TransformAr

Accelerating and upscaling transformational adaptation in Europe: demonstration of water-related innovation packages

Results on the public acceptance and preferences

Deliverable 6.1

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EXECUTIVE SUMMARY

The TransformAr project aims to demonstrate solutions and pathways highly relevant "for climate and social resilience to achieve rapid and far-reaching transformational adaptation". One of the objectives of the project is understanding the degree of acceptance of adaptation solutions by the public. In this perspective, Task T.6.1 on the 'Econometric analysis of acceptance and preferences of adaptative solutions' seeks to elicit the preferences of the public for adaption solutions and to estimate the willingness to pay for adaptation measures and packages across Europe. To this purpose, we designed a survey to be conducted with 9000 respondents in six European countries (1500 per country) where demonstrators, and their respective adaptive solutions, are implemented. The survey is carried out by a reputable survey company using Computer Assisted Web Interviewing (CAWI) procedures.

Our main tool to assess the degree of acceptance of adaptation policy measures by European residents is a Discrete Choice Experiment (DCE). Discrete Choice Experiments have been used to address a wide range of policy concerns in transport economics, environmental economics, and health economics and climate policy, mostly in terms of mitigation. The literature on application of DCEs to adaptation is comparatively scarcer and it mainly focuses on agricultural adaptation and coastal adaptation. DCE studies on adaptation to climate change mostly refer to local study sites.

Discrete choice experiments (DCEs) provide quantitative information on the relative importance of various characteristics that can influence choices, as well as the trade-offs between these factors and the probability of selecting specific options. In a DCE setting, individual decisions about the object of the choice, be it a good, a service or a policy action, are determined by its characteristics, or attributes. One of these attributes is usually the price of the good or service, or the cost of the policy to the respondent (in the form of taxes or higher prices of certain products). DCEs are based on data collected by asking survey respondents to indicate their preferences among a number of goods or policy options described by attributes. In many cases one of these options is the status quo. A baseline (i.e. a status quo alternative) or opt-out (a do nothing option) is often included to ensure that respondents are not forced to make a choice if they prefer not to. In our case, following a Discrete Choice Experiment (DCE) approach allows us to gauge how much people are willing to pay for the implementation of an adaptation measure, or a combination of measures within a policy package. Our study follows a simplified DCE approach, whereby we adopt a referendum format, and each policy package is compared with the status quo. Hence two alternatives are compared in each round.

To generate a suitable database to estimate our model, we follow three lines of actions.

1) we include in our questionnaire questions about some **key individual characteristics of the respondents, as well as aspects of their experiences and opinions about adaptation** that are likely to influence their attitude towards adaptation.
2) we set up **our discrete choice experiment**, defining t**he attributes of the choice card** and we adopt a **referendum format** for our DCE, because it is a way to reduce drastically the complexity of the experimental design. In such a format, where a policy package is compared directly with the status quo, we are mindful to carefully treat **the issue of scope of the program,** to make sure that none of the scope variables (resource/sector covered, type of measure damage reduction and geographic coverage) is treated as redundant by the econometric model. This requires resorting to split sample treatments for the latter two variables.
3) we apply three **split sample treatments**, all independent (orthogonal) from each other, to understand whether the higher or lower degree of protection from climate change damages, or a higher or lower geographical coverage of the measures, do matter in the decision to support or not a given policy package. Moreover, we are interested in testing whether underlying the connection with nature of

certain policy measures (i.e., nature-based solutions) triggers more positive attitudes towards such measures, and hence we use a more neutral term for it with half of the sample.

Thus, our experimental design features

three split sample treatments (one for the language used to express nature-based solutions, one for the damage reduction and on for the geographical coverage) **eight attributes** (the six resource/sectors, the measure applied and the cost attribute) with their respective **levels**, (whether a sector is covered or not, the three types of measures alone or in combination, and the six levels of additional taxes). The resulting number of possible combinations for the choice cards is quite high (3072) but we do not need to use them all within a full factorial design. Instead, we can select a subset of the combinations of "resources/sectors" and "types of measures" that guarantees an exhaustive coverage of individual sectors and type of measures across the seven choice cards, while avoiding repetitions of packages across the seven choice cards seen by each respondent. We were able to identify a compact design that does a good job in terms of identification.

The key component of our study is the empirical evidence collected through the deployment of the survey. Designing the questionnaire for our survey took a considerable amount of creative effort, and a long trial-and-error process coupled with rigorous testing, due to the lack of suitable precursory studies in the literature. We went through four main stages:

- **An initial scoping stage** in which we identified, from the goals of the project and the features of the TransformAr Demonstrator Cases, the main topics of interest for our analysis.
- **An early development stage** in which we outlined the main structure of the questionnaire and explored various alternatives for the questions and for the features of the DCE experiment. We asked the partners in the demonstrator countries for their feedback about early drafts of the questionnaire. Furthermore, the first draft of the questionnaire was tested by means of ten one-on-one tests conducted on lay people in Italy.
- **An advanced development stage** in which the lesson learnt from the partners' comments and the first round of one-ones were incorporated in the draft questionnaire. In this stage important considerations such as the usual of visualisation aids, the role of consequentiality and the time dimension of payments were scrutinised and possible solutions tested again by means of 10 further one-on one tests, carried out in Italy, Spain, Finland, the UK, and Norway.
- **A final stage** whereby the lessons learnt in the second round of 12 one-on-one tests (also lasting 1 hour) were incorporated into the questionnaire, the online version of the questionnaire was duly tested, the final polishing touches were added and the final translations into Italian, Spanish, Finnish, Greek and Norwegian were carried out.

Based on the lessons learnt from the second round of tests, we finalised our English version of the questionnaire and translated it in the other five languages.

The final questionnaire includes seven sections. After a few demographic questions needed to verify the sampling quotas, the focus progressively narrows from broad attitudes towards climate change to the more specific features of adaptation policies, followed by the discrete choice experiment. The final section deals again with the socio-demographic features of the respondent's household. Along the questionnaire, we provide essential information to the respondents in, we hope, a clear and neutral way. The questionnaire closes with a final question about consequentiality.

At the time of writing this report the survey was about to be launched. This Executive Summary and the full deliverable will be completed with the results of the econometric analysis as soon as the dataset will be made available by the survey company and the econometric model will be estimated.

1.0 INTRODUCTION

This report describes the motivation, the methods, the development, and the preliminary results of an empirical study about the acceptance of adaptation options among European residents of solutions to adapt to climate change.

The TransformAr project aims to demonstrate solutions and pathways highly relevant "for climate and social resilience to achieve rapid and far-reaching transformational adaptation".

This is done through a wide array of activities, centred around the development, deployment, and testing of specific adaptation solutions in the EU.

Several of TransformAr's activities focus on providing the most complete knowledge base to stakeholders and policymakers and to the public, to ensure that all the relevant information about opportunities, conditions and implications of adaptation options are available. The project thus provides:

- user-friendly, accessible and comprehensive multi-sector dynamics data services relevant to transformational adaptation and its water-related challenges and fit the needs of public and private;
- innovative financial schemes with demonstrated bankability to support the financing of adaptation solutions;
- a consolidated catalogue of solutions with associated guidance documents, and
- an understanding of the acceptance and preference of citizens of solutions for transformational adaptation.

In view of the last of these objectives, Task T.6.1 on the 'Econometric analysis of acceptance and preferences of adaptative solutions' sets out to gauge the acceptance of adaptation solutions across Europe. In particular, this empirical study seeks to elicit the preferences of the public through a discrete choice experiment. In a discrete choice experiment, survey respondents are asked to choose between a few measures, each described by a set of characteristics, among which one specifies the hypothetical cost of each measure for the respondents' household. By exploiting the theoretical relationship between the parameters attached to each other characteristic and the one related to costs, a willingness to pay measure for policy actions can be empirically estimated.

Our survey is conducted with 9000 respondents in six European countries (1500 per country). The survey is carried out by a reputable survey company using Computer Assisted Web Interviewing (CAWI) procedures. The responses will allow us to see whether the place of residence, the personal socio-demographic features, and the experience with adaptation can influence the support for adaptation measures and the benefits that the public associates with them.

The next section provides a brief review of the literature on discrete choice experiments with particular focus on the (few) applications to adaption to climate change. The rest of this report will describe how this study has been designed, developed and performed, the econometric approach applied, the dataset gathered and our results.

At the time of writing this report, the survey was about to be launched. This report will be completed with the results of the econometric analysis as soon as the dataset will be made available by the survey company and the econometric model will be estimated.

2.0 LITERATURE REVIEW

Discrete Choice Experiments have become a standard economic technique, addressing a wide range of policy concerns in transport economics (Caussade et al. 2005), environmental economics (Hanley et al. 2001), and health economics (de Bekker-Grob et al. 2012). Papers by Lancsar and Louviere (2008) and Train (2009) provide solid guidance on conducting a DCE.DCEs have been applied to the field of climate policy, mostly to mitigation. A systematic survey of this strand of literature is out of scope for this report. These studies aim to elicit the WTP for cutting greenhouse gas (GHG) emissions, (Alberini et al. 2018; Scasny et al. 2016) or to elicit preferences towards specific features of climate policies and plans (Carson, Louviere and Wei, 2010).

The literature on the application of DCEs to adaptation is comparatively scarcer and it mainly focuses on agricultural adaptation and coastal adaptation. DCE studies that address adaptation to climate change mostly refer to local study sites.Studies that address adaptation to climate change in agriculture often focus on specific local measures (for instance Nathambi, Morkova-Nevova and Wätzold, 2021 for irrigation water supply in Kenya; Schaafsma, Ferrini and Turner, 2019, for Malawi; Alcon et al.,2014, for irrigation water supply in Segura, Spain); a few cover preferences for more general adaptation solutions such as insurance against extreme weather events among Irish farmers (Doherty et al., 2021), Danish farmers (Jørgensen, Termansen, and Pascual, 2020) or in Myanmar (Furuka, Omori and Aizaki, 2021); adoption of climate-resistant crop varieties in Mali (Waldman and Richardson, 2018), or in India (Arora, Bansai and Ward 2019) or land use changes in Austria (Pröbstl-Haider et al., 2016).

A couple of studies evaluate bundles of adaptation measures. The aforementioned Danish study (Jørgensen, Termansen, and Pascual, 2020) evaluates the possibility of applying jointly two adaptation solutions (weather insurance and improved land management). Khnaal et al. (2018) elicit preferences of Nepalese farmers for composite adaptation programs that include increased access to climate adaptive crop species and varieties, improved soil quality and irrigation and training in climate adaptive farming. Bro et al. (2020) look at the adoption of climate-resistant coffee varieties coupled with crop management practices.

Studies that address adaptation to climate change in coastal areas focus on either single (e.g. Remoundou et al. 2015; Dachary-Bernard, Rey-Valette, and Rulleau 2018; Liski, Koetse, and Metzger 2019) or sets of adaptation measures (e.g. Chen, Swallow, and Yue 2020; Oliveira and Pinto 2020, Meyerhoff, Redhanz and Wunsch 2021; Wunsch Meyerhoff and Redhanz 2022). Remoundou et al. (2015) investigate preferences for preserving the status of beaches in the Santander Bay area, Spain through replenishment. Liski, Koetse, and Metzger (2019) study the influence of deliberate interventions on realignment preferences as an adaptation approach for Scotland's Inner Forth Estuary. Dachary-Bernard, Rey-Valette, and Rulleau (2019) investigate preferences for features of realignment schemes (time, magnitude, and population consultation process) based on risk perception, of both coastal and hinterland residents around Béziers, France.

As to studies on sets of measures, Chen, Swallow, and Yue (2020) compare preferences for conventionally engineered seawalls and nature-based protections designated as a living coastline for inhabitants of Virginia's Eastern Shore, USA. Landry, Shonkwiler, and Whitehead (2020) investigate coastal erosion management preferences for North Carolina beaches in the United States. Oliveira and Pinto (2020) study consumers' choices for coastal erosion management alternatives at Praia da Amorosa in northern Portugal, including lighter interventions and heavy infrastructures. Meyerhoff, Redhanz, and Wunsch (2021) investigate the trade-offs people are prepared to make in terms of coastal adaptation along the German coast in terms of six attributes: the extent of beach nourishment, dyke elevation, cliff protection, access to dunes, dyke and dunes realignment, and cost in terms of a coastal protection tax. Respondents could be sorted among three latent groups: those who desire major adjustments, those who are only ready to pay for a dike height increase, and those who are hesitant to bear higher costs. Overall, estimated aggregated WTP turns out rather high, particularly those for adaptation scenarios preserving recreation activities, followed by those that protecting nature and safety. In a follow-up study (Wunsch, Meyerhoff and Redhanz 2022), the same authors argue that preferences for coastal adaptation in Germany remain quite stable in terms of

heterogeneity patterns, despite the COVID-19 pandemic, although the relative size of the classes was significantly affected.

3.0 METHODOLOGICAL APPROACH

Our main tool to assess the degree of acceptance of adaptation policy measures by European residents is a (simplified) Discrete Choice Experiment (DCE) setting. Discrete choice experiments (DCEs) provide quantitative information on the relative importance of various characteristics that influence choices, as well as the trade-offs between these factors and the probability of selecting options.

In a DCE setting, individual decisions about the object of the choice, be it a good, a service or a policy action, are determined by its characteristics, or attributes. One of these attributes is usually the price of the good or service, or the cost of the policy to the respondent (in the form of taxes or higher prices of certain products). Each attribute is made up of a number of levels that represent the degree or value that each attribute can take.

DCEs are based on data collected by asking survey respondents to indicate which they prefer among a number of goods or policy options ($N \geq 2$) described by attributes. In many cases one of these policy options is the status quo. Respondents are not allowed to mix-and-match attributes or make substitutions within the policy options.

Some economists are critical of discrete choice experiments because they are sceptical of stated preference methods in general, due to the hypothetical nature of the goods or options and the fact that no actual transaction takes place. Respondents may for example overstate their WTP. But in practice stated preference methods may have an edge over revealed preferences methods (where actual behaviour is observed) when testing out new ideas and policies that do not exist yet.

