Climate Literacy and Behavior: Experimental Evidence from Three Information Interventions

Laura Galdikiene[a*], Jurate Jaraite[a], Aidas Masiliunas[a, b]

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Abstract

Climate change mitigation requires not only governmental and corporate actions but also individual engagement. However, such engagement may be constrained by limited climate literacy. This paper examines whether interventions aimed at improving different domains of climate literacy – climate change literacy, carbon literacy, and climate policy literacy – influence individuals' willingness to mitigate climate change, reduce their carbon footprints, and support climate policies. We address this question using a nationally representative survey experiment conducted in Lithuania. Participants were randomly assigned to one of three information treatments explaining (i) the causes and consequences of climate change, (ii) the greenhouse gas emissions associated with everyday activities, or (iii) the design and functioning of carbon taxes, or to a control group receiving unrelated information. The results show that information about the carbon footprint of everyday activities increases the intentions to reduce diet- and energy-related emissions, while information about carbon taxes increases support for carbon taxation. By contrast, information about the causes and consequences of climate change has no significant effect on the main outcomes.

Keywords: behavior, climate literacy, experiment, information, survey

JEL codes: C91, D83, H23, Q58, Z13

[a] Vilnius University, Faculty of Economics and Business Administration, 9 Sauletekis Avenue, Vilnius, Lithuania

[b] University of Sheffield, School of Economics, Elmfield Building, Sheffield, United Kingdom

* Corresponding author, email: laura.galdikiene@evaf.vu.lt.

1. Introduction

Climate change poses profound risks to human well-being and planetary health, highlighting the need for accelerated mitigation efforts (Intergovernmental Panel on Climate Change, 2023). While large-scale reductions in greenhouse gas emissions are primarily driven by governmental policies and corporate actions, individuals can play a complementary role in addressing climate change by lowering their personal carbon footprints, financially supporting mitigation efforts such as tree planting, and endorsing climate policies such as carbon taxation. However, engagement in these domains may be constrained by limited literacy. Literacy refers to the degree to which individuals possess the knowledge necessary to make informed decisions within a specific domain (Howell, 2018). In the climate context, individuals may lack understanding of the broader causes and consequences of climate change (climate change literacy), the carbon intensity of everyday activities (carbon literacy), or the design and effectiveness of policy instruments (climate policy literacy). In what follows, we refer to these three dimensions collectively as climate literacy.

The information deficit model argues that insufficient knowledge constitutes a key barrier to pro-environmental behavior, and that increasing factual understanding can help individuals align their actions with expert recommendations (Stoutenborough & Vedlitz, 2014; Suldovsky, 2017). However, empirical evidence on the effectiveness of information interventions in promoting climate action remains mixed. While some studies report positive effects (e.g., Barbett et al., 2025; Schleich & Alsheimer, 2024; Bernard et al., 2025), others suggest that the impact of information is context-dependent and often modest, if any (e.g., Vlasceanu et al., 2024; Dechezleprêtre et al., 2025; Rhodes et al., 2014). Despite this growing body of work, we lack systematic comparisons of how distinct types of information interventions operate and how effective they are in shaping individual climate action. This paper addresses this research gap by examining whether interventions that enhance climate change literacy, carbon literacy, and

climate policy literacy increase individuals' willingness to mitigate climate change, reduce their carbon footprints, and support climate policies.

To answer this question, we conducted a nationally representative, between-subject survey experiment in Lithuania (N = 3,400). Participants were randomly assigned to one of three information treatments designed to enhance climate literacy in distinct domains, explaining: (i) the causes and consequences of climate change, (ii) the greenhouse gas emissions associated with five everyday activities (flying, car travel, consumption of chicken or pork, and electricity use), or (iii) the design and functioning of carbon taxes. A control group received information of similar length and format about the history of weather forecasting. We assessed the effects of information interventions on three primary outcomes: (1) willingness to mitigate climate change, measured through an incentivized donation to a tree-planting initiative; (2) support for carbon taxation; and (3) stated willingness to reduce one's carbon footprint.

Our findings indicate that information about the carbon footprint of everyday activities increases willingness to mitigate climate change and raises intentions to reduce diet- and energy-related emissions, though it does not significantly affect travel-related behaviors. Information clarifying the design of carbon taxes significantly increases support for carbon taxation, whereas information about the causes and consequences of climate change has no statistically significant effect on the main outcomes. Together, these results suggest that the behavioral impact of information depends critically on its content and domain, offering practical guidance for policymakers seeking to design targeted and effective climate communication strategies.

