness of climate change as a potential influence on an individual's decision to participate in climate adaptation initiatives (Demski et al. 2017; Deng et al. 2017; Matos 2025; Minor et al. 2023). Sources also highlighted the nuances between the link of climate change experiences and an individual's willingness to participate in climate adaptation initiatives. These sources concluded that there are many factors impacting one's decision to participate in climate adaptation, and while experiencing climate change is a potential influencer, it might not be the only catalyst towards increased participation (Gärtner and Schoen 2021; Ngo et al. 2020).

The survey participants also showed varied responses for a willingness to participate. This variation was tied to the demographics of the participants in terms of age, education, living situation, and so on. These results correlate with some findings in the literature. Huggel et al. (2022) found that the youth movement has listed climate change as a major threat to human beings and highlighted climate activism like "Fridays for Future" and "Extinction Rebellion". Matos (2025) emphasized the link between education levels and climate change perspectives, finding that adults with post-primary education were more likely to attribute climate change to human causes.

3.6.1 Recommendations for decision-makers and future research

The variation in responses based on demographics stresses the need for varied engagement methods by practitioners and decision-makers. Support from individuals and the broader community is vital for the successful implementation of climate adaptation methods (Antronico et al. 2020). Decision-makers should consider the demographics of their region and implement multi-faced engagement strategies that can appeal to a wide range of individuals. These can include financial incentives, awareness campaigns, and different methods of communication. The results of this study highlight four important areas for practitioners and decision-makers:

- *Trust-Building*: The majority of respondents felt a lack of trust in authority figures and believed current policies were ineffective. Differences in trust between citizens and non-citizens should also be noted. This shows that practitioners and decision-makers should prioritize transparency in reporting and policy design that provides clear, measurable outcomes. There should also be a focus on addressing all community segments in policy dialogue and decision-making progress. Prioritizing these areas could help rebuild trust and support in local communities towards both decision-makers and adaptation policies.
- *Education*: The survey results revealed that over 45% of respondents felt they were poorly or not at all informed

and a further 45% were moderately informed on climate adaptation policies. This signals the need for robust, accessible public education campaigns. The need for greater community education is confirmed in the literature, where many sources link increased education or awareness with climate adaptation support.

- *Demographics*: The variation in responses by demographics like age, education, and gender suggests the need for tailored adaptation and communication. Younger age ranges showed a higher likelihood to contribute smaller amounts, whereas older age ranges might require additional incentives. Communication and engagement strategies should not focus on a one-size-fits-all approach but instead should encompass multiple techniques that are tailored towards specific demographics.
- *Commitment*: The decision tree analysis indicates that individuals are more likely to engage further if they have shown previous commitment. Initiatives that encourage a first step in participation (through workshops, local events, or small-scale actions) can build momentum for broader engagement. Respondents also showed a strong interest in implementing actions within the workplace and through local community engagements. Future policies could build partnerships with local organizations and businesses to mainstream climate adaptation and provide a first step in community participation, which can foster further adaptation commitment.

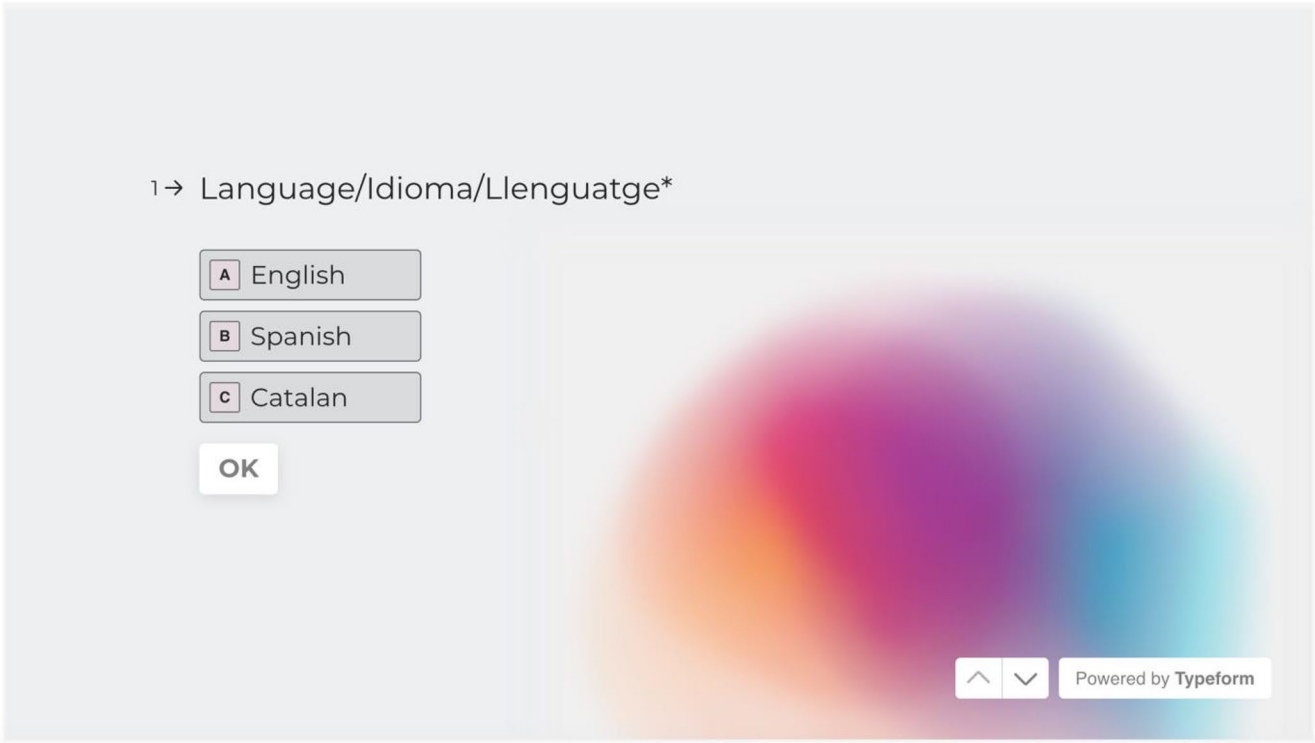
The results from the survey coupled with the nuance highlighted in the literature imply that further research is needed to aid in understanding the link between climate change experiences and increased participation in climate adaptation initiatives. Further research is also needed to explore how climate change perceptions are influenced during natural disasters. While the survey conducted in this study showed an overall willingness to participate from respondents, future replications of this study should stress the influence of the active climate event on the participant's desire to participate. As climate change impacts heighten, and more people are impacted by climate change, understanding its influence in adaptation solutions is vital.

4 Conclusion

This study aimed to analyze the connection between an individual's willingness to participate in climate adaptation initiatives and their exposure or experience with climate change impacts. From the literature review, we found conflicting evidence, with some sources linking climate experiences to an increased willingness to participate, while others claimed there was more nuance. Sources that provided the link between experiences and increased participation state that experiencing climate change impacts serve as motivation for participating in adaptation initiatives and that the experience made climate change feel more threatening. Those that disagreed or provided a neutral stance suggested that the link was not so straightforward and that while experience climate impacts could serve as motivation, they could also have the opposite effect and make future climate events more normalized.

To explore this further, a survey was conducted of Catalonian residents. The survey asked a range of questions regarding participants knowledge of climate change and climate policies, their trust in decision-makers, their current participation levels, and their likelihood of participating in adaptation initiatives in the future. From the survey, we found that participants had high scepticism towards the effectiveness of adaptation policies, a low level of trust in authorities, and significant variations in non-monetary and financial willingness to participate in climate adaptation. Participants' varied willingness to participate were dependent on factors such as age, perceptions of climate change, awareness of climate change, and education. Due to these variations, we derived recommendations to decision-makers to help promote climate participation and behavioral change among citizens, suggesting decision-makers to focus on trust-building, education understanding community demographics, promoting commitment. Further research is recommended to deepen our understanding of how climate experiences influence individual's willingness to participate.