Given the hypothetical nature of choices in a DCE setting, policy actions implementing the findings of DCE studies should validate such findings through subsequent monitoring and ex-post policy assessment. Nonetheless, several strategies exist to reduce hypothetical bias in DCEs. As Colombo et al. (2020) put forward, these strategies can be divided into ex-ante and ex-post mitigation strategies. Ex-ante mitigation strategies seek to reduce hypothetical bias in the design stage of the survey by emphasising what can be referred to as consequentiality (i.e., the consequence of the respondent's choices). This can be addressed by informing respondents that results will have an impact on policy (when this is the case), or through reminders to behave as they normally would behave (by including e.g. 'cheap talk' scripts (Doyon et al., 2015)). Ex-post approaches to tackle hypothetical bias could include screening data for implausible responses based on post-experimental questions related to respondents' maximum WTP, for example, or respondents' stated certainty about a choice. Another option is to combine stated preferences data with revealed preference data (Colombo et al., 2020).

Implementing a DCE requires performing a series of steps:

- identification of attributes and assignment of levels.
- experimental design: deciding what choices to present to individuals.
- development and administration of the survey (data collection).
- data cleaning and formatting for analysis.
- analysis and interpretation.

Thus, our DCEs will begin with the identification of the attributes of the adaptation solutions and their relevant levels. The selection of attributes and their levels should be informed by the literature and relevant stakeholders; they should be realistic and actionable by policy, and validated trough focus group discussions or interviews in the local setting. A clear and unambiguous language is crucial in describing attributes and levels to make sure that their interpretation by the respondents is the same as the one of the authors. Additional important factors to consider in the experimental design phase are the size of the sample, the

possible inclusion of interaction terms, the definition of a status quo/ opt-out option, and the number of DCE questions a respondent can answer before fatigue, boredom or drop-out motivation prevails.

3.1 Theoretical approach for Discrete Choice Experiments

Following a Discrete Choice Experiment (DCE) approach allows us to gauge how much people are willing to pay for the implementation of an adaptation measure, or a combination of measures within a policy package.

Importantly, DCEs can shed light on the trade-offs that respondents are willing to make among attributes, and on the probability of take-up of defined solutions. Trade-offs among attributes can be estimated if a continuous variable is included. If this continuous variable is income, the monetary value for other attributes can be estimated. A particularly useful feature of this approach is its flexibility as to the object of the willingness to pay to be estimated. By exploiting the interactions among marginal effects in terms of marginal utilities, this approach can compute not only the willingness to pay for say, the implementation of a single nature-based solution to preserve water supply, but also the one for a package in which this action is coupled with say, regulatory measures in the same field, or even other kind of measures in other sectors.

In a DCE setting it is posited that responses are driven by the Random Utility Model (McFadden, 1974), where the indirect utility $\bar{V}$ from an alternative depends on the attributes of that alternative. The attributes may also appeal to a different extent to different individuals. In the random utility model, the indirect utility $\bar{V}$ is made up of a deterministic component and a random component. Formally, we assume that the deterministic part is, for each adaptation solution *j* and respondent:

(1) $$\bar{V}_{ij} = \boldsymbol{\alpha X_i} + \beta\left(y - COST_{ij}\right) + \boldsymbol{\gamma X Z_j}$$

where subscripts *i* and *j* denote the individual and the alternative, respectively; the vector of variables $\mathbf{X}_i$ is the set of individual household *i*'s characteristics; the vector of variables $\mathbf{Z}_j$ is the set of characteristics of the policy package in alternative *j*; *y* is the respondent's household income and $COST_{ij}$ is the cost of the program to the respondent's household (euro per year). In equation (1), the α's and γ's are, respectively, the marginal utilities for households' characteristics and for policy packages' characteristics, and β is the marginal utility of income.

In this framework, individuals are assumed to choose between *J* alternatives, opting for the one associated with the highest utility (benefit or satisfaction). Thus, individual *i* will choose option *k* over *h* if and only if *i* attains a higher level of utility under *k* than under *h*.

On appending an error term, ε (and dropping the respondents' index for brevity), the utility of option *j* becomes:

(2) $$V_j = \boldsymbol{\alpha X_i} + \beta\left(y - COST_{ij}\right) + \boldsymbol{\gamma X Z_j} + \varepsilon_j = \bar{V}_j + \varepsilon_j$$

The probability of choosing solution *k* over solution *h* is then

(3) $$\Pr(V_k > V_h) = \Pr(\bar{V}_k + \varepsilon_k > \bar{V}_h + \varepsilon_h)$$

Our study follows a simplified DCE approach, whereby we adopt a referendum format, and each policy package is compared with the status quo. Hence two alternatives are compared in each round.

On appending an independent and identically distributed (i.i.d.), standard type I extreme value error term, ε, it can be shown that the probability that alternative *k* is chosen is

(4) $$\Pr(k) = \exp\left(\bar{V}_k\right) \Big/ \sum_{m=1}^{2} \exp\left(\bar{V}_m\right)$$

which is the contribution to the likelihood in a conditional logit model (see Train, 2009).

In our questionnaire, each respondent is faced with T=7 choice cards, and the log likelihood function is

(5) $$\log L = \sum_{i=1}^{N}\sum_{t=1}^{T}\sum_{k=2}^{2} w_{itk} ln\left(\exp\left(\bar{V}_{itk}\right) \Big/ \sum_{m=1}^{2}\exp\left(\bar{V}_{itm}\right)\right)$$

where w_{itk} is a binary indicator denoting whether respondent *i* selects option *k* in choice exercise *t*. All coefficients are estimated by the method of maximum likelihood. In practice, β is estimated using only cost, rather than residual income (*y-COST*), so that the estimation routine produces the negative of β as the coefficient on cost.

The willingness to pay for each component *j* of the policy package is $\hat{\alpha}_j/\hat{\beta}$ is, where the "hats" denote the maximum likelihood estimates. In this study, however, we are specifically interested in seeing if the WTP for key characteristics of the packages change with other features of the packages or the characteristics of the individual, or both — and by how much.

The coefficients (α **and** γ) thus generated can be used to determine:

- whether the attributes are relevant (statistically significant), the direction of their relevance (shown by their algebraic sign) and their relative importance. For instance, se may want to check how much education level influences WTP for adaptation policies.
- whether the coefficients conform with theory or prior expectations, using the direction of the coefficients' signs as a check on the theoretical/internal validity. For instance, we may test the expectation that people living far from the cost may reduce WTP for coastal protection adaptation packages.

3.2 The econometric model

We wish to study what factors influence support for the various configurations of adaptation policy packages, and the magnitude of such support measured in terms of WTP.

In order to investigate our research questions, we expand equation (1) as follows:

(5) $$\bar{V}_{ij} = + \boldsymbol{\alpha X} + \beta\left(y - COST_{ij}\right) + \gamma_1 REDUCTION_{ij} + \gamma_2 COVER_{ij} + \gamma_3 NBSNAME_{ij} + \boldsymbol{\gamma_3 X Z_j}$$

where COVER, REDUCTION, and NBSNAME are vectors of dummies we use to capture the effect of the three split-sample treatments mentioned above. In practice, this means that we are including alternative-specific intercepts in the discrete choice model. The vector of variables **X** is again the set of characteristics of the respondent's household. Vector **Z** is the sets of all other characteristics of the of the policy package (i.e., those not treated as split sample dummies), while *y* is again the respondent's household income and COST is the cost of the program to the respondent's household (Euros/year).

3.3 The experimental design

To generate a suitable database to estimate our model, we follow three lines of actions.

4) First, we include in our questionnaire questions elicit about some **key individual characteristics of the respondents** that we suspect may influence their attitude towards adaptation. For instance, direct experience of implementation of adaptation policies, or a sense of urgency for specific adaption

measures perceived as badly needed, are factors likely to increase the acceptance of adaptation measures. It is also likely that some socio-demographic characteristics of the respondents, such as their gender, education level, age, income, and the place where they live, are likely to have impacts on the degree by which they may welcome such policy actions. We can test whether living near the coast implies a higher acceptance for adaptation measures targeting coastal areas, or living in a rural area implies a higher attention to adaptation measures targeting agriculture or forestry. Initially, we considered treating these two geographical features of the respondents as split sample treatments as follows: a) living on the coast or in the interior, and b) living in an urban area or in a rural area. We realised that these features could be handled more efficiently by means of ad-hoc variables based on the postal codes of the respondents. The Dynata panel members provide their postal codes upon enrolling, but this information cannot be disclosed directly to us for privacy reasons. However, Dynata can provide approximate values for the distance from the coast of each respondent, by matching the distance from the coast of thee centroid of each postal code area with the postal code of each respondent. Thus, using the matching between postal codes and geographical coordinates provided within a Eurostat database, we derive a continuous variable for the distance from the coast to be matched to each respondent. The same database contains information about the urbanization degree of the area to which each postal code pertains. An analogous matching can thus be performed for a dummy variable flagging whether the postal code area of each respondent pertains to a rural or urban location. UK is unfortunately not included in this database, thus an alternative source (Ordinance Survey) was used, which however does not include the degree of urbanization. To overcome this problem, we also ask directly to respondents whether they live in a densely populate urban area, in the suburbs or in a small town, or in a rural area.

Second, we set up **our discrete choice experiment**. The main challenge from the survey design point of view is to devise a discrete choice experiment that is:

- understandable for the respondent;
- computationally manageable;
- able to capture the features of interest of adaptation policy packages;
- able to generate a menu of choice packages which are both realistic and cover reasonably well the spectrum of possible combinations;
- generating a database likely to provide answers to our research questions.

Third, we apply three **split sample treatments**, all independent (orthogonal) from each other. We use them to understand whether the higher or lower degree of protection from climate change damages, or a higher or lower geographical coverage of the measures, matter in the decision to support or not a given policy package. These two treatments appear as attributes within the choice cards, but they are fixed at one of their two possible values for each half of the sample. This approach allows us to investigate aspects of the scope of the policy packages which would otherwise be bundled together in terms of utility change (see further on in this section for a theoretical explanation of this issue). Moreover, being mindful of the importance of language in purporting the characteristics of alternatives in a choice experiment, we are interested in testing whether the connection with nature (and the mention of nature) of certain policy measures triggers more positive attitudes towards such measures. Therefore, we split our sample in three pairs of equally large sub-samples according to the following criteria:

- the geographical coverage of the damages (either 60% or 80% of the national territory);
- the percentage reduction in damages of climate change brought about by the package (either 50% or 75% of the damages);
- Naming nature-based solutions either "nature-based" in the choice cards or using a more neutral wording such as "non-infrastructure measures", that omits any reference to nature.

Our final experimental design is also the result of a process of dealing with several potential sources of complexity, which we solved with the help of our one-on-one- tests with interviewees from the survey's target countries.

The attributes of the choice card. Our initial idea for the DCE involved six attributes: the institution in charge of implementation (local or national authority), the area of implementation (water, agriculture etc.), the type of intervention (infrastructure, nature-based, financial, research-based), the percentage damage reduction the policy instrument used (regulations, subsidies, etc), and the cost of adaptation (Euro/year). This initial list needed rationalisation, as some attributes proved redundant as they lacked a clear link with our research questions (either as such, or in terms of the levels they may attain), while key aspects were not covered. Thus, the following changes were implemented:

- The attribute related to the institutions in charge of the measures and the policy tools applied was dropped. Since during the first round of tests our respondents were quite indifferent about who is in charge, and in view of the need to keep the number of attributes as low as possible to keep the DCE simple to understand and computationally manageable we established that this is a secondary consideration in determining the acceptance of policy packages by the public, compared to what the policy package covers.
- "Financial adaptation" and "research-based adaptation" were dropped from the list of possible types of adaptation. In a sense, they were merged into the broader "institutional adaptation" category, but at a deeper level, both are necessary preconditions to all adaptation actions, which need to be financed as well as researched and designed, before being implemented. Dropping these categories simplifies considerably the factorial design, as it reduces by a factor of two the degree of complexity of the possible combinations of policy attributes.
- The list of sectors and resources covered was reduced to include only those most relevant for the Demo cases in terms of climate change adaptation (water supply, water resources, coastal areas, agriculture, forestry, and fisheries) dropping tourism and health.
- The "geographical coverage", that is, how much of the national territory is covered by the policy package (expressed in percentage terms) was introduced as it is a key factor in determining the scope of a policy package.
- The cost parameter was examined with the utmost care and two main alternatives were considered: an annual addition to income taxes to be paid each year for ten years, or a lump-sum payment to be paid once and then put in a fund earmarked to cover the costs of the policy package for the next ten years. These two alternatives have profound implications in terms of the time dimension of the underlying Random Utility Function and hence on the way WTP can be estimated econometrically. The lump sum alternative introduces intertemporal interdependences in the utility function and makes the log-likelihood function highly non-linear and problematic to treat econometrically. On the plus side, it would bring about the possibility to study intertemporal preferences for adaptation. Eventually, based on one-one test results

that indicated a strong preference of test respondent for the annual tax format, the annual tax option was chosen, and a suitable range of six alternative amounts for the extra annual tax was identified.

The Discrete Choice Experiment format. We adopt a referendum format for our DCE, because it is a way to reduce drastically the complexity of the experimental design, by dropping one of the two alternative policy programs and compare the remaining one directly to the status quo. For the respondent, it is easier to answer to a few binary choice questions, rather than comparing three options the same number of times. Computationally, the number of possible outcomes is significantly reduced, as they are determined within a bi-dimensional matrix of possible outcomes, instead of a three-dimensional one. The responses to a referendum format DCE can be interpreted as implying that the respondent's WTP for the program is higher or lower than the cost of the program to the respondent.