Our study makes three main contributions. First, whereas prior research typically evaluates isolated interventions targeting a single knowledge domain (e.g., Barbett et al., 2025; Imai et al., 2022; Rhodes et al., 2014; Schleich & Alsheimer, 2024), we adopt a comparative approach,

examining three conceptually distinct forms of climate-related information within a unified experimental framework. This design enables a direct assessment of the relative effectiveness of different knowledge domains in promoting climate action.

Second, we provide evidence from a nationally representative sample in Lithuania, a context that has received limited attention in the experimental literature. Compared to many Western European and Scandinavian countries, public concern about climate change in Lithuania is comparatively low (European Commission, 2025). This makes it a theoretically and policy-relevant case for examining whether information interventions operate differently in settings characterized by lower baseline concern.

Third, we examine a range of behavioral and policy outcomes, including decisions with real economic stakes. The incentivized donation measure and the communication of aggregate policy support results to policymakers reduce reliance on purely hypothetical self-reports and mitigate concerns about social desirability bias (Vesely & Klöckner, 2020). By considering multiple forms of climate action, we provide a more comprehensive assessment of how information translates into different types of engagement.

The remainder of the paper is organized as follows. Section 2 outlines the research design, including the sample, detailed procedures, and the questionnaire. Section 3 presents the results of the study. Section 4 discusses the findings and concludes the paper.

2. Research design

2.1. Data collection and sample

We implemented a between-subjects online experiment, representative of the Lithuanian adult population, in terms of sex, size of residence (city, town, and small town or rural area), and four

age groups (18-29, 30-39, 40-49, and 50 and over).[1, 2] Initially, a total of 3,400 participants were recruited, but some were excluded from the analysis based on pre-registered exclusion criteria.[3] The experiment included four conditions: climate change literacy, carbon literacy, and climate policy literacy interventions, as well as a baseline condition.

Data collection took place in October-November 2025 and was administered by AB "Norstat", a survey firm that operates an online panel of registered internet users who have consented to participate in research studies. Respondents who completed the survey were compensated with virtual coins redeemable for gift cards or vouchers, or alternatively could choose to donate them to a charitable organization. In addition, a subset of participants received a bonus, determined by response accuracy and a random draw. The average completion time for the experiment was 20.3 minutes and the median was 16.2 minutes.

The mean age of respondents was 48 years, with women accounting for 53% of the sample. The vast majority of participants (95%) identified as Lithuanian nationals. University-level education was reported by 70% of respondents, while 72% indicated current full- or part-time employment. 43% of the sample lived in one of Lithuania's five largest cities, and 85% reported owning a private vehicle. Additional descriptive statistics are reported in Table 1.

[1] This experiment received ethical approval from the Committee on Research Ethics in Economics at the Faculty of Economics and Business Administration, Vilnius University (application no. No EC2025_01).

[2] The experiment was preregistered on AsPredicted, https://aspredicted.org/9u7yv3.pdf.

[3] We excluded data from participants who failed either of the two attention checks (103 participants), those with a Q_RecaptchaScore in Qualtrics below 0.3 (25 participants), and participants who completed the questionnaire in less than 20% of the median completion time (3 participants). We preregistered that participants making two or more errors on the three comprehension questions would be excluded from the analysis. However, applying this criterion would have resulted in substantial data loss in some treatment conditions. We therefore retain these observations in the main analysis and report results for the restricted sample in the Appendix. The results are largely consistent with the main findings.

Table 1. Demographic characteristics across treatments

	Control	Climate	Carbon	Policy
Age	48.03	47.75	48.46	48.69
Female	0.53	0.54	0.53	0.53
Climate skepticism index	5.21	5.14	5.19	5.16
Risk preference	5.30	5.20	5.21	5.24
Political trust	3.22	3.28	3.31	3.18
General trust	5.69	5.68	5.67	5.70
Climate change literacy	0.63	0.63	0.64	0.64
Carbon literacy	0.53	0.50	0.51	0.52
Policy literacy	0.52	0.51	0.53	0.52
Information clear	0.95	0.94	0.85	0.88
Information trustworthy	0.86	0.88	0.81	0.78
Urbanicity				
Major city	0.43	0.44	0.44	0.43
Minor city	0.25	0.25	0.25	0.25
Town or village	0.31	0.31	0.32	0.32
Education				
Primary	0.01	0.01	0.01	0.01
Secondary	0.10	0.13	0.09	0.09
Vocational	0.18	0.20	0.21	0.16
Bachelor's	0.41	0.42	0.40	0.46
Master's or PhD	0.29	0.24	0.28	0.29
Monthly net income				
< €500	0.10	0.11	0.10	0.11
€501–€1000	0.26	0.27	0.29	0.25
€1001–€1500	0.31	0.29	0.28	0.27
€1501–€2000	0.18	0.17	0.17	0.20
€2001–€2500	0.08	0.08	0.09	0.08
> €2500	0.08	0.09	0.08	0.09
N	851	849	850	850

2.2. The questionnaire

As shown in Figure 1, the questionnaire consisted of eight parts, described below. Detailed participant instructions are provided in the Supplementary materials.