Appendix


1→ Language/Idioma/Llenguatge*
A English
B Spanish
C Catalan
OK
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The purpose of this survey is to gather the opinion of people living in Spain regarding climate change and the current drought emergency affecting Catalonia. It takes 5 minutes to answer the questions and you can share the link to friends and family at the end.
Responses will be integrated into the European AGORA project, which aims to analyse policies and citizen participation to co-create the most suitable adaptation and mitigation strategies and solutions in each European region.
The answers are completely anonymous and only demographic data are requested for aggregate analysis, and your personal data, such as name, surname or email, is not necessary at any time.
Continue
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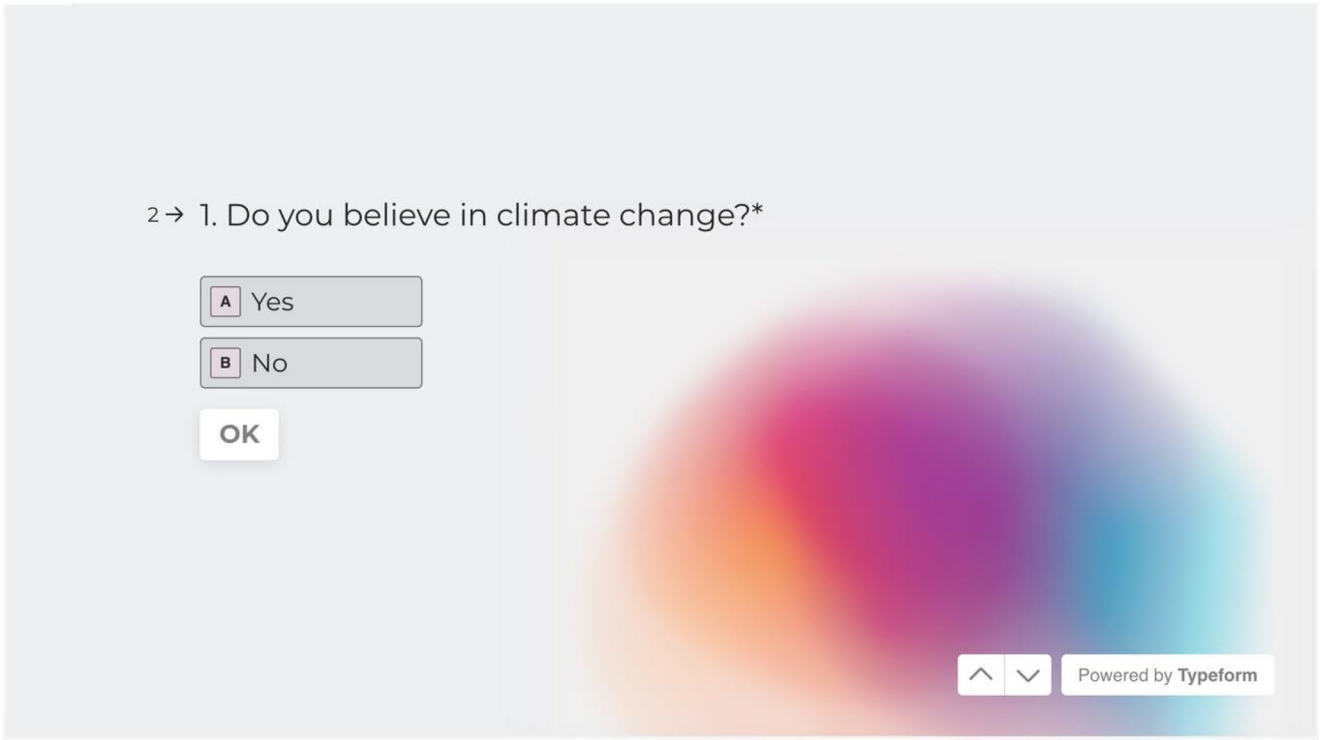