In such a format, where a policy package is compared directly with the status quo, we must be **careful about the way we treat the scope of the program**. In fact, what is included in a policy package comes with various angles: the sector/resource affected, the type of measures included in the policy package, the percentage of damages to be reduced, and the fraction of national territory covered. This generates an important modelling issue. Albeit they are qualitatively different, in terms of utility all these elements concur together to determine an unobserved net benefit to the respondent, who implicitly compares it with the net benefits of the status quo, which are zero by definition, when voting in favour or against it. In other words, the features of the program all concur to increase or decrease the utility of the respondent, and their respective roles in this process are undistinguishable from the outside. A way to trace down the different contributions of the "sectors/resources", the type of measures, and of percentage damage reduction, is to treat "sectors/resources" as full-fledged attributes, the second ones as their weight in the benefit function, and the percentage reduction in damage as a shift parameter. Formally, the idea that a program is chosen if the net benefits of the program *P* are greater than those of the status quo (i.e., 0) can be written as

(6)

$$NB_P > NB_{SQ}$$

$$B_P - C_P > 0$$

$$DR_P \cdot \sum_{j=1}^{k} D_{jP} \cdot \boldsymbol{w} - C_P > 0$$

Where DR_P is the percentage damage reduction offered by the program, $D_{jP.}$ is the (unobserved) idea in the respondent's mind for the damage caused by climate change to resource/sector *j* covered in program P, and **w** is a vector of (also unobserved) weights attached to the respondent's preferences for the type of adaptation action. This provides another way to simplify our design: the damage reduction in our final design loses its status of full-fledged attribute and becomes a split sample treatment. The geographical coverage can be treated in the same way.

Ultimately, our design includes **three split sample treatments** (one for the language used to express nature-based solutions, one for the damage reduction and on for the geographical coverage) **eight attributes** (the six resource/sectors, the measure applied and the cost attribute) with their respective **levels**, (whether a

sector is covered or not, the three types of measures alone or in combination, and the six levels of additional taxes).

There are of course various possible measures of each kind for each resource/sector[1] which we do not include directly in the choice card. Instead we provide examples of relevant infrastructure, nature-based and institutional measures for each resource/sector (if relevant) in the information material preceding the DCE (see Table 3-2), striving to keep the content of possible combinations clear and unambiguous. Thus, we make clear that "water supply" refers only to residential, commercial, and industrial uses, while "irrigation" is used only for infrastructure adaptation in agriculture; also, there are no infrastructure adaptation measures of any significance for public adaptation policies for fisheries and forests.

In our setting, the "real" attributes in the DCE (i.e., the elements in the choice cards not used for split sample treatments) are the six resource/sectors, the measures applied and the cost attribute. There are six resources/sectors that can be either covered or not covered by policy packages. There are eight theoretical ways in which policies or combinations of policies can be applied (including the one in which no measure is applied) and there are six different levels of costs for the taxpayers. The full range of all theoretically possible configurations is called the **full factorial** and counts 2^6 possible configurations for sectors/resources being covered or not covered, 8^1 configurations for the type of policies and 6^1 for the costs. Thus, the full factorial has $2^6 \times 8^1 \times 6^1 = 3072$ combinations. This a daunting number of possible choices for anyone; however, our relatively large sample of 1500 respondents in each country, each one facing seven choice cards, implies that on average each possible combination can be seen almost 3.5 times in each country.

Following Carson, Louviere and Wei (2010), who have a similar setting in terms of eliciting preferences for policy packages, we note that we do not need to use the full factorial design but we can select a subset of the above specified combinations that guarantees a good coverage of individual sectors and type of measures across the seven choice cards, while avoiding repetitions of packages across the seven choice cards seen by each respondent, and avoiding irrelevant combinations. We experimented with several such designs by means of simulations, and we were able to identify a design that does a good job in terms of identification. In practice, we built a mock sample of respondents and tested a very basic version of the econometric model, and our design was able to yield an estimated coefficient for each attribute. In particular, in our final design we drop all the combinations that cover no sector or offer no measure, and combinations that combine infrastructure and forests or fisheries. This leaves us with 1800 combinations from which we draw the seven alternatives to be presented to our respondents. Note that or final design requires the additional assumption that the same types of measures are to be applied uniformly across the sectors covered in the choice card.

3.4 The questionnaire design

The key component of our study is of course the empirical evidence collected through the deployment of the survey. Designing the questionnaire for our survey took a considerable amount of creative effort, and a long trial-and-error process coupled with rigorous testing, due to the lack of suitable precursory studies in the literature. We went through four main stages:

- **An initial scoping stage** in which we identified, from the goals of the project and the features of the Demo Cases, the main topics of interest for our analysis. A questionnaire was distributed to the

[1] see Table 3-2 for some examples; note that for some resource/sectors, some types of measures may not be available.

demonstrators to gather information needed for this initial scoping stage, and a workshop was conducted to discuss these topics in more detail directly with the relevant partners.

- **An early development stage** in which we outlined the main structure of the questionnaire and explored various alternatives for the questions and for the features of the DCE experiment. We asked the partners in the demo countries for their feedback about early drafts of the questionnaire. Furthermore, the questionnaire was tested by means of ten one-on-one tests lasting 1-2 hours conducted on lay people in Italy.
- **An advanced development stage** in which the lesson learnt from the partners' comments and the first round of one-ones were incorporated in the draft questionnaire. In this stage important considerations such as the usual of visualisation aids, the role of consequentiality and the time dimension of payments were scrutinised and possible solutions tested again by means of ten further one-on one tests, carried out in Italy, Spain, Finland, the UK, and Norway.
- **A final stage** whereby the lessons learnt in the second round of tests were incorporated into the questionnaire, the final polishing touches were added and the final translations into Italian, Spanish, Finnish, Greek and Norwegian were carried out.

We describe below in more detail the main developments that took place during each of these stages.

3.4.1 Scoping Stage

This stage involved the following actions:

- Framing the problem: finding out what are the main traits of the demo case adaptation solutions to single out the features of adaptation measures that we wanted the DCE to capture.
- Identifying the themes to be covered by the other sections of the questionnaire: We needed to identify those aspects of climate change adaptation that are relevant for our project in terms of the possible attitudes of European residents. We also needed to identify which other aspects of their life are likely to matter for their attitudes towards adaptation to climate change.

To guide us in this scoping process, we sought the advice of the Demo Case partners (ADEME, CETMAR, EGALEO, LAPPERALANTA, MEDSEA AND WRT) through a short questionnaire, circulated in winter 2021-22. The questions inquired about the familiarity of partners with DCE, the perks of the adaptation solutions of their Demo Cases, the costs associated with the implementation of such solutions, the groups more likely to benefit from the implementation of these solutions and the groups more likely to bear the costs, the size of the population likely to be affected, and the degree of the maturity of the solutions (at the demo site or elsewhere). The replies from the Demo Cases partners clarified that:

- adaptation actions implemented at Demo sites focus mostly on water, agriculture, and fisheries.
- There is a wide range of typologies of measures, with a prevalence of nature-based ones.
- The "type of adaptation" (to address flooding, to address coastal erosion, droughts, forest fires, etc.) is very relevant and can be used as an attribute of the DCE.
- Population affected varies widely across demo cases, from a few hundred (households living on fisheries in Galicia) to over a million (tourist and local population in Guadeloupe). The specific segments of the population affected were also considered relevant.
- The reported costs of implementing the adaptive solutions at the Demo cases sites range between 10000 and 210000 Euros.

- Most solutions were in an early development phase, with only two solutions (WRT and EGALEO) partially implemented at that time.

During this stage, it was decided to use Norway (where a follow-up Demo Case is implemented) instead of France. This has been a hard decision to take, determined eventually by the following considerations: if we want to include adaptation options which are representative of the Demo Case situation, for France we would need to face the issue of adaptation actions implemented in overseas regions such as Guadeloupe. For these regions, two options are possible: either the entire national territory is surveyed, with the need of deploying the survey both in metropolitan France and in French overseas territories, or only overseas territories are targeted. Both options are problematic. If the whole France is surveyed, it will mostly represent the preferences and attitudes of people living in (geographical) Europe, the vast majority of which will not have ever visited any overseas territory, and hence is likely to feel quite distant from the adaptation needs in oversea territories and to have a limited knowledge thereof. Deploying the survey only in Guadeloupe and similar overseas territories, would have been logistically complicated (due to limited possibility of distributing a CAWI-based survey) and would produce results hardly comparable with those derived based on the responses of a (geographically) European sample, as it would overrepresent the view of people living in overseas territories. It was thus decided to leave France aside and explore the possibility of having a small survey in Guadeloupe directly administered by ADEME.

3.4.2 Early development stage

Based on the feedback from the Demo case partners, we designed the questionnaire. We wanted it to include a general part on the knowledge and attitudes of respondents about climate change and climate change adaptation, a core DCE section (in a standard setting, with two alternatives compared to status quo) and a concluding socio-demographic section.

In this early stage, the main challenge was to identify the relevant topics to be explored and the clearest language to be used in the questions and in the explanatory text boxes, to convey the right meaning to the respondents, while minimising the risks of boring or tiring them out. Topics that were considered and then discarded in the interest of clarity and conciseness included:

- whether respondents had ever heard about climate change.
- The use of financial adaptation measures.
- Among the attributes of the DCE: adaptation for health; urban vs. rural adaptation, adaptation for wetlands; the institutions in charge of implementing the measures; the specific policy instrument used for implementing the measures.
- The “angle” used to identify the sectors targeted by adaptation measures. We wondered whether we should use a bio-physical lens, and economic lens or a geographical lens. For instance, adaption measures for wildfire prevention target forest ecosystems, the inland territory and the forestry sector. We explored which angle would be understood most easily by respondents and whether to use it uniformly. Eventually we decided to use the most relevant and commonly used one for each specific resource under scrutiny, so to avoid introducing an extra layer of complexity. Thus, for example we refer to adaptation measures for agriculture rather than for “anthropic ecosystems” or “inland territories”, because these options would be unnecessarily obscure for the respondents.

Some of the discarded items were not completely abandoned, but grouped together in broader categories: for instance, adaption measures targeting wetlands were included into the nature-based solutions. Some question topics were discarded for good, as they were deemed redundant or not particularly relevant for the attitude of respondents towards adaptation (e.g., broad familiarity with climate change or the public authority in charge).

After several rounds of trials and errors about what should be included in the questionnaire, by end July 2022 we arrived at a version that was deemed suitable for testing. Before the proper one-on-one tests with administrative employees at CMCC, we also sought the feedback from partners in the survey countries.

Project partners were very supportive and gave us useful feedback that usually reflected their background and the adaptation solution their activity is focused on. They flagged the following concerns and suggestions:

- The survey appears to be general: there are specific aspects of measures at demo sites to be considered;
- The time foreseen for completion of the survey can be adjusted (suggestions were offered both to increase it as well as decrease it)
- The set of measures proposed can be enriched;
- Some questions look complex (e.g., adaptation potential, implementation status and classification of adaptation options into broad classes) and the standard DCE setting looks complex.
- It was also suggested to include questions on psychological distance, competence and trust in the various agents involved, personal involvement, social norms, and evaluation of the proposed adaptive measures. To take up this suggestion we considered introducing a series of **attitude questions** asking how much people agreed with a series of statement on a Linkert scale from 1 to 5 (where 5 means complete agreement). However eventually we discarded the idea to explore these attitudes by means of a detailed list of questions. Instead, we included the consideration of trust, personal involvement, and competence in other questions.

3.4.3 Improving the questionnaire building on one-on one tests.

Early development stage: first round of tests

For the **one-on-one tests with CMCC personnel,** we sought the point of view of lay persons, thus we excluded researchers and recruited test respondents only among the administration staff members; we were mindful however that test respondents could have indirectly gathered knowledge on adaptation by working in a climate research institution. To guarantee incentive compatibility, each test participant was rewarded with a 50 Euro compensation. The draft questionnaire was translated into Italian by the research team, which includes two native Italian speakers.

During the one-on-one tests a specific protocol was followed. Test participants were contacted by email to fix appointments and sent a copy of the draft questionnaire in electronic format for their perusal. We began each test by reminding the test respondents that the interview was going to be recorded and we asked for their explicit consent. After a short ice-breaking conversation mainly about the respondents' work (also to double check their lack of professional expertise about climate change), we introduced briefly the TransformAr project, the purpose of the survey, and why we needed to test the questionnaire. Test respondents were asked to read each explanatory text and to answer to the questions in the questionnaire.

After each text box or question, we asked them if they found it clear and impartial, and if there any part of what they just read/answered to that they found problematic.

We were particularly interested in finding out whether the DCE setting we devised was feasible by the general public, and whether people could actually understand the meaning of these components and the way the experiment worked. To this purpose, we asked our test respondents to perform some additional tasks and answer to some additional questions.

After a brief explanatory text about the features of policy package we were about to consider, we showed them an example of policy package described succinctly in a table format (see Table 3-1) and we asked whether this example seemed clear and reasonable, whether they thought that other people would have doubts about the type of government responsible for the package, whether it was clear that the greater the percentage of damage reduction, the more we protect the country from climate change. We also asked about form of payment for the cost to the taxpayer and in particular, whether people should be asked to pay an additional amount of money in the form of income tax every year (and in this case, for how many years) or rather a one-off payment, after which the resulting revenue will be used over several years.

We then asked them to compare two policy packages and to tell us which one they thought would be more effective, which one the more costly to the taxpayer. The cost trade-off was obvious (100 Euro vs 300 Euros), while valuing effectiveness implied trading off geographical coverage and damage reduction, as one package covered a larger area, but brought about a lower damage reduction than the other one. Finally, we asked them to read a short text mimicking the formal announcement of the launch of policy package and asked the test respondent to describe it using the same succinct format used in the example we proposed. This exercise was intended to evaluate the ability of the respondents to correctly identify the main components of the policy packages as described in the format we intended to use for the DCE.