Screening. Individuals who responded to the invitation first completed screening questions on age, sex, and place of residence. These responses were used to ensure that participants in each of the four experimental conditions were representative of the Lithuanian adult population with respect to key sociodemographic characteristics (Stage 1 in Figure 1).

Climate attitudes, risk preferences, and trust. Participants answered six questions measuring their attitudes toward climate change, including whether climate change is occurring, whether it is driven by human activity, its personal importance, concern about climate change, and its perceived impacts on themselves and future generations. Responses were recorded on a 7-point Likert scale. Participants then reported their general willingness to take risks using an 11-point Likert scale (Dohmen et al., 2011). In addition, two questions assessed trust in political institutions and trust in science, both measured on a 7-point Likert scale. These measures were placed at the beginning of the experiment to avoid influence from subsequent treatments (Stage 2 in Figure 1).

Climate literacy. This part measured three types of climate literacy: climate change literacy, climate policy literacy, and carbon literacy (Block 3 in Figure 1). Climate change literacy questions assessed participants' knowledge of the causes and consequences of climate change, as well as major sources of emissions. Climate policy literacy questions measured knowledge of policy instruments to address climate change, including carbon taxation, the EU Emissions Trading System, international agreements, and general policy principles. For both climate change literacy and climate policy literacy, participants answered ten incentivized questions, each presented on a separate screen with a 50-second time limit. Four answer options and an additional "I don't know" option were provided. To incentivize effort, ten randomly selected participants in each part received €2 for each correct answer, while selecting "I don't know" yielded €0.50 to discourage guessing. Carbon literacy was measured using a task in which participants had four minutes to rank five climate mitigation actions from the highest to the lowest GHG emission reduction (e.g., replacing a portion of pork with vegetables once per week). Participants then had four additional minutes to compare these actions pairwise in terms of their emission reduction potential. Responses were incentivized: ten randomly selected

participants who correctly ranked two randomly selected actions received €10, with the possibility of earning up to an additional €10 based on the accuracy of their comparisons.

Figure 1. Main stages of the experiment

<table>
<tr><th>#</th><th>Stage</th><th>Description</th></tr>
<tr><td>1</td><td>Screening</td><td>Age, sex, and place of residence to ensure representativeness of the Lithuanian adult population.</td></tr>
<tr><td>2</td><td>Climate attitudes, risk & trust</td><td>Climate change attitudes, risk preferences, and trust in political institutions and science.</td></tr>
<tr><td>3</td><td>Literacy scales</td><td>Incentivized literacy scales:
(a) Climate change literacy: 10 questions on causes, mechanisms, and consequences.
(b) Climate policy literacy: 10 questions on climate agreements and policies.
(c) Carbon literacy: ranking of five GHG-reducing behaviors and magnitude estimation of relative GHG savings.</td></tr>
<tr><td>4</td><td>Randomized information treatment</td><td>
<table>
<tr><th>4a. Climate change literacy</th><th>4b. Carbon literacy</th><th>4c. Policy literacy</th><th>4d. Control</th></tr>
<tr><td>Scientific consensus on human-caused warming, observed Lithuanian impacts, and projected future risks.</td><td>Correct GHG ranking and CO_2 figures for the five behaviors from Stage 3 with brief explanations.</td><td>Economic rationale for a CO_2 tax, its incentive effects, and revenue redistribution options.</td><td>Neutral text on the history of weather forecasting (unrelated to climate change).</td></tr>
<tr><td colspan="4">All conditions: 3-question comprehension check.</td></tr>
</table>
</td></tr>
<tr><td>5</td><td>Donation decision</td><td>Allocation of €50 between self and a tree-planting and forest conservation organization.</td></tr>
<tr><td>6</td><td>Carbon tax support</td><td>Support for a CO_2 tax under three revenue-use scenarios: (a) redistribution to low-income households, (b) environmental protection, (c) national defense.</td></tr>
</table>

#	Stage	Description
7	**Behavioral change intentions**	Likelihood of reducing pork, poultry, flying, driving, and electricity consumption in the next year.
8	**Background characteristics**	Demographic information (nationality, education, income, employment, car ownership), current habits, political views, and evaluation of the information received.