2 → 1. Do you believe in climate change?*
A Yes
B No
OK
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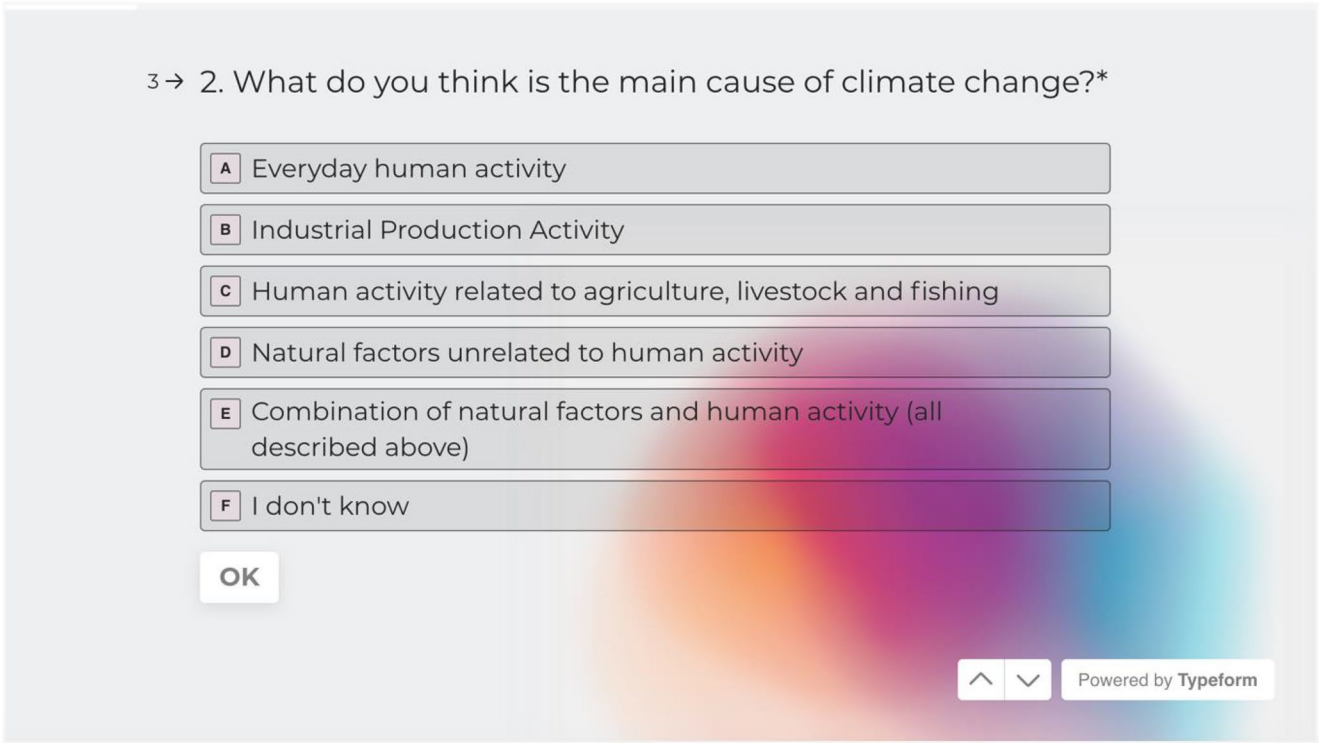
3 → 2. What do you think is the main cause of climate change?*
A Everyday human activity
B Industrial Production Activity
C Human activity related to agriculture, livestock and fishing
D Natural factors unrelated to human activity
E Combination of natural factors and human activity (all described above)
F I don't know
OK
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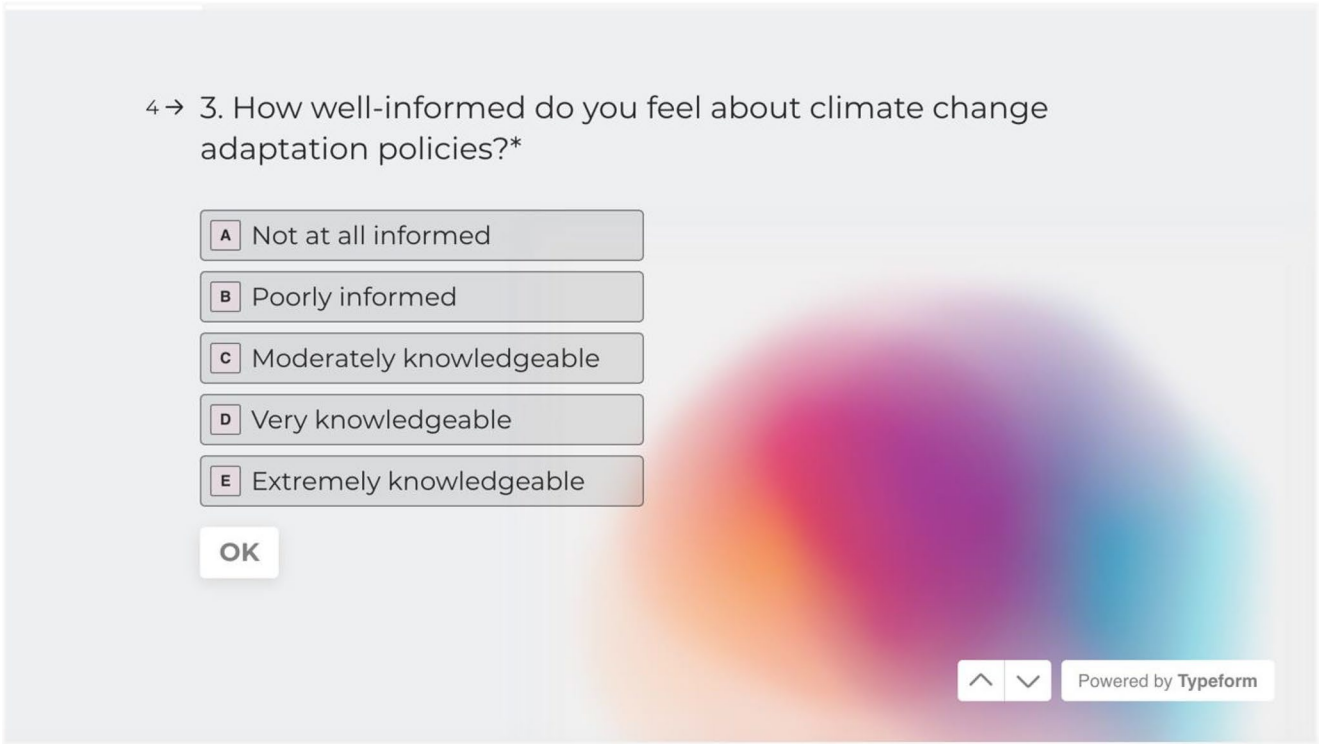
4→ 3. How well-informed do you feel about climate change adaptation policies?*
A Not at all informed
B Poorly informed
C Moderately knowledgeable
D Very knowledgeable
E Extremely knowledgeable
OK
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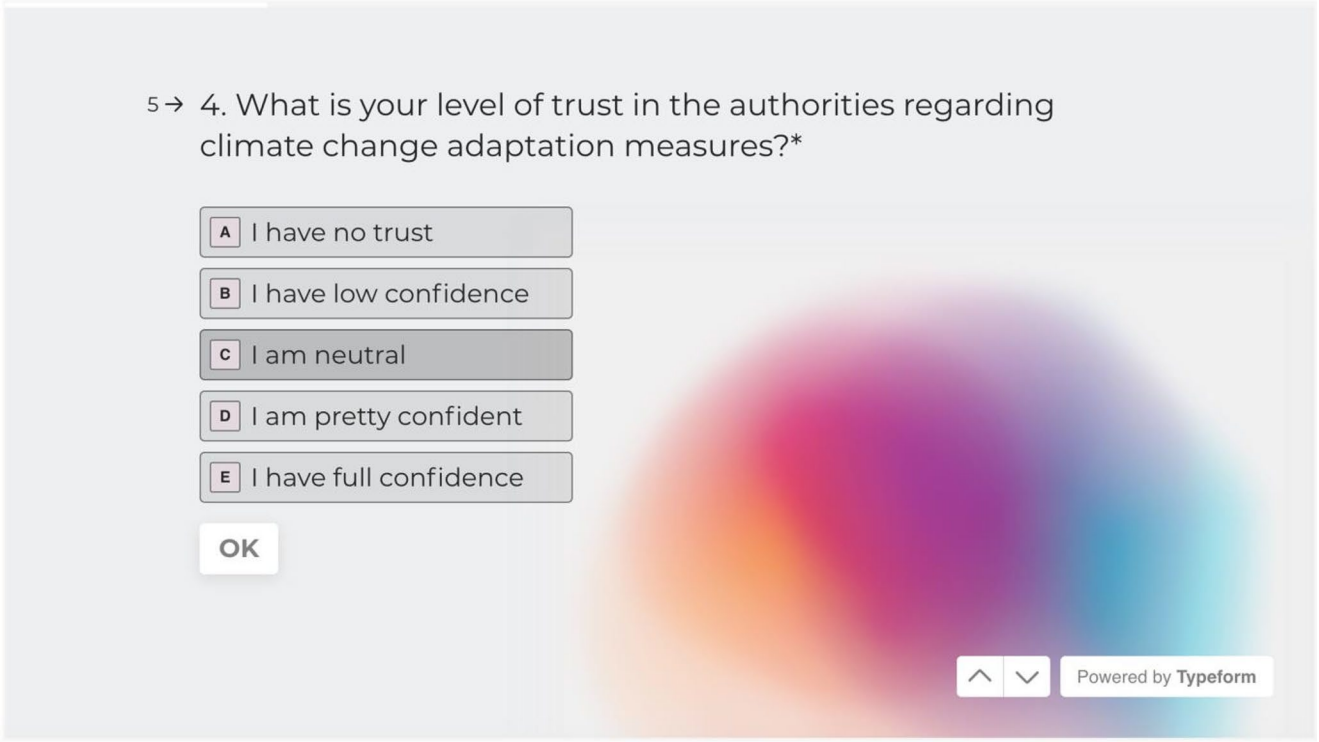
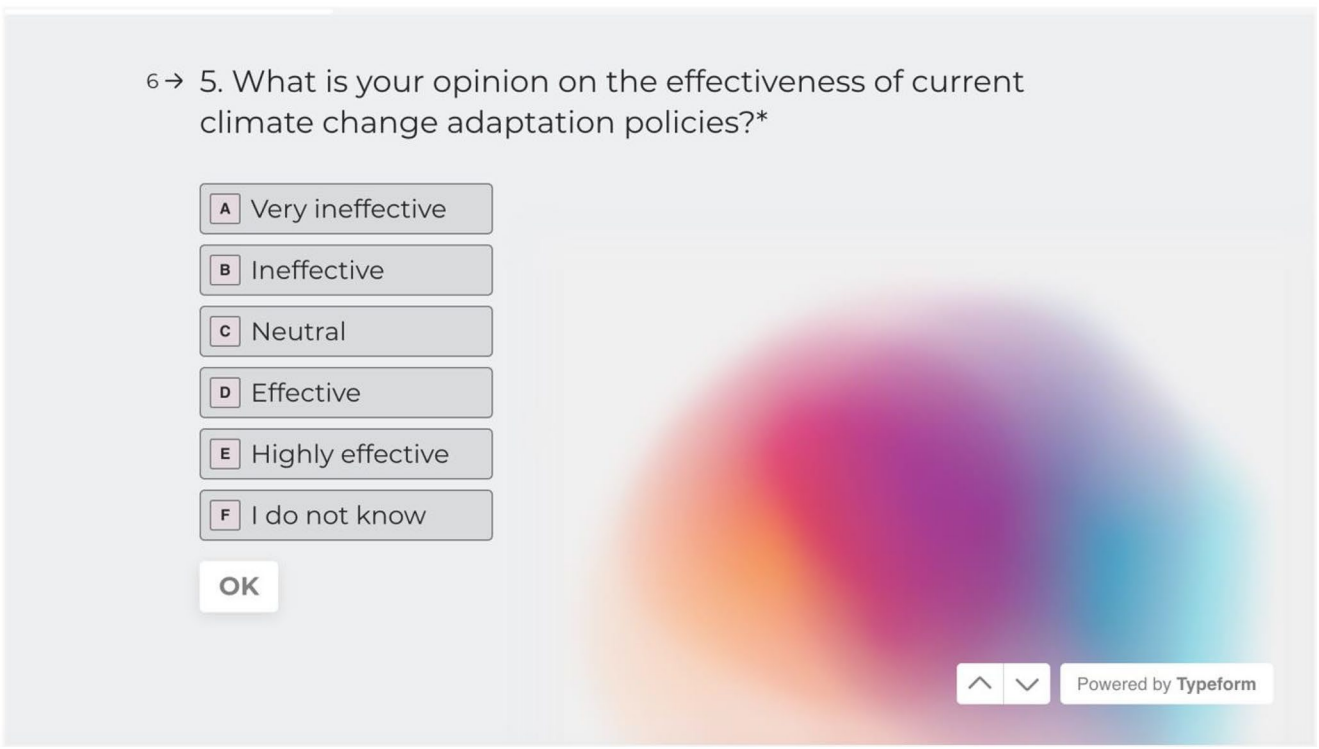