We concluded the test with a series of debriefing questions, aimed at giving the test respondents an opportunity to think back to their experience with the questionnaire and elicit their feedback about clarifications and simplifications needed. We pointed them to parts of the questionnaire that we suspected to be more difficult to understand, and we noted down their suggestions for improvement. We also asked if they considered additional impacts of the policies, such as those on employment, human health, environmental quality. We also checked and whether they included their place of residence in their evaluation of the geographical coverage of the policies, and (once again) their familiarity with the sectors and resources targeted by the policy packages, and whether they thought that climate risks were high for their sector of activity and whether working in a research organization that deals with climate change had made the questionnaire easier for them.

Table 3-1 The policy package example shown to Italian test respondents in August 2022 (English translation)

	Misure
Sector/resources	
Water supply	Infrastructure measures (irrigation dikes, desalinisation plants, water reservoirs)
Rivers and water bodies	n.a.
Coastal areas	Infrastructure measures (barriers)

Agriculture	n.a.
Fisheries and aquaculture	n.a.
Forests	n.a.
Geographical coverage:	The whole national territory
Institution in charge	Local administration
Percentage reduction in climate change damages	50%
Cost to each taxpayer	100 euro/year

Overall, the participants in this first round of one-on-one tests in Italy found information material clear and interesting. They mostly stated to be quite at ease with questions about adaption priorities, likely benefits, adaptation costs, familiarity with adaptation measures. They were less at ease when asked to identify who benefits from adaptation measures or who is in charge with implementing them. They found information material clear and interesting. The DCE example was in general found clear, but when asked to play around with attributes most people found the exercise difficult. The cost attribute needed clarification – if annual, the number of years was often indicated as a crucial piece of information to be specified. They frequently related the questions with their own experiences and with the climate-related emergencies in their place of residence: people living in Venice often referred to sea level rise and the MOSE barrier that was installed to protect the lagoon; those living in southern Italy (Lecce) were often concerned about the impacts of draughts on agriculture. They often suggested the use of visual aids and/or examples to clarify questions.

Advanced development stage: second round of tests

Based on the results of the first round of tests and the feedback we got from project partners at TransformAr's third Consortium Meeting in in Guadalupe in early December 2022, we set out to refine our questionnaire. We considered introducing visual aids (short movies or pictures or infographics) exploring various alternatives; we feared however that applying this idea to our questionnaire, given the number of themes that could receive visual support, would have increased considerably the time needed for completion and tired unnecessarily the respondents. To be on the safe side, however, we decided to inquire about the desirability of visual aids within our **second round of one-on-one tests.**

This new round involved twelve additional one-on one tests with people from the public, and were carried out in Italy, Spain, Finland, the UK and Norway between February and early March 2023.

The second round of test followed a similar protocol as the first round, but we introduced important novel elements to be tested. As in the first round, we began each test with some casual icebreaking conversation, follow by a brief introduction about the purpose of the survey and of the testing exercise. We asked people to go through the questionnaire, answer the question and tell us if they found the exercise easy to understand and unbiased. The new elements tested in this round were the following:

- **The type of measures considered in the DCE:** We dropped research-based adaptation, to reduce the complexity of the experimental design and in consideration of the fact that such research would ultimately result into adaptation solutions pertaining to the other three categories (infrastructure, nature-based, or institutional), and we checked if test respondents were at their ease with these categories.

- **The format of the DCE:** given the difficulty experienced by our test respondents in the first round with comparing alternatives, we resorted to a simplified DCE setting whereby just one policy package is compared to the status quo, instead of a standard DCE format where two alternatives are compared to the status quo.
- **The time dimension of costs and benefits:** we used the first half of the one-on-one tests in this round to learn about attitudes towards the payment – whether annual instalments for several years (ten years in our case) were preferable to one lump-sum payment, whereby the funds thus collected would be earmarked to finance the policy measure during the subsequent ten years. We also asked whether having to wait for a measure to be operative or knowing that some measure may come with an expiry date, would have been a problem.
- **The deployment of a mock DCE (in a referendum setting):** We asked the test respondents of the second half of the one-on-one tests in this second round, to choose among a policy package and the status quo a total of eight times, varying the sectors/resources, the type of measures and the cost, while leaving geographic coverage and damages restored always unchanged. The purpose of this exercise was both to check the feasibility of the referendum format for the DCE and the identification of a realistic range of values for the payments. To take care of strategic behaviour, the rules of the game were carefully explained, and test respondents were asked to answer each referendum question independently from the previous ones.
- **The geographical coverage of the policy package**: we investigated what people understand for the fraction of the territory covered by the policy package. We inquired whether they understood it as uniformly distributed over the national territory, or over the territory where the relevant climate vulnerabilities are most pressing, or where most people leave.
- **The role of consequentiality:** The degree of confidence in the willingness of public authorities to take into due account the opinions expressed by respondents through this survey (consequentiality) was carefully examined. Specific language about consequentiality was introduced just before the discrete choice experiment. This is particularly important to ensure the incentive compatibility of the whole DCE exercise.

Overall, our revised questions and explanatory texts were found clear and our understandable – some minor clarifications were required in terms of finding plain language equivalents for some technical terms.

Our test respondents made clear that the time dimension is considered important but so is the opportunity to have working adaptation solutions in place for the longest time possible: people are prepared to wait to see results of adaptation actions, and to contribute to their implementation trough a reasonably increase in their tax bill. Importantly all test respondents considered an additional annual income to be paid each year for ten years as the most viable in their country, rather than a comparable lump sum payment used to finance policy action in the next decade. As noted in the methodological section, this has important consequences for the survey design and the econometric model and implies that a simplified setting without intertemporal dependence (and hence without non-linearities) can be adopted.

Test respondents generally understood geographical coverage as referring to the territory most exposed to the relevant vulnerabilities, or where most people leave - a couple of respondents noted that quite often the two notions overlap considerably in their countries.

An important concern raised by one of the first respondents in this round was related to strategic behaviour in the DCE exercise: people may vote for a policy package if presented as the only one available, but they may actually prefer a different configuration that they can imagine having learnt from the explanatory material, which sectors, resources and types of measures are possible. If multiple referenda are proposed, people might vote against a package if they hope to get a better deal in the subsequent runs or vote in favour of a packages even though their preferred configuration did not show up, for fear of be left bare-handed. These considerations prompted us to seek a refined way to present the rules of the game of the referendum format.

The mock DCE exercise made clear that the referendum format was well understood, but low additional taxes always resulted in a vote for the program. We experimented with higher rates and found that people started vote against the program for costs higher than 100- 800 Euro per year, depending on their country of residence and their income (we did not ask them about their income, but we were able to broadly guess their economic conditions from their occupation). Interestingly, in one instance a respondent who voted against a package costing 800 Euro, considered and eventually, suspended his judgement, for a more expensive package which displayed attractive attributes. This is hints to the possibility that people will trade-off attributes in evaluating policy packages, a sign of economically rational behaviour. The fact that we could identify upper limits for acceptable costs, prompts reasonable hope that a WTP for our policy measures can be estimated.

3.4.4 The final questionnaire

Based on the lessons learnt from the second round of tests, we finalised our English version of the questionnaire and translated it in the other five languages. The integral text final version of the questionnaire is included in the Annex. Here we summarise its main features.

The final questionnaire includes seven sections. After a few demographic questions needed to verify the sampling quotas, the focus progressively narrows from broad attitudes towards climate change to the more specific features of adaptation policies, followed by the discrete choice experiment. The final section deals again with the socio-demographic features of the respondent's household. Along the questionnaire, we provide essential information to the respondents in, we hope, a clear and neutral way. Importantly, this information can be retrieved by the respondents at any time during the completion of the questionnaire by clicking on clearly visible links placed in the sides of the screen. The questionnaire closes with a final question about consequentiality. More specifically, the questionnaire includes the following sections:

Section 0. Sampling quota questions: Basic sociodemographic questions to check sample stratification at the national level. We want to make sure that key features of the population in the six countries of our analysis are captured by our sample. We ask people about their gender, education and income (expressed as income brackets) because we want national sub-samples to have:

- Equal gender shares (50-50) among the respondents that agree to reveal their gender and are non-binary;
- Education quotas capturing those of the population in the respective countries, (conditional on having completed at least lower secondary education), for lower secondary education, upper secondary and upper secondary non tertiary education and for tertiary education;

- 50% of the respondents with household income below the median household income for that country, and 50% above the median household income for that country (in terms of after-tax disposable household income).

The questions about household income and education required a careful fine-tuning. While most education systems share the same broad structure to channel a person' education from the basis notions of primary schools to specialised academic levels up to Ph.D., the number of years each country assigns to each step, the different structure and duration of vocational and professional curricula compared to high-school and university curricula, and the specific labels attached to educational attainments vary a lot across countries in the case of the UK, even across the education systems of the British nations.) Also, school systems have evolved through the years, and the attainments of middle-aged people may have been named and organised differently from the courses their children are attending now and from those their parents attended when they were young. The Bologna Process has brought some uniformity in current academic education levels and titles across the EU, but those who graduated before 1999-2006 (the years in which this process became effective in most EU states) hold "different" degrees from those currently issued. This situation needs to be accounted for by submitting to the attention of the respondents, country-specific lists of education attainment levels that are easily understood whatever the age or the country of residence of the respondent, and that preserves comparability across countries. To this purpose we resorted to the widely used OECD-ISCED system (OECD/Eurostat/UNESCO Institute for Statistics, 2015), whereby education levels are classified in nine levels ranging from 0 (no education or primary school not completed) to 8 (Ph.D.), and sorted the most common names (expressed in the national language of the countries in our sample) for all types of education attainments available, now and in the past, in these countries, across the ISCED levels. We drop level 0 because we think it highly implausible to find a non-negligible amount of respondent without an education able to interact with a CAWI questionnaire.

As to income levels, we are interested in what households can afford; hence, we are looking for after-tax disposable income for the whole household of the respondent. A preliminary picture about the distribution of this variable can be drawn using the Eurostat database, which offers data based on EU-SILC panel survey (Wirth and Pforr, 2022), for all the six countries in our panel up to 2018 (after that year, the UK drops out). We inquired about income brackets instead of exact income amounts, to minimise the number of protest answers from people that may feel that income is sensitive personal information. This however opened another thorny issue, namely, how to make sure that respondents can choose among income brackets that are realistic in all six countries, and that allow reasonable ranges for low- medium- and high-income countries alike. This is not straightforward in our sample, because of the wide disparity between higher income countries such as Norway (and, to a lesser extent, Finland and the UK) and lower income countries such as Greece (and to a lesser extent, Spain and Italy). For instance, households in the second lowest decile in Norway have already an income higher than households in the ninth decile in Greece, according to Eurostat income distribution data. Thus, we use a reasonably wide list of possible monthly household income brackets, with enough options along the whole spectrum of the income distributions in our six countries, to accommodate the likely answers of our respondents, spanning from "up to € 500" to "over "12500". Equivalent income brackets for the UK and the Norway are converted into the local currency using PPP, and then rounded for clarity.

Finally in this section we also ask information about where people leave (through their postal code and their assessment of the urbanization degree of their area of residence) in order to match the respondents with

the distance from the coast variable and provide an alternative source of information for the degree of urbanization variable (which is not available for the UK).

Section A. Climate change knowledge and concern: After a brief information box on climate change causes and impacts, respondents are asked about their familiarity with the consequences of climate change, their personal concern about them and their rating of specific climate risks in the country where they live.

Section B. Adaptation. This is the section where the first split sample treatment begins to be applied. From this section on, half of the respondents will be asked about, and read about, "nature-based" measures when relevant, and the other half will be asked about, and read about, "non-infrastructure" measures in the very same instances. After a brief information box about the concept of adaptation, and which kind of actions can be undertaken by public authorities to put in place climate change adaptation measures, this section explores the respondents' familiarity with adaptation, by asking in which sectors their country stands better chances to adapt. After this question, the questionnaire narrows down the focus on the features of the adaptation actions that will be examined in the rest of the questionnaire, by presenting succinctly the area of concern, the main climate risks at stake, and examples of adaption measures (see Table 3-2**Erreur ! Source du renvoi introuvable.**), subdivided into their three classes – Infrastructure, Institutional and Nature-based (or Non-Infrastructure, in the alternative split sample treatment). The section then continues by inquiring about the familiarity of the respondents with adaptation solutions (asking whether, as far as they know, a selection of these solutions is implemented near their place of residence or in the country where their live), the sense of urgency for the same options in their country, and their understanding of the three categories in which adaptation options are classified in our questionnaire.