Note. Stages 1–3 and 5–8 were identical across all four treatment arms.

Treatments. Participants were randomly assigned to one of four conditions: climate change literacy, carbon literacy, climate policy literacy, or a baseline condition. In all conditions, participants read a short informational text. In the climate change literacy treatment, the text described the causes and consequences of climate change, emphasizing the increasing frequency of extreme weather events and their impacts on property, food production, health, infrastructure, and migration (Block 4a in Figure 1). In the carbon literacy treatment, the text provided quantitative information on the GHG emission reductions associated with the mitigation actions previously evaluated by participants (Block 4b in Figure 1). In the climate policy literacy treatment, the text explained how carbon taxation works, its effectiveness in reducing GHG emissions and fostering innovation, and the potential redistribution of tax revenues (Block 4c in Figure 1). In the baseline condition, participants read placebo information unrelated to climate change, specifically on the history of weather forecasting (Block 4d in Figure 1). Following the informational texts, participants were given 90 seconds to answer three comprehension questions. In each condition, ten randomly selected participants received €2 for each correct answer, while "I don't know" responses were rewarded with €0.30.

Donation decision. This stage elicited participants' willingness to mitigate climate change (Block 5 in Figure 1). Participants made an incentivized donation decision by allocating €50 (using a slider in €1 increments) between themselves and the National Fund for the Support of Strictly Protected Forests, an organization engaged in forest protection and tree planting. The

instructions highlighted the role of forests in reducing atmospheric CO_2, noting that one mature tree absorbs approximately 22 kg of CO_2 per year, roughly equivalent to the emissions from an average car driving 200 km. Participants were provided with links to the organization's website and informed that the decisions of five randomly selected participants would be implemented, with donated funds transferred to the organization and the remainder paid to the participant.

Carbon tax support. This section measured support for climate policy, focusing on carbon taxation (Block 6 in Figure 1). Participants indicated their level of support for implementing a carbon tax in Lithuania on a 5-point Likert scale. Three versions of the question varied the proposed use of tax revenues: (i) redistribution to the poorest households and those lacking alternatives to fossil fuels, (ii) investment in environmental protection, or (iii) investment in national defense. To reduce hypothetical bias, participants were informed that aggregated and anonymized responses would be shared with representatives of the Ministry of Environment.

Behavioral change. This stage measured participants' willingness to reduce their carbon footprint (Block 7 in Figure 1). Participants reported, on a 5-point Likert scale, how likely they were to adopt five behaviors: eating less pork, eating less chicken, reducing flights, reducing car use, and reducing electricity consumption.

Background characteristics. In the final stage, participants provided background information (Block 8 in Figure 1), including habits related to food and travel, political party preference, nationality, education, income, employment status, and car ownership. Participants also indicated whether they understood the informational texts and found them credible.

As preregistered, two attention checks were included: one at the beginning of the experiment, prior to the climate attitude questions, and a second following the donation decision.

3. Results

3.1 Variable construction

Climate skepticism. Climate skepticism was measured using six questions on a seven-point Likert scale. The six items are highly internally consistent (Cronbach alpha = 0.91) and the principal component analysis shows that the first component explains 69% of the total variance, indicating a single dominant dimension. We therefore combined the items into a composite skepticism index by taking the average of the six components.

Literacy scales. We construct three climate literacy measures for climate change literacy, carbon literacy, and policy literacy. Climate change and climate policy literacy scales are calculated as the average number of correct answers, out of the 10 questions. The literacy scores therefore range between 0 (no correct answers) and 1 (all answers correct). Carbon literacy was measured by asking the respondents to rank the five activities in terms of their carbon footprint. Literacy was measured by comparing how well the provided ranking corresponds to the actual ranking using Spearman's rank correlation coefficient. The coefficient ranges between -1 to 1, but it has been normalized to the range between 0 and 1 to facilitate comparison with the other climate literacy scores.

3.2 Balance checks

Table 1 compares the key characteristics across the four treatments. Age categories, gender and urbanicity were used as stratification variables, and Table 1 shows that the assignment was successful as the variables are very similar across treatments. The assignment is balanced in terms of the other characteristics as well. Importantly, the levels of climate change, carbon and policy literacy were very similar in all four conditions.

We verify the balance of randomization by regressing the treatment variable on the observables (including all the variables in Table 1 and also political preferences, nationality, employment status and car ownership). We run the regressions pairwise, comparing each of the three treatments to the control. We then conduct omnibus F-tests of joint orthogonality with

randomization inferences, using 500 permutations of treatment assignments, as recommended in Kerwin et al (2024). The randomization inference p-values are 0.5, 0.51 and 0.27 for the three treatments, indicating that the treatments are balanced compared to the control on observable characteristics.