5 → 4. What is your level of trust in the authorities regarding climate change adaptation measures?*
A I have no trust
B I have low confidence
C I am neutral
D I am pretty confident
E I have full confidence
OK
Powered by Typeform


6 → 5. What is your opinion on the effectiveness of current climate change adaptation policies?*
A Very ineffective
B Ineffective
C Neutral
D Effective
E Highly effective
F I do not know
OK
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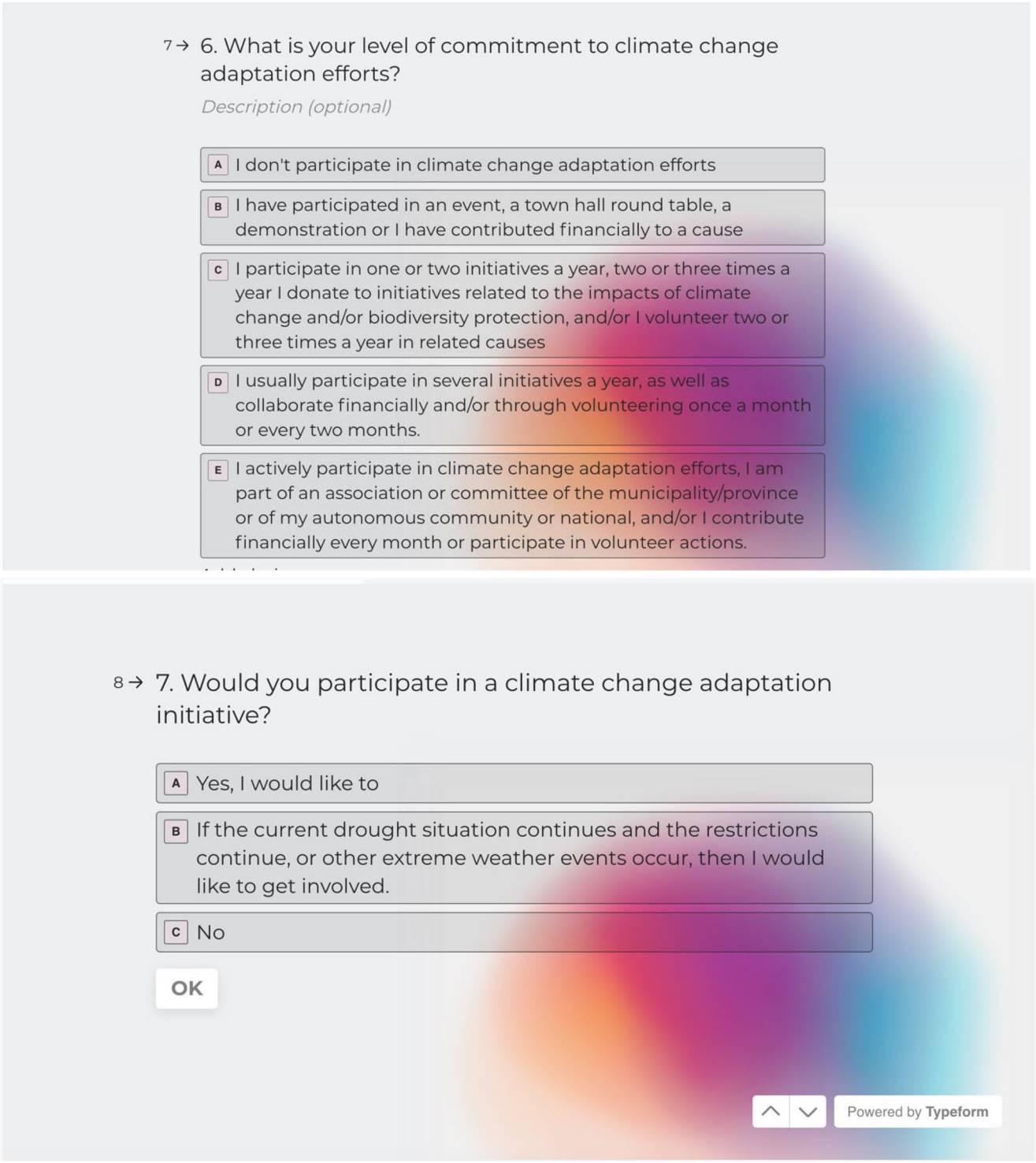
7→ 6. What is your level of commitment to climate change adaptation efforts?
Description (optional)
A I don't participate in climate change adaptation efforts
B I have participated in an event, a town hall round table, a demonstration or I have contributed financially to a cause
C I participate in one or two initiatives a year, two or three times a year I donate to initiatives related to the impacts of climate change and/or biodiversity protection, and/or I volunteer two or three times a year in related causes
D I usually participate in several initiatives a year, as well as collaborate financially and/or through volunteering once a month or every two months.
E I actively participate in climate change adaptation efforts, I am part of an association or committee of the municipality/province or of my autonomous community or national, and/or I contribute financially every month or participate in volunteer actions.
8→ 7. Would you participate in a climate change adaptation initiative?
A Yes, I would like to
B If the current drought situation continues and the restrictions continue, or other extreme weather events occur, then I would like to get involved.
C No
OK
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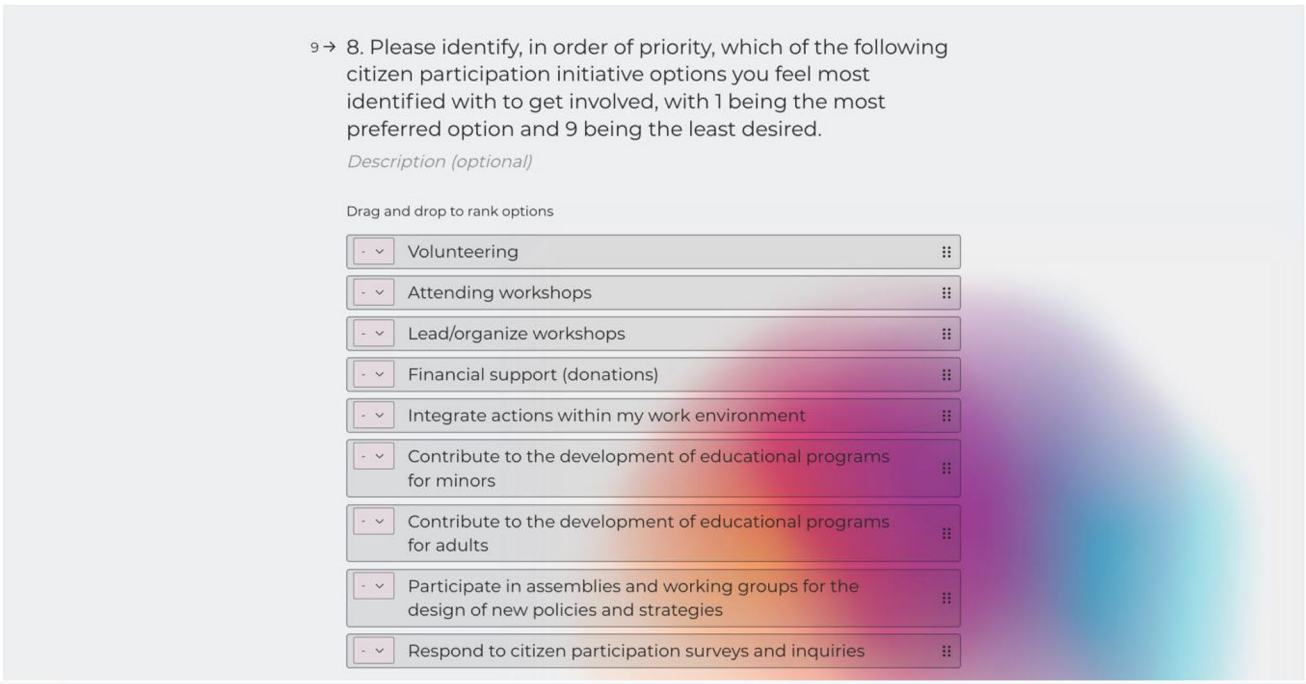
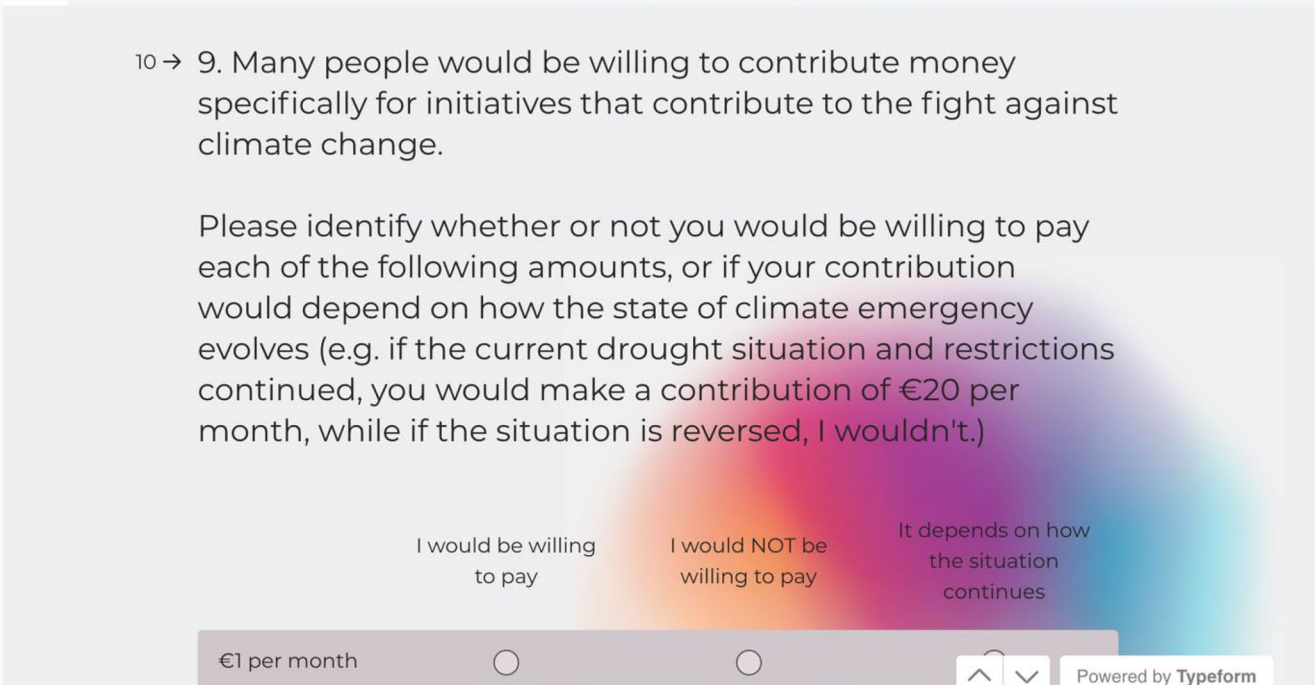

9 → 8. Please identify, in order of priority, which of the following citizen participation initiative options you feel most identified with to get involved, with 1 being the most preferred option and 9 being the least desired.
Description (optional)
Drag and drop to rank options
Volunteering
Attending workshops
Lead/organize workshops
Financial support (donations)
Integrate actions within my work environment
Contribute to the development of educational programs for minors
Contribute to the development of educational programs for adults
Participate in assemblies and working groups for the design of new policies and strategies
Respond to citizen participation surveys and inquiries