Table 3-2 Summary description of adaptation measures in the questionnaire

	Area of concern	Climate change risks	Adaptation measures
	Water supply for drinking and all other residential, commercial, and industrial uses.	- Droughts - Saltwater intrusion - Water scarcity	*Infrastructural Measures* - Organize water storage (in reservoirs) - Build desalination plants *Institutional Measures* - Import water from other locations - Establish and coordinate water rights markets *Nature-based* Measures* - Restore wetlands to help recharge aquifers.
	Rivers and water bodies (lakes, lagoons, etc.)	-Higher water temperatures are bad for certain species -Floods and runoff during extreme weather events deposit sediments, and worsen water quality - Floods cause damage to people and property - Floods may destroy or damage bridges, and infrastructure	*Infrastructural Measures* - Raise river banks - Reinforce infrastructure (bridges, etc.) *Institutional Measures* - Improve early warning systems for extreme events - Technical standards for new and existing infrastructure to ensure it is resilient to climate change *Nature-based* Measures* - Use plants and wetlands to limit runoff and help maintain water quality
	Coastal areas	-Coastal flooding - Sea level rise	*Infrastructure Measures* - Build or install barriers / floating barriers -Restore beaches -Strengthen existing infrastructure *Institutional Measures* - Technical standards for new and existing infrastructure to ensure it is resilient to climate change - Early warning systems for extreme events

			Nature-based Measures* -Dunes, beach nourishment, wetlands. - Coral banks and mussels have been found to mitigate sea level rise and coastal erosion.
	Agriculture	-Loss of crops due to drought, changed temperature and precipitation patterns - This may affect high-value crops (e.g., certain wine grapes)	*Infrastructure Measures* - More efficient irrigation systems (e.g., drip irrigation instead of sprinkling) - Strengthen irrigation networks *Institutional Measures* - Plans and regulations for land use to better cope with climate change *Nature-based* Measures* - Climate-resistant crops - Climate-resistant breeds of livestock
	Forests	- Increased risk of wildfires - Some species of plants may be heavily affected -Increased spread of harmful, invasive species of plants and insects that may damage forests	*Infrastructure Measures* n.a. *Institutional Measures* - Strengthen fire prevention systems - Monitor species of plants and insects, and prompt eradication of harmful, invasive plants and insects *Nature-based* Measures* -Sustainable forest management practices
	Fisheries and aquaculture (fish and seafood farming)	-Species will be affected by climate change -Marine fisheries and aquaculture are expected to be at higher risk than freshwater aquaculture -Impacts will be different across Europe	*Infrastructure Measures* n.a. *Institutional Measures* - Adjust catch quotas to changes in fish population induced by climate change - Monitoring of environment and fish health - Promote new technologies, breeding and feeding programs *Nature-based* Measures* - Climate-resistant breeds

Section C. Benefits of adaptation and **Section D. Cost of adaptation** are short sections containing only one question each. Section C enquires about which societal groups or institutions, in the opinion of the

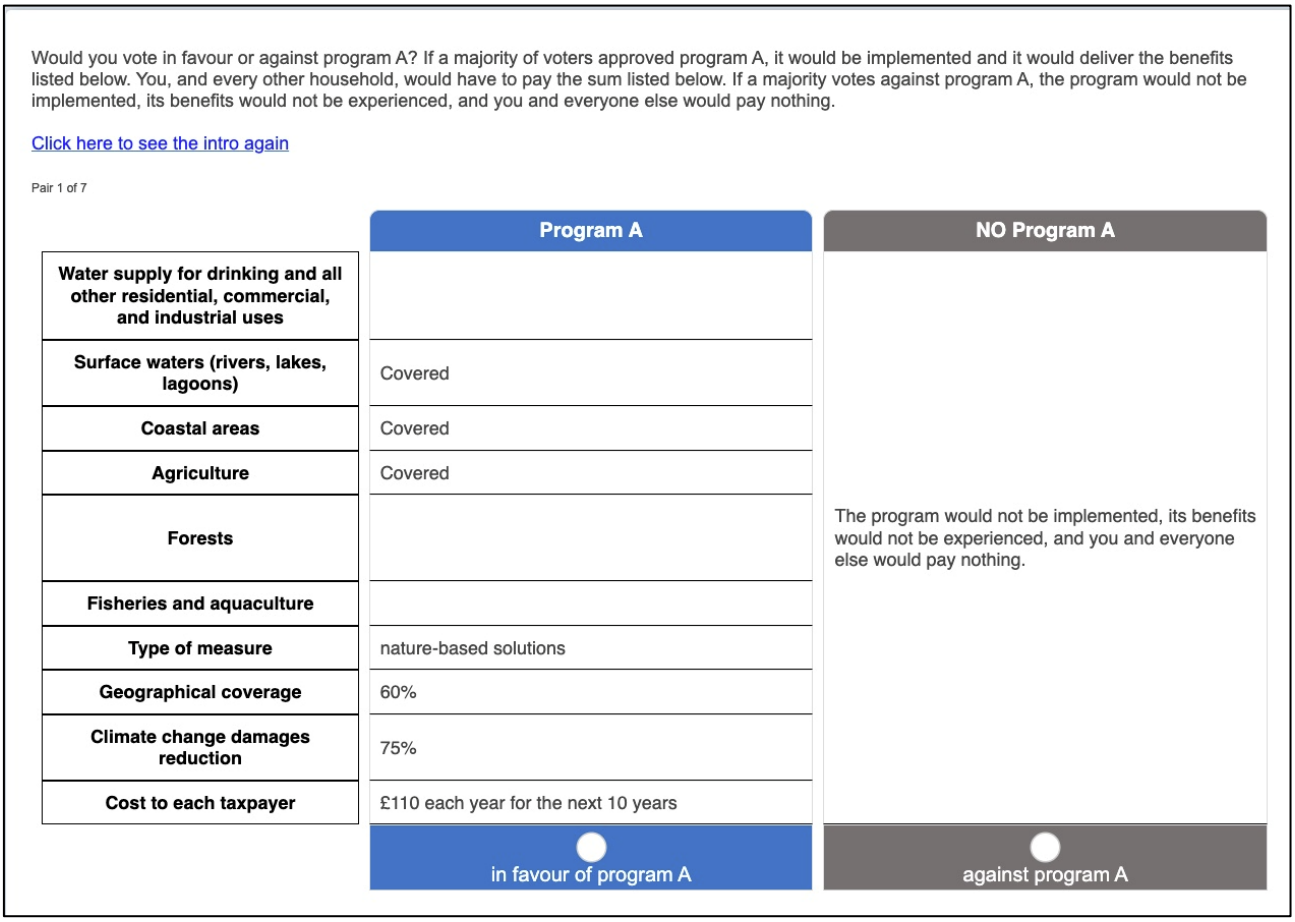
respondents, benefit the most from the implementation of a selection of adaptation measures. Section D asks which groups or institutions the respondents deem likely to be bearing the costs of implementing such measures. Section D also offers a brief explanatory text about the economic concept of cost, clarifying that it can be monetary or non-monetary (i.e., personal discomfort from performing an action).

Section E. Adaptation policies is the core section of the questionnaire, as it is the one where the Discrete Choice Experiment takes place. The Section opens with an explanatory text about the way we describe stylized policy packages during the experiment, the way the experiment works, and the relevance of the information collected through this experiment (consequentiality). The respondents thus learn that the choice cards they are about to see include information about the resources or sectors covered by the policy, the possible types of measures adopted within the package, the geographical coverage of the package, the reduction in climate change damages to be delivered by the policy and the cost of the program to the taxpayers who would face an additional income tax, to be paid each year for a total of 10 years. As mentioned above, the geographical coverage and the damage reduction are used to implement two split sample treatments, independent from each other and from the first one introduced in Section B. The respondents then learn the rules of the game, and that the experiment involves seven referendum questions. They are reminded that the results will be shared with national policymakers, and to consider each referendum as it were the only one they are voting about.

The referendum format implies that each of the seven-policy package will be compared to the status quo. In the status quo, no *new* adaptation policy is put in place, but no extra tax is levied on their income. The content of each policy package each respondent sees, are determined by:

- assigning an attribute combination that specifies the sectors/resources targeted and the cost of the package, chosen randomly among the set of combinations specified in the experimental design of the survey;
- the subsamples the respondent is assigned to by the three subsample treatments, in terms of Nature-based/non-infrastructure naming of NBSs, geographical coverage and damage protection of the policy package under scrutiny.

Figure 3.1 Choice card example from online survey prototype



Would you vote in favour or against program A? If a majority of voters approved program A, it would be implemented and it would deliver the benefits listed below. You, and every other household, would have to pay the sum listed below. If a majority votes against program A, the program would not be implemented, its benefits would not be experienced, and you and everyone else would pay nothing.

Click here to see the intro again

Pair 1 of 7

	Program A	NO Program A
Water supply for drinking and all other residential, commercial, and industrial uses		The program would not be implemented, its benefits would not be experienced, and you and everyone else would pay nothing.
Surface waters (rivers, lakes, lagoons)	Covered	
Coastal areas	Covered	
Agriculture	Covered	
Forests		
Fisheries and aquaculture		
Type of measure	nature-based solutions	
Geographical coverage	60%	
Climate change damages reduction	75%	
Cost to each taxpayer	£110 each year for the next 10 years	
	in favour of program A	against program A

Figure 3.1 provides an example of choice card as shown in the CAWI. We also use debriefing questions to get additional feedback on what the DCE meant to the respondent. After each referendum question, respondents are asked whether they deem that the package they just examined would bring about benefits only in terms of climate change adaptation, or it might have also co-benefits related to environmental quality, biodiversity, human health, or other fields. Finally, we ask them to identify which aspects of the packages mattered the most, and which the least in determining their votes.

Finally, Section F. Demographics closes the questionnaire with questions about further characteristics of the respondents' households, such as the employment status of the respondent and the age composition of the household. We check whether household members work in sectors directly affected by the adaptation packages considered in this survey, or they are likely to be involved in the policy process as employees of local or national authorities in charge of adaptation policies.

The questionnaire closes with a final question about **consequentiality.** Specifically, we ask our respondents how likely it is, in their view, that the opinions they reported in this survey and those of other consumers will be duly considered by policymakers and authorities in their country, ranking this on a scale from 1 to 5, where 1=not likely at all and 5=very likely.

3.5 Contractual arrangements

We kicked off the administrative procedures for the administration of the survey during the initial scoping stage. In parallel with the questionnaire development, a competitive procurement process was initiated to identify, a reputable company of proven capability to deploy a state-of-the-art DCE survey in six European countries while providing the best value for money, preferably through their proprietary panels and not through sub-contracting to local survey companies.

After considerable searching we identified three survey companies (Qualtrics, Ipsos and Dynata) to which we asked to demonstrate their ability provide a statistically representative sample in each of the selected countries, as well as to provide enough evidence of their ability to conduct a study of this size and complexity in six European country using proprietary consumer panels. To verify that these requirements were indeed satisfied, we elicited references from the companies themselves and checked with authors of studies conducted with the support of these companies if their services were of an adequate scientific standard.

This search process has not been a straightforward one because most companies focus on marketing projects and on their own national markets and rely on subcontracting for international projects (something that may reduce the reliability of results).

Eventually we selected Dynata as the company that proved most able to deliver on all our scientific requirements while providing the best value for the money. Contracting Dynata proved much more complicated and time-consuming than expected, due to the complexity of designing a contract that abides both the status of corporate company of Dynata under United States' law, and the status of public institution under Italian law of CMCC. All contractual details were settled in May 2023 and Dynata was officially contracted to deliver the survey.

4.0 DATA

The survey will be deployed in June 2023. At the moment of closing this report (30th May, 2023), no data were available yet.

5.0 RESULTS

The econometric analysis of the dataset will be implemented as soon as the database is provided by the survey company.

6.0 CONCLUSIONS

Unfortunately, it has proven impossible to collect the data and analyse them econometrically before the deadline, although no effort was spared to speed up the process while keeping the academic quality of the research unscathed. At the time of closing this report, the survey was about to be launched. Scripting has been completed and a test survey has been programmed by Dynata, and the prototype version of the online survey was tested by the research team. A few, mostly minor, issues were identified and corrected. After approval by the research team, a soft launch with 10% of the sample will be implemented and then the main survey will be implemented shortly afterwards in the month of June 2023.

In general, the initial estimate for the time needed to develop the survey proved too optimistic. Given the novelty of the topic, it took a considerable scoping effort to devise a research strategy that was both general enough to capture the attitudes of Europeans towards adaptation and relevant for the specific areas of adaptation of our demonstrator cases. The selection of the attributes and the decisions about split sample treatments were also quite complex, and several decisions could only be taken after testing (sometimes repeatedly) different preliminary versions of the questionnaire by means of one-on -one tests in the target countries. Defining the attributes required careful testing. In particular, the cost attribute needed extra care to determine both the time profile of the payment (whether lump-sum or yearly) and a reasonable range of amounts to be proposed to respondents. In total 22 one-on-one tests were conducted in two rounds (summer 2022 and February-March 2023). Each one of these tests was quite time-consuming in terms of recruiting, conducting, and analysing the outcome.

We also had some setbacks with the experimental design, as our first designs proved unable to identify the parameter of interests when tested on a simulated sample. After some trials, we eventually were able to identify an efficient design, which requires the additional (reasonable) assumption that the same types of measures are to be applied uniformly across the sectors covered in the choice card.

Finally, another cause of delay has been the need to ensure the compatibility of our questionnaire with Dynata's operational protocols. Each element of the questionnaire had to be thoroughly checked, and the modalities of posing questions and presenting informative material had to be agreed upon and then scripted for programming. This resulted into revising questions and introducing new ones. Moreover, we needed to make sure that this compatibility was kept across six language translations, that needed to be perfectly aligned, and this also took more time than expected.

Albeit exceedingly time-consuming, this whole process has been very instructive and interesting, nonetheless. We are very grateful to all test participants and project partners that provided us with their feedback. Working with the demo partners in the initial scoping phase and receiving partners' feedback during the intermediate phases has been illuminating, in terms of identifying what really defines (transformational) adaptation actions and in terms of being offered alternative and sometime surprising points of view from which to tackle our research questions. The interaction with lay people during the one-on-one tests has been illuminating as well, as all participants provided us their sincere and well-thought feedback, which in more than one occasion included highly valuable intuitions that forced us to reconsider and revisit or questions.

Our hope is to have built a robust, state-of the art survey, and we are looking forward to deriving as soon as possible the results of the econometric analysis, to inform with their hopefully interesting insights, other activities of the project such as the benefit -transfer exercise of Task 6.2, the networking and stakeholder

engagement activities taking part in the second part of the project, and to provide useful insight to the scientific community and to policy makers in Europe and beyond.

REFERENCES

Alberini, A., Bigano, A. Ščasný, M., Zvěřinová, I., (2018) Preferences for Energy Efficiency vs. Renewables: What Is the Willingness to Pay to Reduce CO_2 Emissions? Ecological Economics, V. 144, 171-185, ISSN 0921-8009.

Alcon F., Tapsuwan S., Brouwer R., de Miguel M.D., (2014) Adoption of irrigation water policies to guarantee water supply: A choice experiment, Environmental Science & Policy, Volume 44, Pages 226-236, ISSN 1462-9011, https://doi.org/10.1016/j.envsci.2014.08.012.