There are some differences in whether the participants found the provided information clear and credible, with lower values in the carbon and climate policy literacy treatments. The difference is likely driven by the more complex nature of the intervention text in the carbon and climate policy treatments, as well as more unfamiliar information being presented.

3.3 Treatment effects

We are testing three primary preregistered hypotheses:

Hypothesis 1. Information about the main causes and consequences of climate change increases climate change mitigation.

Hypothesis 2. Information about carbon taxes increases support for carbon taxes.

Hypothesis 3. Information about the carbon footprints increases the willingness to reduce one's carbon footprint.

We test the hypotheses by comparing the treatments to the control condition in terms of the three dependent variables: climate change mitigation, willingness to reduce individual carbon footprint and support for carbon taxes.

3.3.1 Climate change mitigation

Direct climate change mitigation behavior was measured by asking the participants to divide money between themselves and an organization that mitigates climate change by taking actions such as planting trees. We find that the average investment in mitigation in the control treatment is 25.2 euros. The investments in the three treatments are higher, but not statistically different

from the control: 26.4 euros in the climate information treatment (Mann-Whitney U test p=0.16), 26.0 euros in the policy information treatment (MWU p=0.31) and 26.6 euros in the carbon information treatment (MWU p=0.13). Figure 2 shows the distribution of investments across the treatments. The distributions look very similar, with around 20% of the respondents choosing to invest their entire endowment in each treatment. We do not find any statistical differences in terms of the distributions between the control and each of the three treatments (the lowest Kolmogorov-Smirnov test combined p-value is 0.186, for the difference between Control and Carbon treatments).

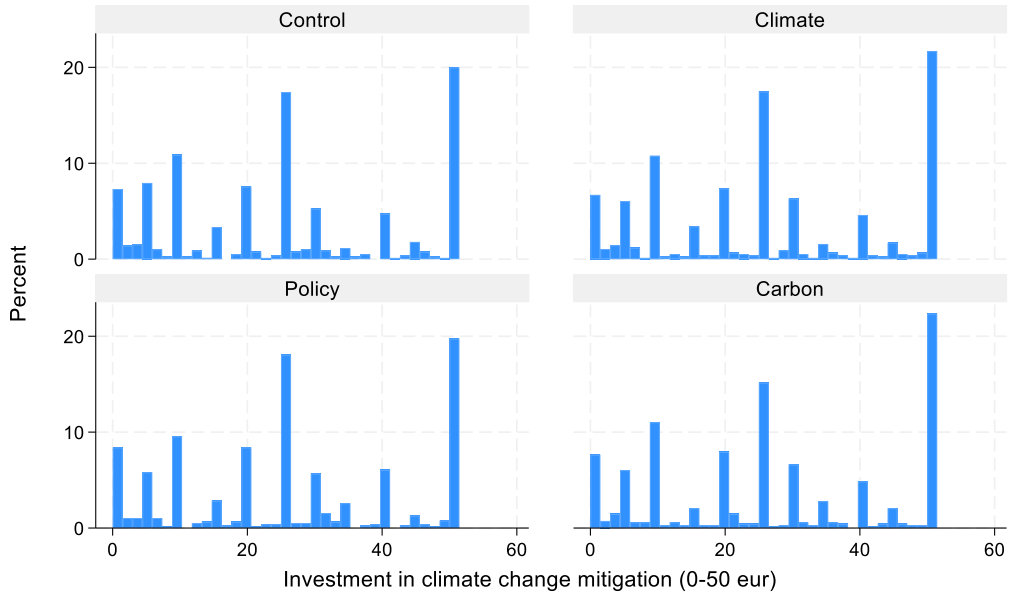


Figure 2. Histogram of investments in climate change mitigation across treatments

We also test if the treatment differences are significant by regressing the mitigation investments on treatment dummies and the control variables. Since there is a large mass of choices at both the upper and the lower bound of the strategy space, we use Tobit regressions. As a robustness check, we also ran OLS regressions, as specified in our preregistration.

Figure 3 compares the Tobit regression coefficients of the three treatments, where climate change mitigation investments are regressed on the treatment dummies and the control

variables. The average investments are higher in treatments compared to control, but none of the differences are statistically significant. Table 2 shows the results of the full regression model, where we include both Tobit and OLS regressions. In the two models, we also include additional controls for nationality, income, employment, education, party, habitat, and car ownership. We do not observe a statistically significant treatment difference for any of the three treatments. As a result, we cannot reject the null hypothesis, indicating that our Hypothesis 1 is rejected.