10 → 9. Many people would be willing to contribute money specifically for initiatives that contribute to the fight against climate change.
Please identify whether or not you would be willing to pay each of the following amounts, or if your contribution would depend on how the state of climate emergency evolves (e.g. if the current drought situation and restrictions continued, you would make a contribution of €20 per month, while if the situation is reversed, I wouldn't.)
I would be willing to pay
I would NOT be willing to pay
It depends on how the situation continues
€1 per month
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10 → 9. Many people would be willing to contribute money specifically for in...
€2 per month
€5 per month
€10 per month
€20 per month
€50 per month
€100
More than €100
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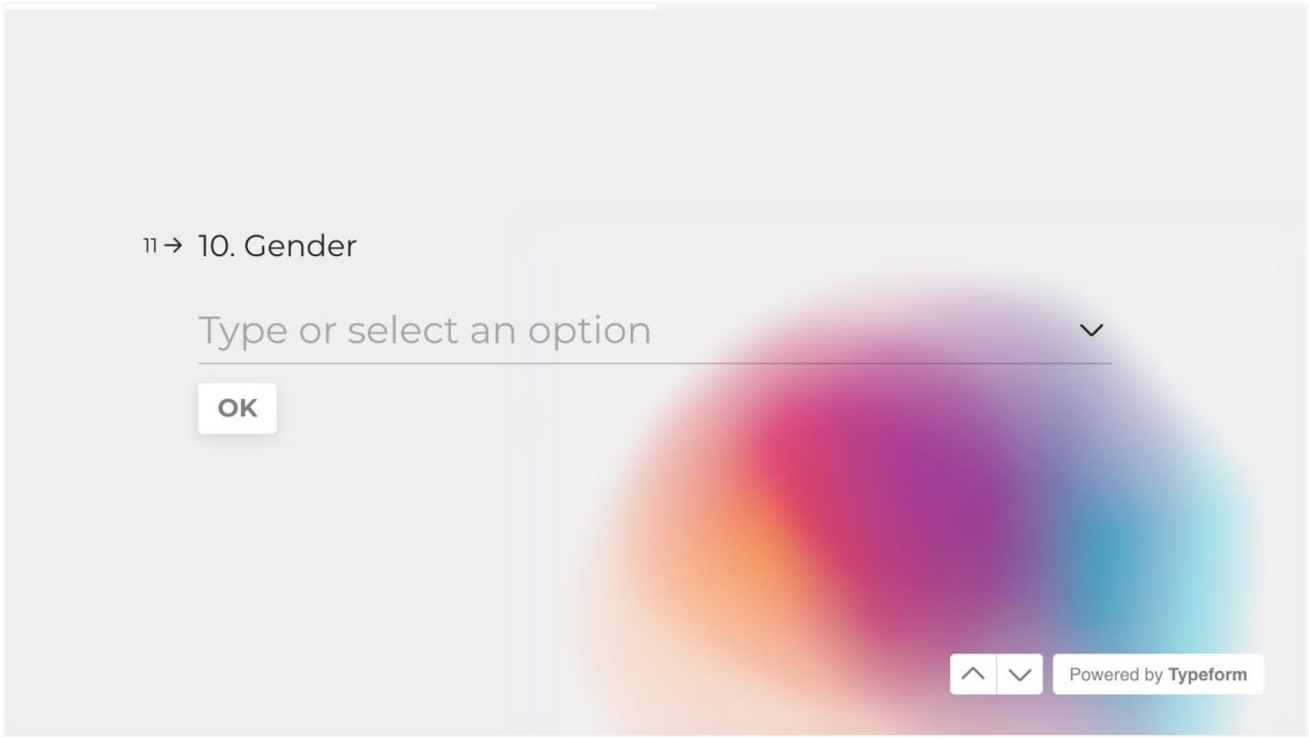
11 → 10. Gender
Type or select an option
OK
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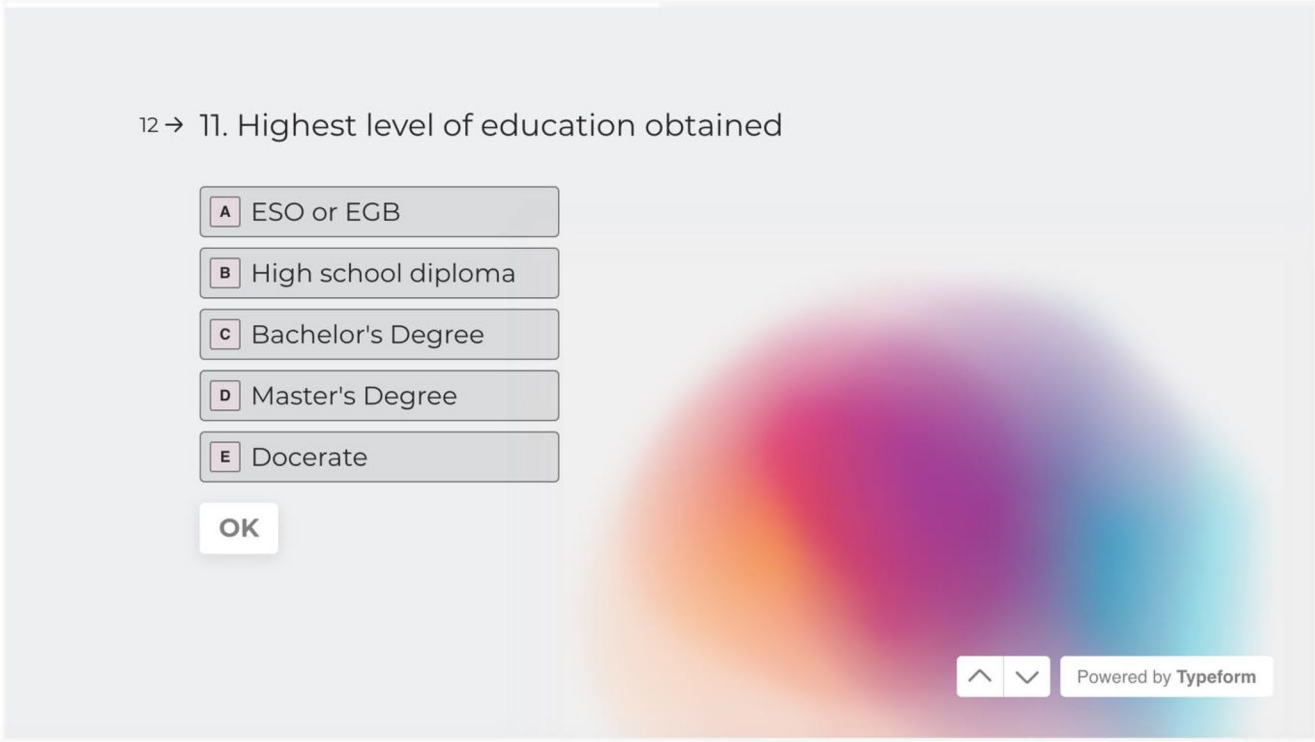
12 → 11. Highest level of education obtained
A ESO or EGB
B High school diploma
C Bachelor's Degree
D Master's Degree
E Docerate
OK
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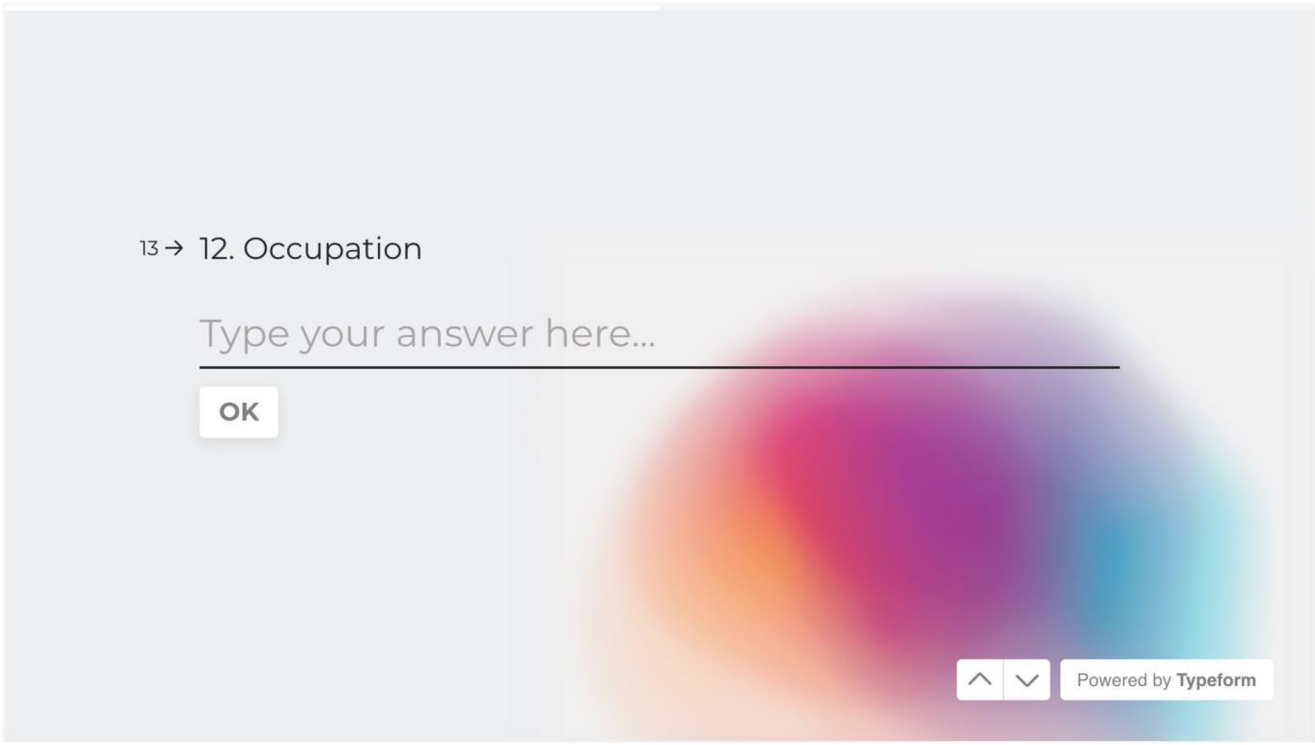
13 → 12. Occupation
Type your answer here...
OK
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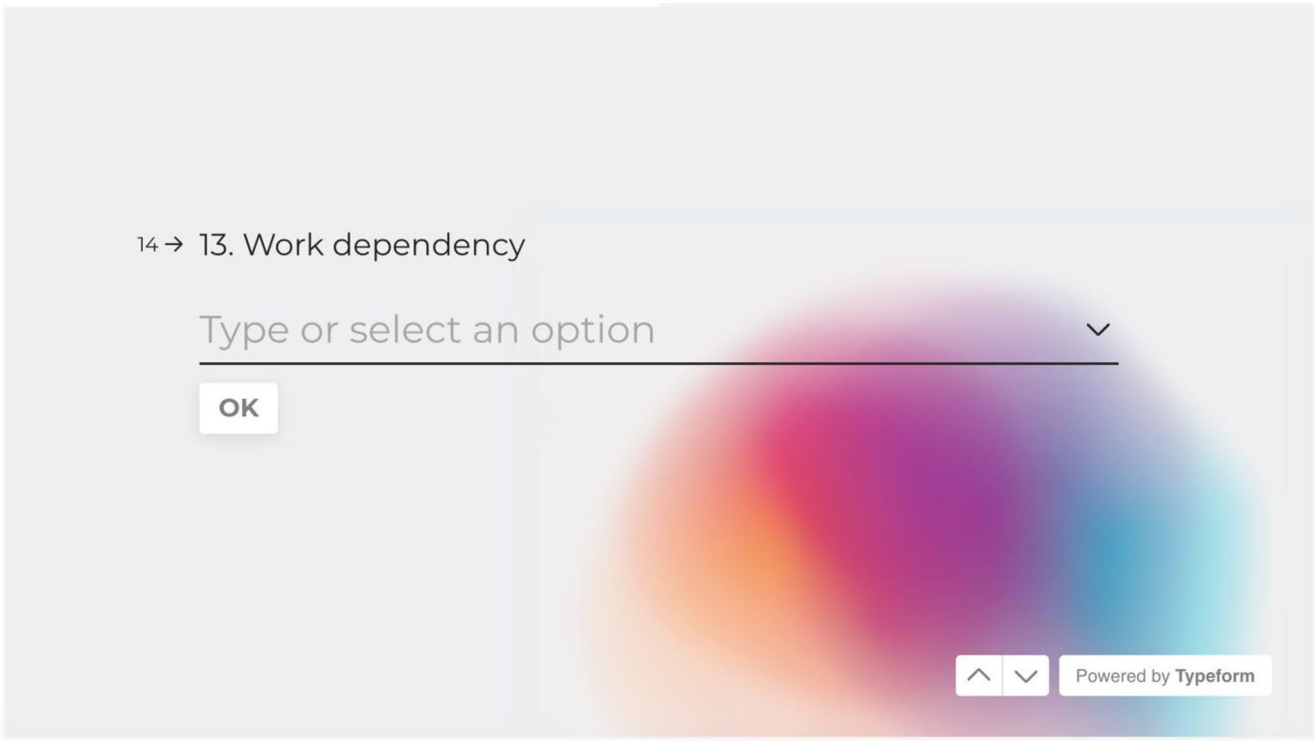
14 → 13. Work dependency
Type or select an option
OK
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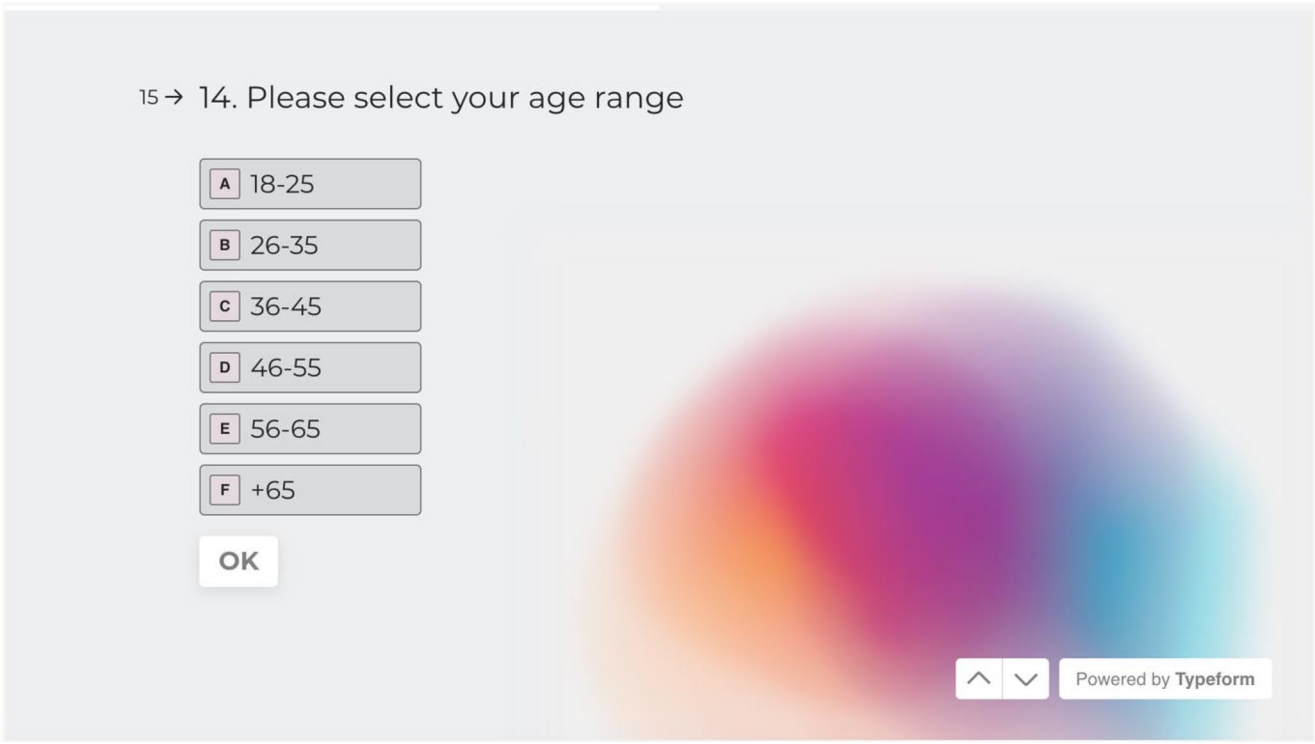
15 → 14. Please select your age range