Arora A., Bansal S., Ward P.S., (2019) Do farmers value rice varieties tolerant to droughts and floods? Evidence from a discrete choice experiment in Odisha, India, Water Resources and Economics, Volume 25, Pages 27-41, ISSN 2212-4284, https://doi.org/10.1016/j.wre.2018.03.001.

Bro A.S, Ortega D.L., Clay D.C. and Richardson R.B. (2020) Understanding individuals' incentives for climate change adaptation in Nicaragua's coffee sector, Climate and Development, 12:4, 332-342, DOI: 10.1080/17565529.2019.1619506

Carson R.T., Louviere J.J, Wei E. (2010), Alternative Australian climate change plans: The public's views, Energy Policy, Volume 38, Issue 2, Pages 902-911, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2009.10.041.

Caussade S., Ortúzar J de D., Rizzi L.I., Hensher D.A. (2005) Assessing the influence of design dimensions on stated choice experiment estimates. Transportation Research Part B: Methodological, 39:621–640. https://doi.org/10.1016/j.trb.2004.07.006

Chen, Z., S. K. Swallow, and I. T. Yue. (2020).“Non-participation and Heterogeneity in Stated Preferences: A Double Hurdle Latent Class Approach for Climate Change Adaptation Plans and Ecosystem Services. Environmental and Resource Economics77: 35–67

Colombo, S., Budziński, W., Czajkowski, M., & Glenk, K. (2022). The relative performance of ex-ante and ex-post measures to mitigate hypothetical and strategic bias in a stated preference study. Journal of Agricultural Economics, 73(3), 845-873.

Dachary-Bernard, J., H. Rey-Valette, and E. B. Rulleau 2019. “Preferences Among Coastal and Inland Residents Relating to Managed Retreat: Influence of Risk Perception in Acceptability of Relocation Strategies.” Journal of Environmental Management 232: 772–780.

de Bekker-Grob E.W., Donkers B., Jonker M.F., Stolk E.A. (2015) Sample size requirements for discrete choice experiments in healthcare: a practical guide. Patient 8:373–384. https://doi.org/10.1007/

s40271-015-0118-

Doherty E., Mellett S., Norton D., McDermott T.K.J., O' Hora D., Ryan M. (2021), A discrete choice experiment exploring farmer preferences for insurance against extreme weather events, Journal of Environmental Management, Volume 290, 112607, ISSN 0301-4797, https://doi.org/10.1016/j.jenvman.2021.112607.

Doyon M., Saulais L., Ruffieux B., and Bweli D. (2015) Hypothetical bias for private goods: does cheap talk make a difference? Theoretical Economics Letters, 5(6):749{756, 2015. 23)

Furuya, J., Omori, K. and Aizaki, H. (2021)Toward the development of a weather index insurance for rice farmers in the coastal region of Myanmar. *Paddy Water Environ* **19**, 255–260. https://doi.org/10.1007/s10333-021-00862-7

Jørgensen S.L, Termansen M., Unai Pascual U., (2020) Natural insurance as condition for market insurance: Climate change adaptation in agriculture, Ecological Economics, Volume 169, 106489, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2019.106489.

Khanal U., Wilson C., Lee B. and Hoang V.-N. (2018) Smallholder farmers' participation in climate change adaptation programmes: understanding preferences in Nepal, Climate Policy, 18:7, 916-927, DOI: 10.1080/14693062.2017.1389688

Lancsar, E. and Louviere, J. (2008), Distinguishing between Conjoint Analysis and Discrete Choice Experiments with Implications for Stated Preference and Welfare Elicitation, Sydney: University of Technology, Sydney.

Liski, A. H., M. J. Koetse, and M. J. Metzger 2019. "Addressing Awareness Gaps in Environmental Valuation: Choice Experiments with Citizens in the Inner Forth, Scotland." Regional Environmental Change 19: 2217–2229. doi:10.1007/s10113-018-01458-4.

McFadden, D. (1974). Conditional Logit Analysis of Qualitative Choice Behavior. In P. Zarembka (ed.), Frontiers in Econometrics. New York: Academic Press, 105-142.

Nthambi M., Markova-Nenova N., Wätzold F., (2021) Quantifying Loss of Benefits from Poor Governance of Climate Change Adaptation Projects: A Discrete Choice Experiment with Farmers in Kenya. Ecological Economics, Volume 179,106831, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2020.106831.

OECD/Eurostat/UNESCO Institute for Statistics (2015), *ISCED 2011 Operational Manual: Guidelines for Classifying National Education Programmes and Related Qualifications*, OECD Publishing, Paris, https://doi.org/10.1787/9789264228368-en.

Oliveira, S., Pinto, L.M.C. Choice experiments to elicit the users' preferences for coastal erosion management: the case of *Praia da Amorosa*. *Environ Dev Sustain* **23**, 9749–9765 (2021). https://doi.org/10.1007/s10668-020-00768-0

Pröbstl-Haider, U., Mostegl, N.M., Kelemen-Finan, J. *et al.* Farmers' Preferences for Future Agricultural Land Use Under the Consideration of Climate Change. *Environmental Management* **58**, 446–464 (2016). https://doi.org/10.1007/s00267-016-0720-4

Remoundou, K., P. Diaz-Simal, P. Koundouri, and B. Rulleau 2015. "Valuing Climate Change Mitigation: A Choice Experiment on a Coastal and Marine Ecosystem." Ecosystem Services 11: 87–94. doi:10.1016/j.ecoser.2014.11.003.

Schaafsma M., Ferrini S., Turner. R. K, (2019) Assessing smallholder preferences for incentivised climate-smart agriculture using a discrete choice experiment, Land Use Policy, Volume 88, 104153, ISSN 0264-8377, https://doi.org/10.1016/j.landusepol.2019.104153.

Train, K. E. 2009. Discrete Choice Methods with Simulation. Second edition. Cambridge, United Kingdom: Cambridge University Press.

Waldman K.B. and Richardson R.B. (2018). Confronting Tradeoffs Between Agricultural Ecosystem Services and Adaptation to Climate Change in Mali, Ecological Economics, Volume 150, Pages 184-193, ISSN 0921-8009, https://doi.org/10.1016/j.ecolecon.2018.04.003.

Wirth H., Klaus Pforr K., The European Union Statistics on Income and Living Conditions after 15 Years, *European Sociological Review*, Volume 38, Issue 5, October 2022, Pages 832–848, https://doi.org/10.1093/esr/jcac024

World Health Organization (2012) How to Conduct a Discrete Choice Experiment for Health Workforce Recruitment and Retention in Remote and Rural Areas: A user guide with case studies. ISBN 978 92 4 150480 5. https://www.who.int/hrh/resources/DCE_UserGuide_WEB.pdf?ua=1

Wunsch, A., Meyerhoff, J. and Rehdanz, K., (2022). "A test–retest analysis of stated preferences in uncertain times," Economic Analysis and Policy, Elsevier, vol. 73(C), pages 725-736.

ANNEX I: THE QUESTIONNAIRE

The following is the latest version of the questionnaire, as revised by the authors and Dynata on May 23, 2023 and used for programming the online survey.

Please note that this is the version using “Nature-based” within the split sample treatment “Nature-based. vs. Non-Infrastructure”. This version will be administered to half of our sample, that is 750 respondents in each country, 4500 in total. The remaining 4500 respondent will see “Non-Infrastructure” in all instances in which “Nature-based” appears in the text below. For the convenience of the reader, these instances are marked with an asterisk.

Survey on the acceptability of climate change adaptation options

To be conducted in Six EU countries

Consent

Welcome to this survey! This survey is about measures and initiatives to limit the adverse consequences of climate change in Europe.

This survey is being conducted in six European countries by a consortium of universities and research organizations led by the University of Antwerp, Belgium. This study is part of the Project TransformAr, which is funded by the European Commission.

Your participation and your opinions are very important to us. This survey is not a quiz. There are no right or wrong answers to our questions. We are simply interested in your honest opinions.

This form contains important information about the reasons for undertaking this study, what you will be asked to do if you decide to be in the study, and the way information about you will be used if you choose to participate.

Informed consent

By this informed consent **you confirm that**:

- you are 18 years or older and
- you are competent to provide this consent;

- you have read the information about the survey (click here to read the information sheet); (INSERT LINK)
- you are voluntarily taking part in this survey.

Time Required: We estimate that it will take you approximately **25 minutes** to answer the questions in this survey. If you do not **complete the questionnaire by DATE** it will be assumed that you have withdrawn your consent, and none of your responses will be retained.

By completing the questionnaire, you **agree** that anonymous data from the questionnaire may be provided to third parties for non-commercial research. Any change to the above conditions is possible only with your explicit approval.

This project has received funding from European Union's Horizon H2020 innovation action programme under grant agreement 101036683.

[1] I would like to participate in the survey and give my consent

[2] I prefer not to participate

INFORMATION ON THE SURVEY (INFORMATION SHEET)

About the project

This survey is being carried out by Dynata (you can find here more information about Dynata's privacy policy) on behalf of the University of Antwerp and the Euro-Mediterranean Center on Climate Change (CMCC) as part of the project *"TransformAr - Transformational adaptation to reduce climate-related risks", funded by the EU Commission within the Horizon 2020 Programme under grant agreement 101036683*.

You can find more information about the Project and its Partners here.

Purpose of this survey

This survey is about measures and initiatives to limit the adverse consequences of climate change in Europe. The TransformAr project studies the development of concrete climate change adaptation solutions in Europe, and this survey aims to gauge the attitudes and opinions of the people in order to better inform the project's research and the policymakers with whom the project's results will be shared.

Confidentiality and sharing of the results

The data that you will share will be handled as confidentially as possible adhering to all pertinent standards and legislation. To minimize the risks of breaching confidentiality, we will collect only data that we need for the purposes of the described research project.

This survey will not require the insertion of personal data or information that may identify the relevant users, which will remain anonymous also to the researchers involved in the Project. However, before the publication or presentation of the results of this study, we will make sure that eventual personal data and other personally identifiable information (if any) will not be used. Hence, we will make sure that no answers you give can be traced back to you. Nonetheless, all partner institutions involved in the TransformAr project adhere to the provision set in the European Union's General Data Protection Regulation (GDPR).

All scientific reports or publications based on this survey will present summary statistical information, such as averages or ranges. No information will ever be disclosed that could be linked to a particular person.

Who is responsible for the data collected in this study?

The work in the survey is being led by Andrea Bigano, PhD on behalf of the TransformAr's Partners. If you have any questions about this survey, you may contact Dr. Bigano at andrea.bigano@cmcc.it.

What are the benefits of participating in this study?

Panelists will be compensated according to the usual point scheme of the Dynata program. The study itself can be used to help design policies that better address people's concerns about climate change.

What if I have any ethical concerns about this research?

This survey has been reviewed and approved by TransformAr's coordination team. If you are concerned about how this research is being conducted, you can contact the leader of the research team.

For more information

If you have any further questions or concerns about this survey, please visit the TransformAr webpage at www.transformar.eu or contact Andrea Bigano (andrea.bigano@cmcc.it)

Section 0. Questions for sampling quotas

Q.1 What is your gender?

[1] male

[2] female

[3] non-binary

[4] prefer not to say

Q.2 Please enter the postal code of your place of residence:

I_I_I_I_I_I

Q2.a Do you live:

[1] in a densely populated urban area

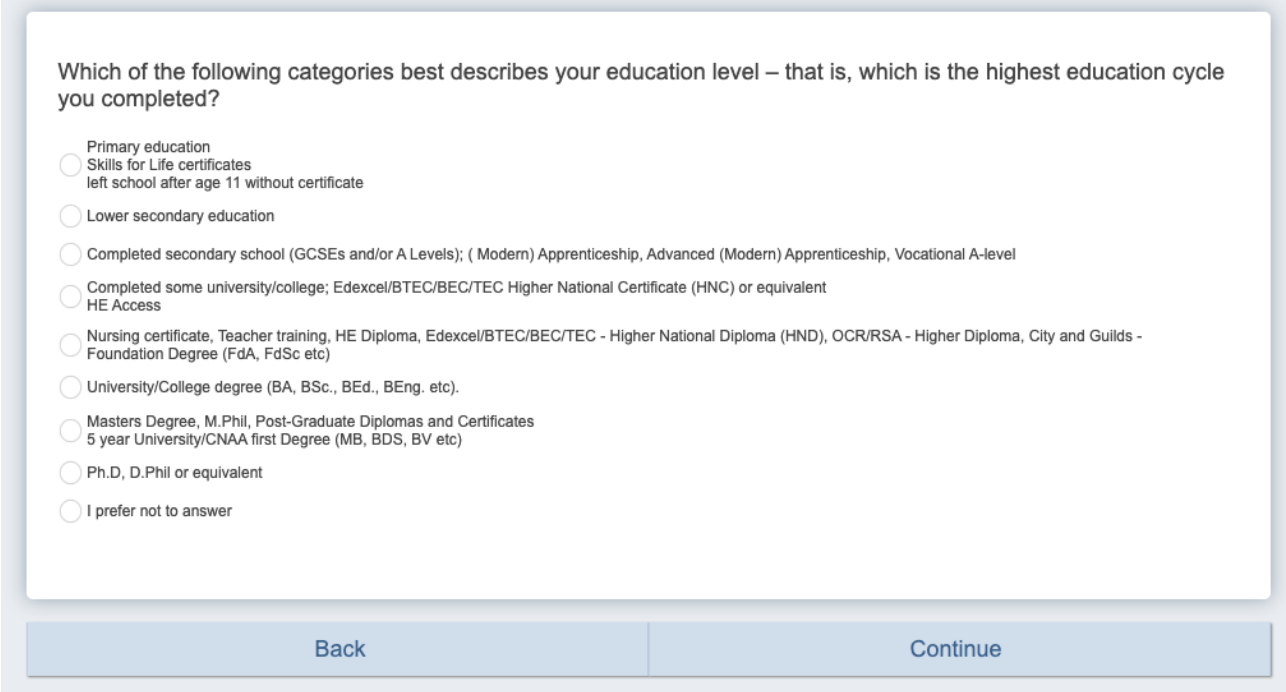
[2] in the suburbs or in small town

[3] In a rural area

[4] I don't know

Q3. Which of the following categories best describes your education level – that is, which is the highest education cycle you completed?