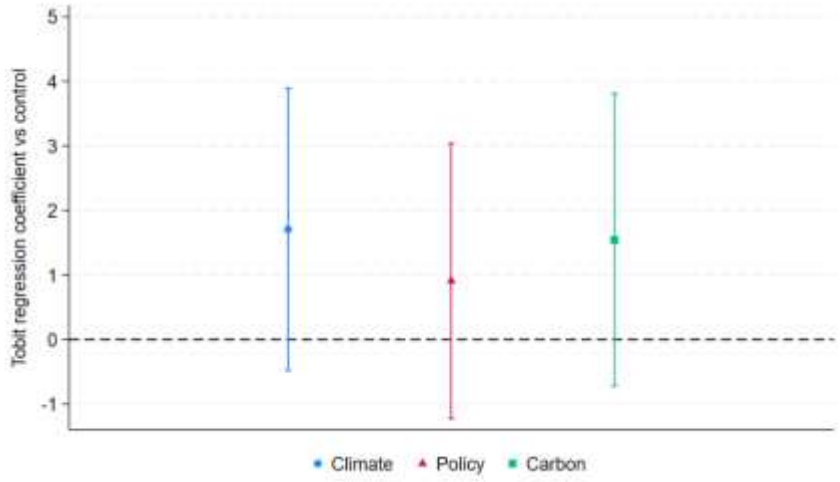


Figure 3. Tobit regression coefficients with 95% confidence intervals for the three treatment dummy variables

Table 2 shows that some other control variables have a significant association with investments in climate change mitigation. It is perhaps unsurprising that the respondents who are more skeptical towards climate change invest less in climate change mitigation. We also find that those with higher climate policy literacy invest more. Finally, there is some evidence that mitigation investments are higher for older respondents.

Table 2. Treatment effects on climate change mitigation (Tobit and OLS regressions with robust standard errors.

	Tobit	OLS	Tobit	OLS
Climate treatment	1.583	1.335	1.722	1.436
	(0.153)	(0.110)	(0.123)	(0.088)
Policy treatment	0.872	0.947	0.935	1.000
	(0.422)	(0.247)	(0.390)	(0.225)

Carbon treatment	1.514	1.322	1.570	1.357
	(0.190)	(0.125)	(0.175)	(0.118)
Climate skepticism	-3.630***	-2.710***	-3.587***	-2.657***
	(0.000)	(0.000)	(0.000)	(0.000)
Climate change literacy	-3.129	-2.378	-5.167	-3.861
	(0.241)	(0.230)	(0.059)	(0.058)
Carbon literacy	-0.013	-0.082	-0.395	-0.350
	(0.994)	(0.950)	(0.821)	(0.791)
Policy literacy	6.215**	4.632**	5.096*	3.802*
	(0.007)	(0.007)	(0.030)	(0.032)
Risk preference	-0.262	-0.159	-0.251	-0.150
	(0.174)	(0.267)	(0.200)	(0.304)
Political trust	0.146	0.206	-0.109	0.007
	(0.605)	(0.324)	(0.712)	(0.975)
General trust	0.897	0.596	0.584	0.354
	(0.053)	(0.086)	(0.217)	(0.318)
Age (years)	0.101***	0.077***	0.093**	0.070**
	(0.000)	(0.000)	(0.009)	(0.009)
Female	-0.166	-0.260	-0.130	-0.229
	(0.848)	(0.688)	(0.888)	(0.740)
Additional controls	No	No	Yes	Yes
N	2997	2997	2975	2975
(Pseudo) R-squared	0.008	0.054	0.010	0.071

Notes: p-values in parentheses; * p<0.05, ** p<0.01, *** p<0.001. Tobit models are censored at 0 and 50. Models (3)–(4) additionally control for nationality, income, employment, education, party, habitat, and car ownership (not shown).

3.3.2 Climate policy support

Our second variable of interest is support for carbon taxation. Participants indicated their support for three types of carbon tax policies that differed in how the tax revenue was used: (i) invested in national defense, (ii) invested in environmental projects or (iii) redistributed to the poorest households. For each policy, respondents indicated their support on a 5-point Likert scale. Figure 4 shows the carbon tax support by revenue use and treatment. As expected, the treatment that provided information about carbon taxes has the highest share of support for carbon taxes.