A 18-25
B 26-35
C 36-45
D 46-55
E 56-65
F +65
OK
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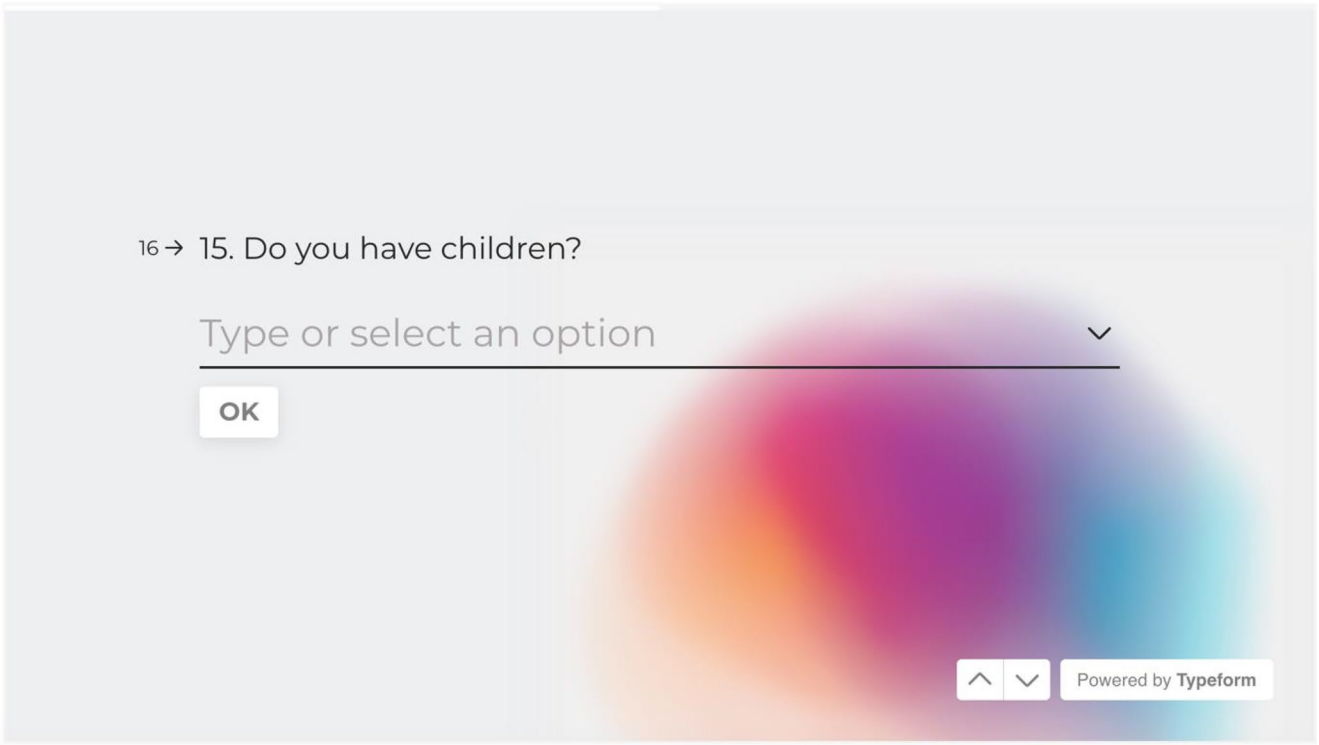
16 → 15. Do you have children?
Type or select an option
OK
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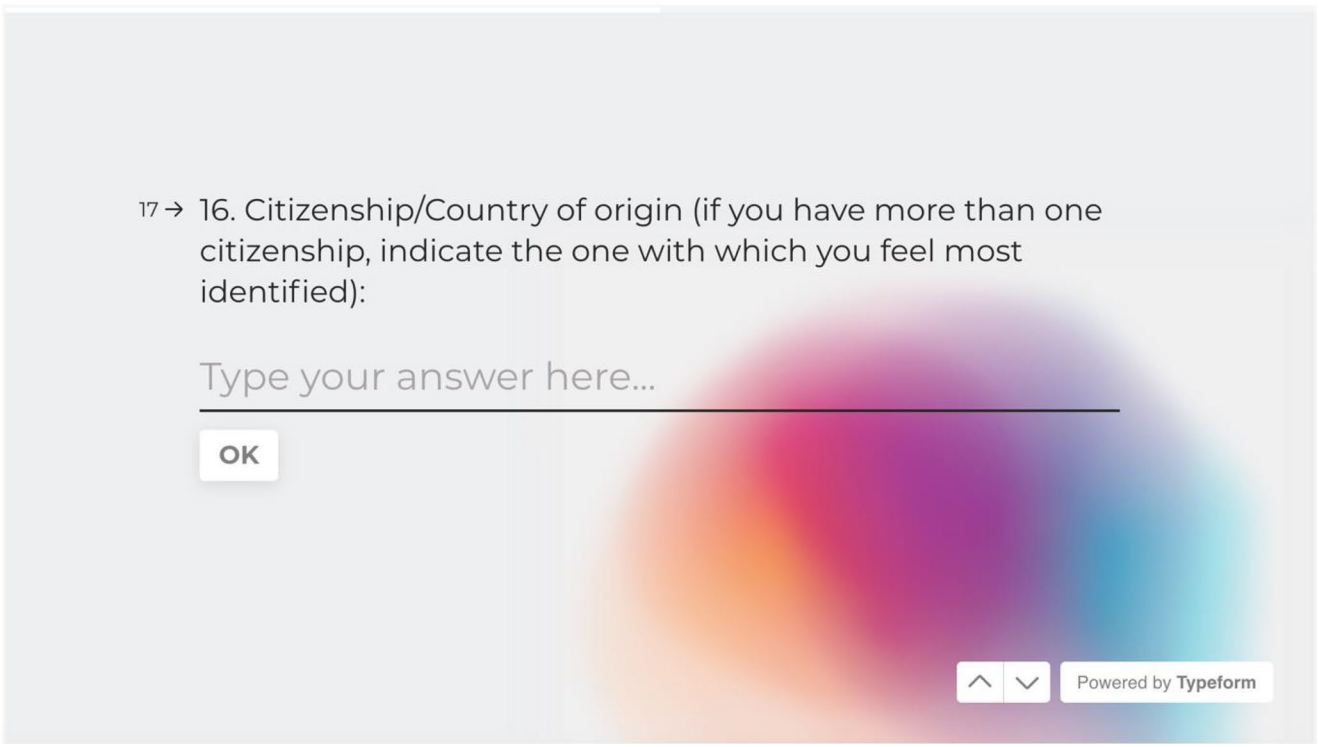
17 → 16. Citizenship/Country of origin (if you have more than one citizenship, indicate the one with which you feel most identified):
Type your answer here...
OK
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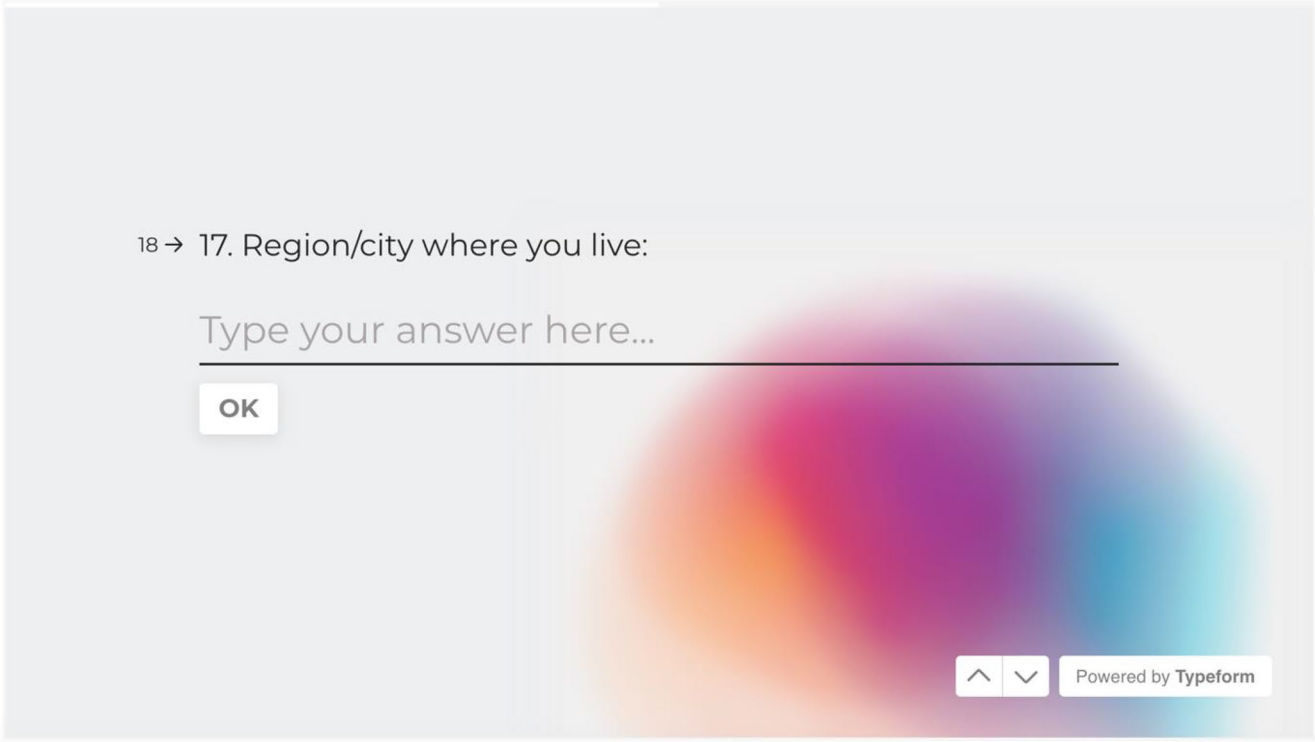
18 → 17. Region/city where you live:
Type your answer here...
OK
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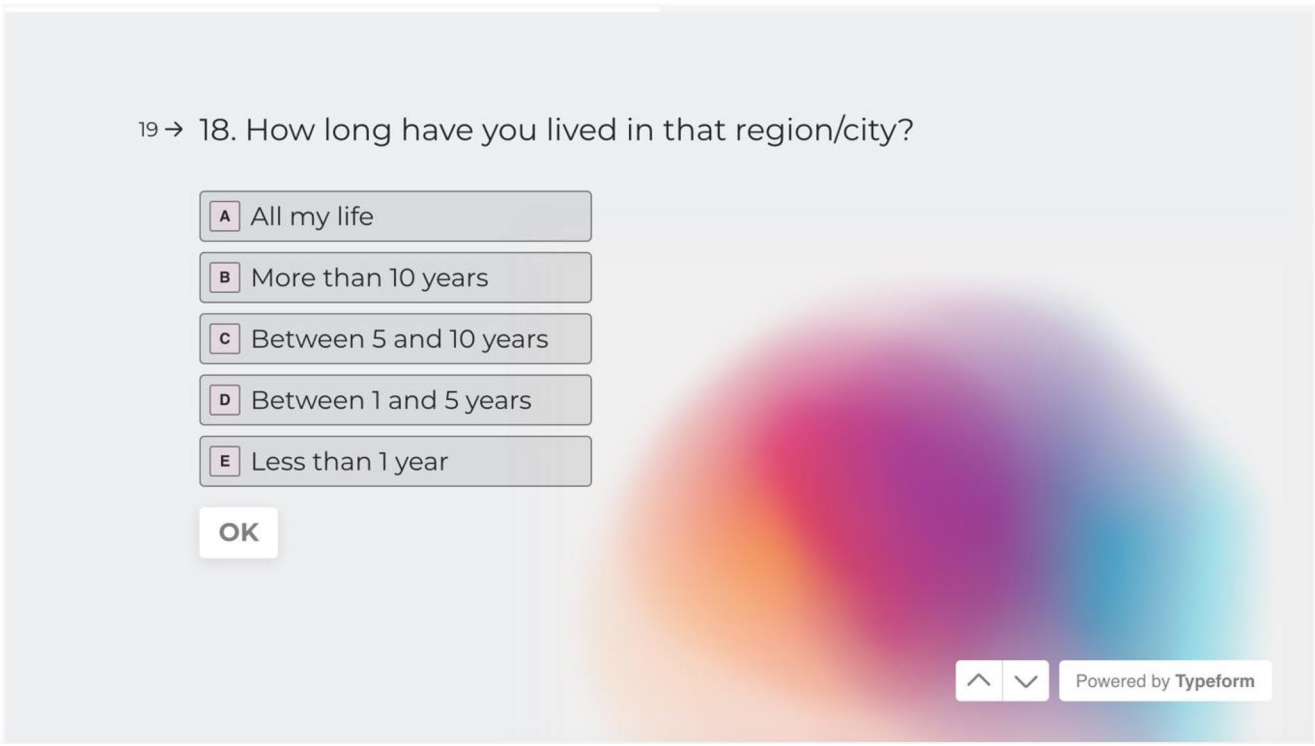
19 → 18. How long have you lived in that region/city?
A All my life