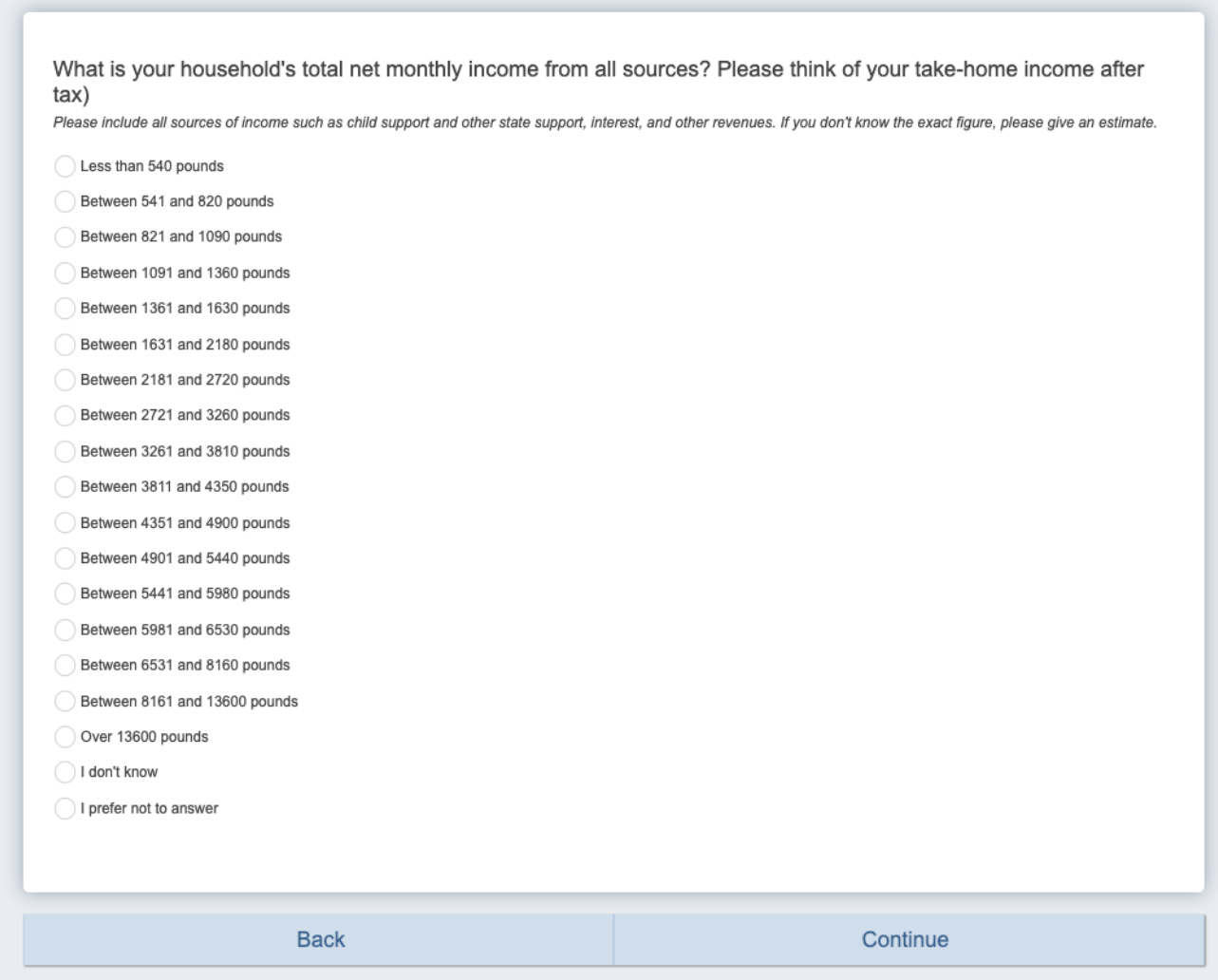
(NB. As this question is programmed differently for each country, see below the corresponding screen for the UK)



Q4. What is your household's total net monthly income from all sources? Please think of your take-home income after tax)

Please include all sources of income such as child support and other state support, interest, and other revenues. If you don't know the exact figure, please give an estimate.

(NB. As this question is programmed differently for each country, see below the corresponding screen for the UK)



Section A. Climate change knowledge and concern.

The scientific community and governments alike agree that the climate is rapidly changing and will continue to do so over the next decades.

By climate, we mean the average weather (including temperature and precipitation patterns) in a place over many years.

Climate change is caused by the use of oil, gas and coal to generate electricity, heat buildings, for factories, and in transport. When these fossil fuels burn, they release greenhouse gases—mostly carbon dioxide (CO_2). Greenhouse gases are also released during agricultural activities, by livestock, and while drilling gas and oil. These gases trap the sun's heat and cause the planet's temperature to rise. The Earth is now about 1.2° C warmer than it was in 1850—and the concentration of CO_2 in the atmosphere has risen by 50% since.

The most important consequences of climate change include:

- sea level rise,
- damage to crops and vegetation,

- more frequent and intense heat waves,
- changing precipitation patterns that may cause severe floods in some places and extreme droughts in others,
- extreme weather events (massive storms, heat waves, etc.),
- wildfires, and
- loss of plant and animal species.

These impacts may force people to move to other locations.

What can be done to slow down or stop climate change? This can be accomplished by reducing greenhouse gas emissions, switching to renewable energy sources, planting trees, preserving forests to capture CO_2, changing agricultural practices and extracting less gas and oil.

The effects of climate change are already being experienced in many places, in terms of rising sea levels, coastal erosion, floods or droughts, forest fires, heat waves, and other extreme weather events.

They affect virtually every aspect of everyday life and every sector of the economy. For example, rising sea levels erode the structures that support bridges and buildings in coastal areas. They also compromise the quality of groundwater and/or water wells in coastal areas. Excessive heat causes damage to railroad tracks and other transportation infrastructure. It can also threaten the electricity grid just at the time when it is needed most (during heat waves when people and businesses need air conditioning), and even the generation of electricity. Changing precipitations and droughts damage crops and forests and can compromise the water supply.

Q.5. Before this survey, had you heard about the following possible consequences of climate change?

Climate change consequences	**YES**	**NO**
Rising sea levels	[ ]	[ ]
Damage to crops and vegetation	[ ]	[ ]
More frequent and intense heat waves	[ ]	[ ]
Floods	[ ]	[ ]
Droughts	[ ]	[ ]
Other extreme weather events	[ ]	[ ]
Loss of plants and animal species	[ ]	[ ]
Some harmful, invasive species will spread to new areas	[ ]	[ ]
Mass migrations	[ ]	[ ]

Q.6 How concerned are you personally about the following consequences of climate change? Please rate your level of concern about each of these consequences on a scale from 1 to 5, where 1=not at all and 5=very highly.

Climate change consequences	**1 Not at all**	**2**	**3**	**4**	**5 Very highly**	**Don't know**
Rising sea levels	1	2	3	4	5	6
Damage to crops and vegetation	1	2	3	4	5	6
More frequent and intense heat waves	1	2	3	4	5	6
Floods	1	2	3	4	5	6
Droughts	1	2	3	4	5	6
Other extreme weather events	1	2	3	4	5	6
Loss of plants and animal species	1	2	3	4	5	6
Some harmful, invasive species will spread to new areas	1	2	3	4	5	6
Mass migrations	1	2	3	4	5	6

Q7. Based on your knowledge and experience, how would you rate climate change risks in your country? Please rate each of the following items on a scale from 1 to 5, where 1 = low or no risk, and 5 = very high risk.

	Climate Risk					
	1= low or no risk	**2**	**3**	**4**	**5=very high risk**	**6= don't know**
Water supplies for irrigation	1	2	3	4	5	6
Structures, buildings and people in coastal areas	1	2	3	4	5	6
The agricultural sector	1	2	3	4	5	6

The quality of water in rivers, lakes, and lagoons	1	2	3	4	5	6
Forest health	1	2	3	4	5	6
The water supply in cities and rural areas	1	2	3	4	5	6
Marine ecosystems	1	2	3	4	5	6
Urban areas	1	2	3	4	5	6
The manufacturing sector	1	2	3	4	5	6
The population during heat waves	1	2	3	4	5	6
Rural areas	1	2	3	4	5	6
The service sector	1	2	3	4	5	6

Section B. Adaptation.

To limit the adverse consequences of climate change, we can put in place policies, measures, and individual actions. In this questionnaire, we will focus on these policies, measures and actions, and will refer to them using the term "adaptation."

The purpose of adaptation measures is to reduce climate change damages to people, buildings and structures, and economic activity in general.

Adaptation measures can be taken by individuals or by the government. An example of individual adaptation is when people run the air conditioning when it is too hot.

Public adaptation programs may be undertaken by local or national governments, are generally paid with tax revenues, and bring benefits to the community. They include, for example,

- beach nourishment to combat beach erosion and sea level rise,[1]
- regulations to prevent building homes in areas subject to floods,
- protecting the population from extreme weather events, and
- securing water sources in the event of droughts.

Public adaptation programs can rely on

- **Infrastructure measures** (building or strengthening structures)
- **nature-based* approaches** such as
  - using plants to limit soil erosion and runoff,[2]
  - restoring wetlands to limit floods and help protect water quality in rivers, streams, and lakes,
  - switch to climate-resistant crops or forest management practices to improve resilience to harsh climate conditions
- **institutional measures**, such as regulations, alerts to the population in advance of extreme weather events, and preparations to make sure that vital services (for example, water or electricity) are available during extreme weather events or other disruptions.

[1] Beach nourishment means bringing sand to beaches to combat beach erosion.

[2] These practices have been used by farmers for decades to reduce soil erosion. These have been extensively tested in riparian areas (that is, along land alongside creeks, streams, gullies, rivers and in wetlands).

Q.8. Based on your knowledge and experience, how would you rate the adaptation potential in your country? Please rate each of the following items on a scale from 1 to 5, where 1=lowest adaptation potential and 5=highest adaptation potential.

In judging the adaptation potential, please think of physical constraints[4] and opportunities, as well as available resources. Tougher physical constraints limit the adaptation potential, whereas more resources (financial, technical and/or know-how) increase the adaptation potential.

[3] By "physical constraints" we mean here any physical features that may hinder putting in place adaptation measures, such as the geographical characteristics of a given area

	Adaptation Potential					
	1= lowest	**2**	**3**	**4**	**5= highest**	**6= don't know**
Water supplies for irrigation	1	2	3	4	5	6
Structures, buildings and people in coastal areas	1	2	3	4	5	6
The agricultural sector	1	2	3	4	5	6
The quality of water in rivers, lakes, and lagoons	1	2	3	4	5	6
Forest health	1	2	3	4	5	6
The water supply in cities and rural areas	1	2	3	4	5	6
Marine ecosystems	1	2	3	4	5	6
Urban areas	1	2	3	4	5	6

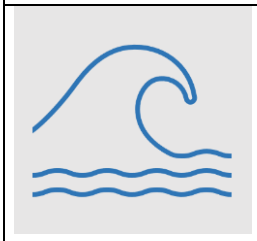
The manufacturing sector	1	2	3	4	5	6
The population during heat waves	1	2	3	4	5	6
Rural areas	1	2	3	4	5	6
The service sector	1	2	3	4	5	6

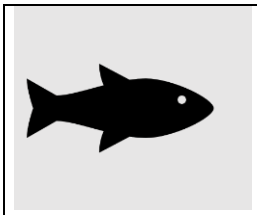
This questionnaire focuses on climate change risks and adaptation in six areas or sectors of concern:

- Water supply for drinking and all other residential, commercial, and industrial uses
- Rivers, lakes, and other water bodies
- Coastal areas
- Agriculture
- Forests
- Fisheries and aquaculture

We describe them briefly below.

	Area of concern	Climate change risks	Examples of adaptation measures
	Water supply for drinking and all other residential, commercial, and industrial uses.	- Droughts - Saltwater intrusion - Water scarcity	*Infrastructural Measures* - Organize water storage (in reservoirs) - Build desalination plants *Institutional Measures* - Import water from other locations - Establish and coordinate water rights markets *Nature-based* Measures* - Restore wetlands to help recharge aquifers.
	Rivers and water bodies (lakes, lagoons, etc.)	-Higher water temperatures are bad for certain species -Floods and runoff during extreme weather events deposit sediments, and worsen water quality - Floods cause damage to people and property	*Infrastructural Measures* - Raise river banks - Reinforce infrastructure (bridges, etc.) *Institutional Measures* - Improve early warning systems for extreme events - Technical standards for new and existing infrastructure to ensure it is resilient to climate change *Nature-based* Measures*

		- Floods may destroy or damage bridges, and infrastructure	- Use plants and wetlands to limit runoff and help maintain water quality
	Coastal areas	-Coastal flooding - Sea level rise	*Infrastructure Measures* - Build or install barriers / floating barriers -Restore beaches -Strengthen existing infrastructure *Institutional Measures* - Technical standards for new and existing infrastructure to ensure it is resilient to climate change - Early warning systems for extreme events *Nature-based* Measures* -Dunes, beach nourishment, wetlands. - Coral banks and mussels have been found to mitigate sea level rise and coastal erosion.
	Agriculture	-Loss of crops due to drought, changed temperature and precipitation patterns - This may affect high-value crops (e.g., certain wine grapes)	*Infrastructure Measures* - More efficient irrigation systems (e.g., drip irrigation instead of sprinkling) - Strengthen irrigation networks *Institutional Measures* - Plans and regulations for land use to better cope with climate change *Nature-based* Measures* - Climate-resistant crops - Climate-resistant breeds of livestock
	Forests	- Increased risk of wildfires - Some species of plants may be heavily affected -Increased spread of harmful, invasive species of plants and insects that may damage forests	*Infrastructure Measures* n.a. *Institutional Measures* - Strengthen fire prevention systems - Monitor species of plants and insects, and prompt eradication of harmful, invasive plants and insects *Nature-based* Measures* -Sustainable forest management practices

	Fisheries and aquaculture (fish and seafood farming)	-Species will be affected by climate change -Marine fisheries and aquaculture are expected to be at higher risk than freshwater aquaculture -Impacts will be different across Europe	*Infrastructure Measures* n.a. *Institutional Measures* - Adjust catch quotas to changes in fish population induced by climate change - Monitoring of environment and fish health - Promote new technologies, breeding and feeding programs *Nature-based* Measures* - Climate-resistant breeds

Q.9 We list below a number of possible adaptation options. For each of them, please let us know whether—to the best of your knowledge—they are currently being implemented in your country and in the area where you live. Please let us know if you have never heard of them before.