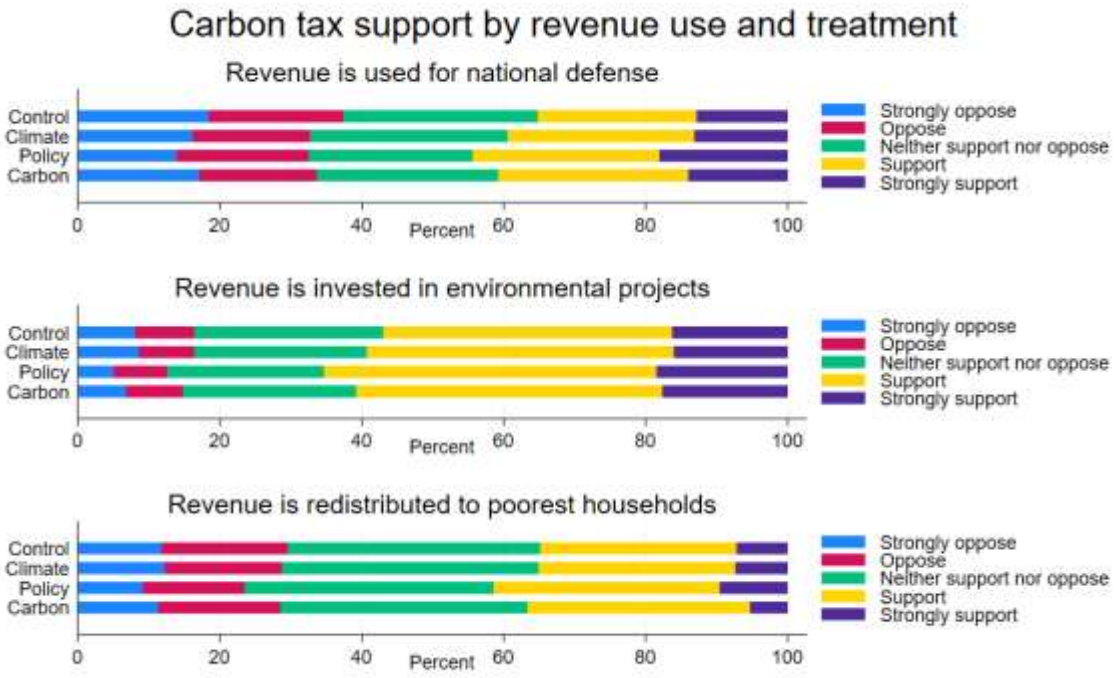


Figure 4. Distribution of responses about carbon tax support across treatments

We test whether the support for carbon taxes is higher in each treatment relative to control using Mann-Whitney U test. We find a significant difference between the climate policy treatment and control for all three questions ($p=0.0003$ for national defense, $p=0.0018$ for environmental projects and $p=0.0013$ for redistribution). None of the other two treatments are different from control at the 5% significance level.

Next, we compare the treatments by regressing carbon tax support on the treatment dummies and control variables. We use ordered probit regression with robust standard errors. Figure 5 shows the estimated coefficient values across the three variables, comparing each treatment to control. Error bars indicate the 95% confidence intervals. We find that the climate policy treatment produces significantly more support for carbon taxes compared to the control treatment. The differences between the control and the other two treatments are not statistically significant.