B More than 10 years
C Between 5 and 10 years
D Between 1 and 5 years
E Less than 1 year
OK
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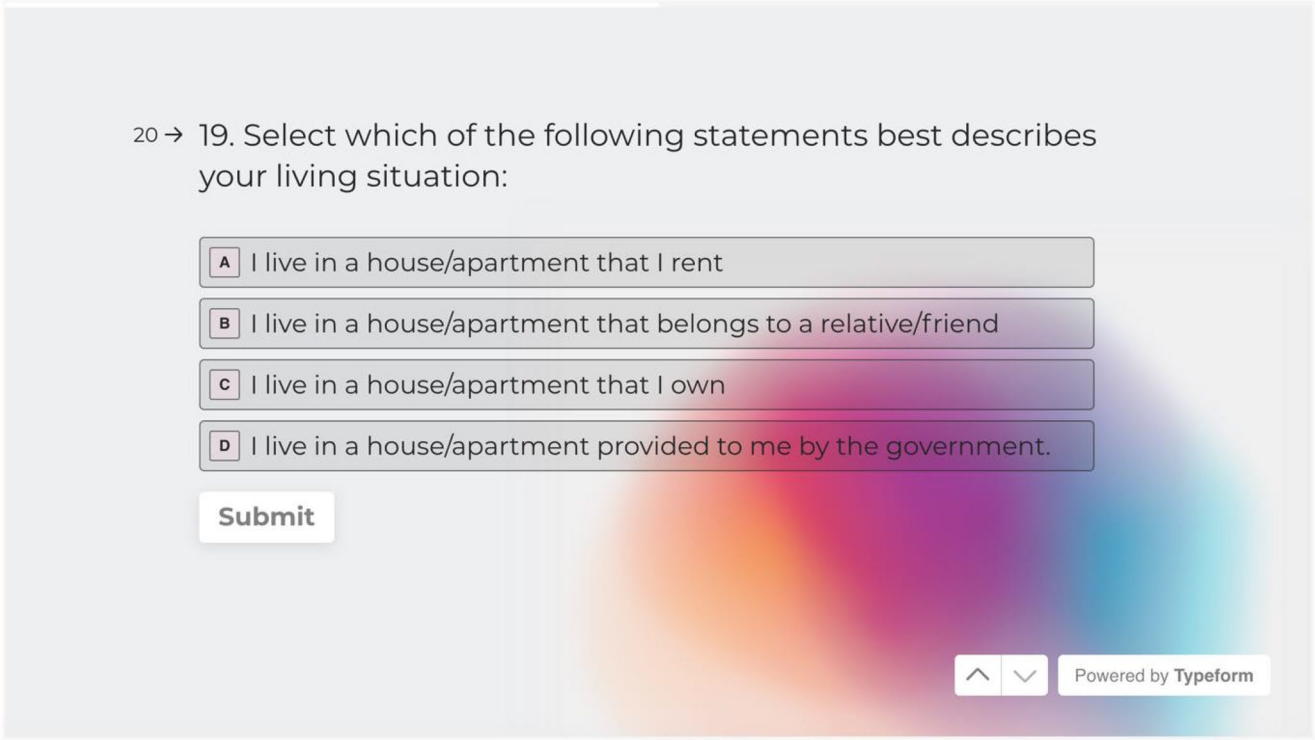
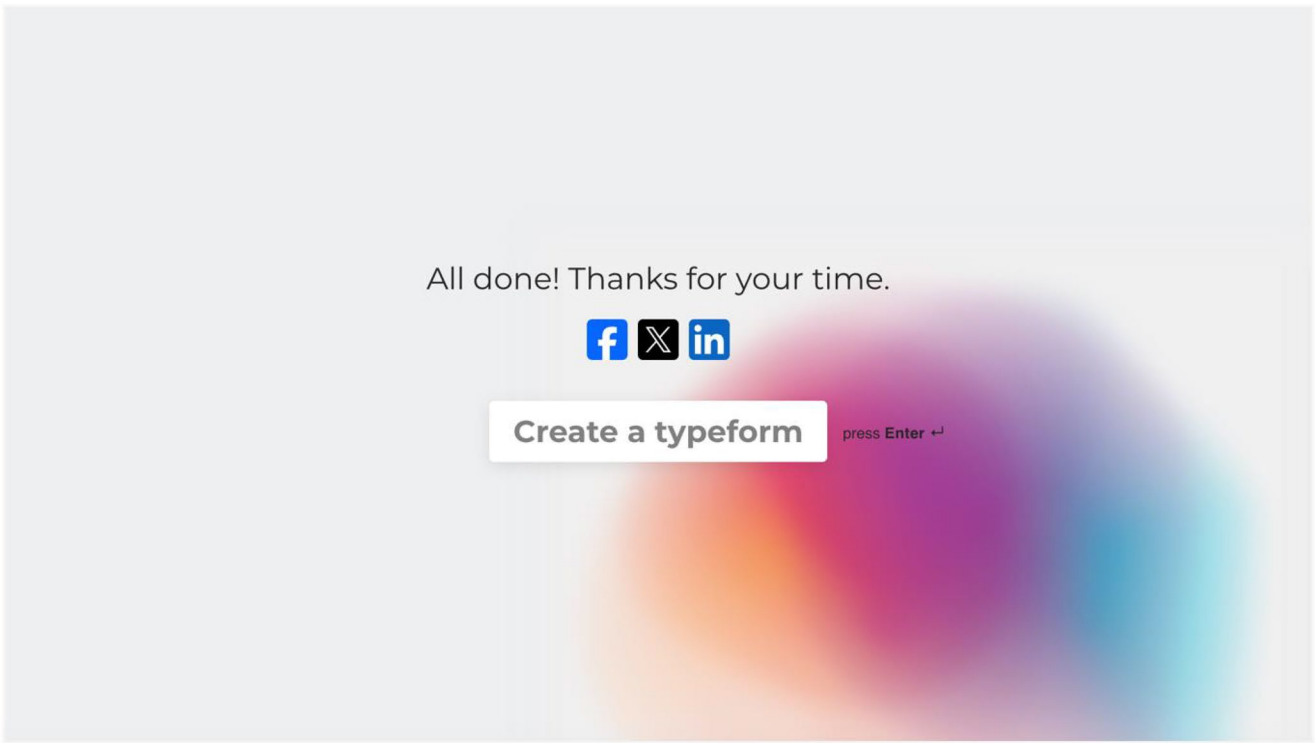

20 → 19. Select which of the following statements best describes your living situation:
A I live in a house/apartment that I rent
B I live in a house/apartment that belongs to a relative/friend
C I live in a house/apartment that I own
D I live in a house/apartment provided to me by the government.
Submit
Powered by Typeform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press Enter ↵

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Data availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

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