Adaptation measure	Implemented in my country	Implemented in my region, province or city	Not implemented	Don't know if it is being implemented	Never heard of it
Structures (seawalls, dams) to prevent flooding of coastal areas	[ ]	[ ]	[ ]	[ ]	[ ]
Raise river banks to avoid floods and/or leave an undeveloped area around rivers to reduce damages in the event of a flood	[ ]	[ ]	[ ]	[ ]	[ ]
Develop water resources for water supply security in case of droughts or climate-caused disruptions in the water supply.	[ ]	[ ]	[ ]	[ ]	[ ]
Reinforce bridges and other structures that might get eroded or damaged by rising water levels	[ ]	[ ]	[ ]	[ ]	[ ]
Switch to drought- and climate-resistant crops	[ ]	[ ]	[ ]	[ ]	[ ]

Q.10. Whether or not they are currently being implemented, we would like you to tell us what level of priority should be given in your country, in your opinion, to each of the adaptation measures listed below. Please rate each of them on a scale from 1 to 5, where 1=lowest or no priority and 5=highest priority.

Adaptation measure	**1=lowest or no priority**	**2**	**3**	**4**	**5=highest priority**	**Don't know**
Structures (seawalls, dams) to prevent flooding of coastal areas	1	2	3	4	5	6
Raise river banks to avoid floods and/or leave an undeveloped area around rivers to reduce damages in the event of a flood	1	2	3	4	5	6
Develop water resources for water supply security in case of droughts or climate-caused disruptions in the water supply.	1	2	3	4	5	6
Reinforce bridges and other structures that might get eroded or damaged by rising water levels	1	2	3	4	5	6
Switch to drought- and climate-resistant crops	1	2	3	4	5	6

Q11. How would you classify these adaptation measures—Infrastructural, nature-based*, institutional?

Adaptation measure	**Infrastructure**	**Nature-based***	**Institutional**	**I don't know**
Structures (seawalls, dams) to prevent flooding of coastal areas	[ ]	[ ]	[ ]	[ ]
Raise river banks to avoid floods and/or leave an undeveloped area around rivers to reduce damages in the event of a flood	[ ]	[ ]	[ ]	[ ]
Develop water resources for water supply security in case of droughts or climate-caused disruptions in the water supply.	[ ]	[ ]	[ ]	[ ]
Reinforce bridges and other structures that might get eroded or damaged by rising water levels	[ ]	[ ]	[ ]	[ ]
Switch to drought- and climate-resistant crops	[ ]	[ ]	[ ]	[ ]

Section C. Benefits of adaptation

Q12. In your opinion, who are the likely beneficiaries of adaptation policies? Please select all that apply.

	Potential beneficiaries					
Adaptation measure	The entire nation	The local community	Specific interest groups (for example, farmers, fishermen, industry groups)	Tourists and visitors	Others, please explain	**I don't know**
Structures (seawalls, dams) to prevent flooding of coastal areas	[ ]	[ ]	[ ]	[ ]		
Raise river banks to avoid floods and/or leave an undeveloped area around rivers to reduce damages in the event of a flood	[ ]	[ ]	[ ]	[ ]		
Develop water resources to ensure water supply security in case of droughts or climate-caused disruptions in the water supply.	[ ]	[ ]	[ ]	[ ]		
Reinforce bridges and other structures that might get eroded or damaged by rising water levels	[ ]	[ ]	[ ]	[ ]		
Switch to drought- and climate-resistant crops	[ ]	[ ]	[ ]	[ ]		

Section D. Cost of adaptation

Adaptation generally comes at a cost. In some cases, when people have to change their behaviours, the cost is limited to simple discomfort or annoyance. Imagine for example having to re-arrange your schedule because it is too hot to go outside during the day in the middle of a heat wave.

In other cases, the cost is out-of-pocket and is incurred by individuals. This would be the case, for example, when we run the air conditioning during a heat wave, which will bring a higher electricity bill.

In other cases yet, when adaptation measures are undertaken by the government, the cost is incurred by society and is spread over all taxpayers.

Q13. In what follows, we will show you a number of adaptation measures. We will ask you to identify who bears these costs in your country.

Q13.1a. The cost of building seawalls, dams and structures to protect from rising sea levels is incurred…

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Q13.2a. The cost of avoiding going outside when it is too hot during a heat wave is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Q13.3a. The cost of suspending outdoors work (in farms, construction, etc.) when it is too hot, is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don't know

Q13.4a. The cost of running the air conditioning at home when it is too hot, is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don't know

Q13.5a. The cost of switching to different crops, re-arranging irrigation (watering), and changing agricultural practices is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above [

[] I don't know

Q13.6a. The cost of restoring wetlands to help avoid floods is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Q13.8a. The cost of leaving an undeveloped area around rivers to reduce the damage in the event of a flood is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Q13.9a. The cost of developing water resources to ensure water supply security in case of droughts or climate-caused disruptions in the water supply is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain

[ ] by none of the above

[] I don’t know

Q13.10a. The cost of reinforcing bridges and other structures that might get eroded or damaged by rising water levels is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Q13.11a. The cost of using plants to limit runoff when it rains to protect water quality in rivers and water bodies is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Q13.12a. The cost of switching to climate-resistant crops, livestock breeds, and aquaculture breeds is incurred...

[ ] by the entire nation

[ ] by local communities.

[ ] by firms

[ ] by individuals

[ ] by other groups. Please explain:

[ ] by none of the above

[] I don’t know

Section E. Adaptation programs

We would now like to describe a number of possible climate change adaptation programs. Scientists and engineers are currently examining a number of options, assessing their effectiveness, and estimating the costs of these programs.

These programs focus on natural resources (such as the water supply, surface waters and coastal areas) and economic activities involving natural resources, such as agriculture, fisheries and aquaculture, and forests.

We will use a stylized description, based on the points listed below:

Resources or sectors covered by the program:

- Water supply for drinking and all other residential, commercial, and industrial uses
- Surface waters (rivers, lakes, lagoons)
- Coastal areas
- Agriculture
- Fishing and aquaculture
- Forests

Type of measures adopted in the program:

Each of the above resources or sectors can rely on

- Infrastructure measures
- nature-based* measures, or
- institutional measures,

alone or in combination.

Geographical coverage:

- Percentage of the country's territory that would be covered by the program

Reduction in climate change damages delivered by the program:

- Expressed in percentage terms.

Larger percentages mean more protection from climate change damages.

Cost of the program to the taxpayer:

- additional income tax on your household, to be paid each year for a total of 10 years

We will now show you a number of programs currently under consideration that would limit the adverse consequences of climate change in your country. These programs vary in terms of coverage, types of measures, level of protection that they offer, and estimated cost.

Exact design possibilities and details and cost estimates are still being developed and evaluated by engineers and other experts at this time.

Given the scope and the cost of these programs, it is important to learn the opinions of the public about them.

We will share your opinions and those of the other participants in this study (in anonymous form) with the authorities of [COUNTRY].

Please consider the advisory referendum below. You will be asked to vote in favour or against the hypothetical adoption of a possible program. The general rules of voting apply here: If a majority of the voters were in favour, the program would be adopted and every taxpayer would pay the stated amount, which would be added to their household's income taxes. The money collected in this way would be placed in a special account and spent only on the indicated adaptation program. (It would not be allowed to spend it on anything else.) If a majority were not reached, the program would not be adopted, and no payment would be collected from the taxpayers.

We will repeat this exercise a total of seven times. Every time you will vote a different adaptation program. Please try to evaluate each of the seven programs on their own and independently from the others. In other words, vote on each program if this was the only referendum you are voting.

Q14.A Would you vote in favour or against program A? If a majority of voters approved program A, it would be implemented and it would deliver the benefits listed below. You, and every other household, would have to pay the sum listed below. If a majority votes against program A, the program would not be implemented, its benefits would not be experienced, and you and everyone else would pay nothing.

Program A:

Natural resource or Sector	**Details**
Water supply for drinking and all other residential, commercial, and industrial uses	
Surface waters (rivers, lakes, lagoons)	
Coastal areas	
Agriculture	
Forests	
Fisheries and aquaculture	

Geographical coverage:	
Percentage reduction in climate change damages	
Cost to each taxpayer	

[ ] in favour of program A

[ ] against program A

Q15.A Do you think that the benefits from the program are

[ ] Climate change adaptation,

[ ] Environmental quality

[ ] Biodiversity

[ ] Human Health

[.] Recreation

[ ]] Other, please explain

[ ] I don't know

Q14.X *Now consider program X*. Would you vote in favour or against program X? Again, if a majority of voters approved program X, it would be implemented, and it would deliver the benefits listed below. You, and every other household, would have to pay the sum listed below. If a majority votes against program X, the program would not be implemented, its benefits would not be experienced, and you and everyone else would pay nothing. Please remember to vote on this choice independently of your previous answers.

Program X:

Natural resource or Sector	**Details**
Water supply for drinking and all other residential, commercial, and industrial uses	
Surface waters (rivers, lakes, lagoons)	
Coastal areas	

Agriculture	
Forests	
Fisheries and aquaculture	
Geographical coverage:	
Percentage reduction in climate change damages	
Cost to each taxpayer	

[ ] in favour of program X

[ ] against program X

Q15.X Do you think that the benefits from the program are:

[ ] Climate change adaptation,

[ ] Environmental quality

[ ] Biodiversity

[ ] Human Health

[.] Recreation

[ ]] Other, please explain

[ ] I don't know

Q.16 When choosing your preferred policy programs, was there one specific component of the programs that is **more important to you** than all others? Please select one.

[ ] The sectors in general

[ ] Water supply for drinking and all other residential, commercial, and industrial uses

[ ] Surface waters

[ ] Coastal areas

[ ] Agriculture

[ ] Fisheries and aquaculture

[ ] Forests

[ ] Geographical coverage

[ ] Percentage climate change damage reduction

[ ] Cost for the taxpayer

[ ] All components were equally important in my decision

[ ] I don't know

Q.17 When choosing your preferred policy programs, was there one specific component of the programs that was **not important at all** for your decision? Please select one.

[ ] The sectors in general

[ ] Water supply for drinking and all other residential, commercial, and industrial uses

[ ] Surface waters

[ ] Coastal areas

[ ] Agriculture

[ ] Fisheries and aquaculture

[ ] Forests

[ ] Geographical coverage

[ ] Percentage climate change damage reduction

[ ] Cost for the taxpayer

[ ] All components were equally important in my decision

[ ] I don't know

Section F. Demographics

Q.18 How many people is your household comprised of?
1 (just me)
2
3
4
5
More than 5

Q18A. How many children under the age of 18 live with you at your home?
1
2
3
4
5
More than 5
None
[ ] I prefer not to answer

Q18B. How many people aged 65 and older live with you at your home (including yourself, if your aged 65 or older)?
1
2
3
4
5
More than 5
None
[ ] I prefer not to answer

Q19. How would you describe your current employment status?

[1] Employed full-time

[2] Employed part-time

[3] Self-employed

[4] Student

[5] Homemaker

[6] Employed but currently on maternity/paternity or parental leave

[7] Retired

[8] Unemployed, looking for work

[9] Unable to work due to sickness or disability

[10] Other, please specify:

[99] I prefer not to answer

Q20. Do you, or any member of your household living with you, work in one of the following sectors?

[ ] Agriculture and/or animal husbandry

[ ] Food processing

[ ] Fisheries and/or aquaculture

[ ] Forestry

[ ] Timber industry

[ ] Water utilities

[ ] Maritime transport (including ports and shipyards)

[ ] Inland water transport (including ports and shipyards)

[ ] Local and national public administration

[ ] Public environmental agencies and authorities

[ ] Tourism and recreation

[.] none of the above

[99] I prefer not to answer

Q.21. How likely is it, in your opinion, that the opinions you reported in this survey and those of other consumers will be taken into account by policymakers and authorities in your country? Please select your answer on a scale from 1 to 5, where 1=not likely at all and 5=very likely.

1= not likely at all	**2**	**3**	**4**	**5= very likely**	**6= I don't know**
1	2	3	4	5	6

Climate change impacts are here and now. The impacts on people, prosperity and planet are already pervasive but unevenly distributed, as stated in the new EU Blueprint strategy (European Commission-EC, 2019). To reduce climate-related risks, the EC and the IPCC agree that transformational adaptation is essential. The TranformAr project aims to develop and demonstrate products and services to launch and accelerate large-scale and disruptive adaptive process for transformational adaptation in vulnerable regions and communities across Europe.

The 6 TransformAr lighthouse demonstrators face a common challenge: water-related risks and impacts of climate change. Based on existing successful initiatives, the project will develop, test and demonstrate solutions and pathways, integrated in Innovation Packages, in 6 territories.

Transformational pathways, including an integrated risk assessment approach are co-developed by means of 9 Transformational Adaptive Blocks. A set of 22 tested actionable adaptive solutions are tested and demonstrated, ranging from nature-based solutions, innovative technologies, financing, insurance and governance models, awareness and behavioral change solutions.

TransformAr

This project has received funding from the European Union's Horizon H2020 innovation action programme under grant agreement 101036683.