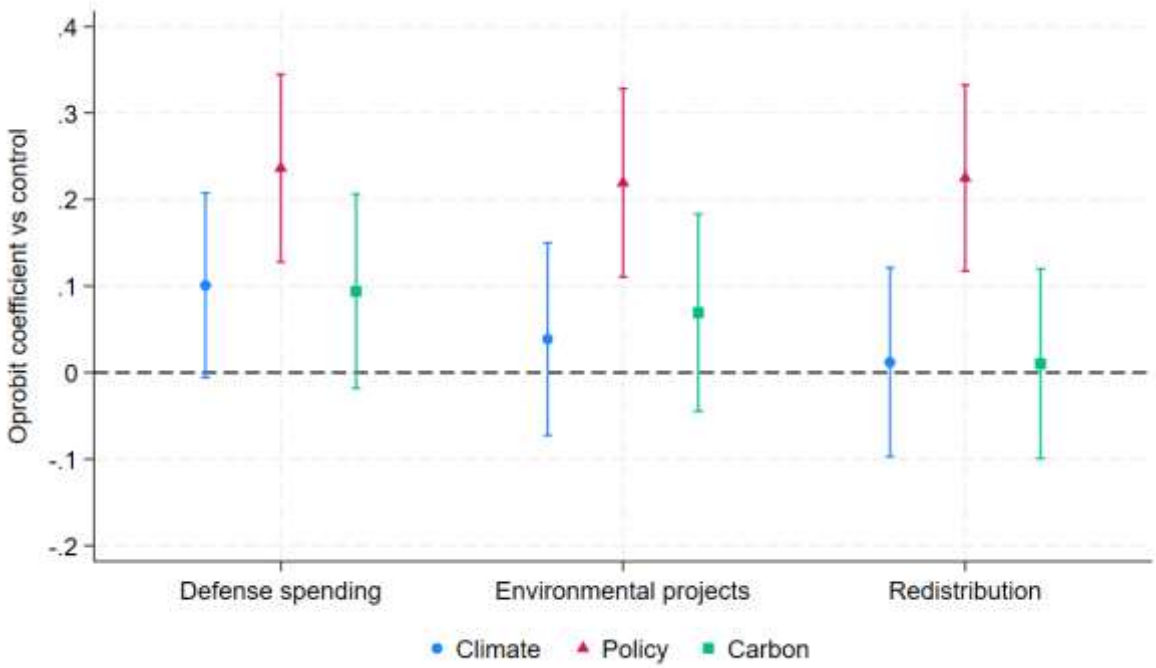


Figure 5. Ordered probit regression coefficients with 95% confidence intervals for the three treatment dummy variables

Table 3 displays the full results of the ordered probit regression. Besides the significant effect of the climate policy treatment and no effect of the other two treatments, we also find some correlations between the personal characteristics and policy support. Climate skepticism is associated with lower policy support, just as we observed for the investments in climate change mitigation. This time we also find that the two trust measures (political and general trust) show a significant positive correlation with each of the three policy support questions. There is also a significant correlation between risk preferences and two out the three policy support questions, indicating lower support for the more risk averse individuals. Climate change and carbon literacy have no effect, and the effect of climate policy literacy is inconsistent across the three measures. There is also some weak evidence that women are less willing to support carbon taxes, but this effect is only significant when taxes are redistributed to the poorest households.

Table 3. Treatment effects on carbon tax support. Ordered probit regressions with robust standard errors

	Defense spending	Environmental projects	Redistribution
Climate treatment	0.101	0.039	0.012
	(0.064)	(0.495)	(0.830)
Policy treatment	0.236***	0.219***	0.225***
	(0.000)	(0.000)	(0.000)
Carbon treatment	0.094	0.069	0.010
	(0.100)	(0.233)	(0.854)
Climate skepticism	-0.241***	-0.385***	-0.261***
	(0.000)	(0.000)	(0.000)
Climate change literacy	-0.181	-0.086	-0.168
	(0.163)	(0.532)	(0.199)
Carbon literacy	-0.124	0.073	-0.078
	(0.155)	(0.408)	(0.362)
Policy literacy	-0.283*	0.460***	-0.134
	(0.015)	(0.000)	(0.243)
Risk preference	0.012	0.026*	0.034***
	(0.230)	(0.010)	(0.000)
Political trust	0.095***	0.040**	0.062***
	(0.000)	(0.006)	(0.000)
General trust	0.140***	0.134***	0.094***
	(0.000)	(0.000)	(0.000)
Age (years)	-0.000	0.001	-0.003
	(0.818)	(0.452)	(0.052)
Female	-0.035	-0.008	-0.093*
	(0.453)	(0.870)	(0.041)
N	2975	2975	2975
Pseudo R-squared	0.101	0.109	0.055

Notes: p-values in parentheses; * p<0.05, ** p<0.01, *** p<0.001. Additional controls (nationality, income, employment, education, party, urbanicity, and car ownership) are included but not shown.

Taken together, both the non-parametric tests and the ordered probit regressions strongly support hypothesis 2, finding that the climate policy intervention significantly increased support for carbon taxes for all three versions of the carbon tax policy.

3.3.3. Intentions to reduce carbon footprint

Our third variable of interest is the intention to reduce one's carbon footprint. In particular, we asked whether the participants were willing to consume less pork and poultry, reduce the number of flights and car trips taken and reduce energy consumption. Each question could be answered on a 5-point Likert scale (very unlikely/ unlikely / neither likely nor unlikely / likely / very likely). Participants could also indicate that they are not engaged in a particular activity (e.g., do not eat pork or do not travel by car). We removed the answers from the participants

who are not engaged in an activity. Removing these observations reduced the amount of data by 5.8%.

Figure 6 plots the distribution of the answers about behavioral change intentions. We find a significant difference between Control and Carbon for the intentions to reduce pork consumption (MWU p=0.0004), chicken consumption (MWU p=0.0009) and electricity consumption (MWU p= 0.0315), while the difference for reducing the number of flights is marginally significant (MWU p=0.0781). We also find that the willingness to reduce pork consumption is higher in the Climate and Policy treatments (MWU p=0.0160 and p=0.0314), respectively. All the other pairwise differences are not statistically significant at the 5% level.

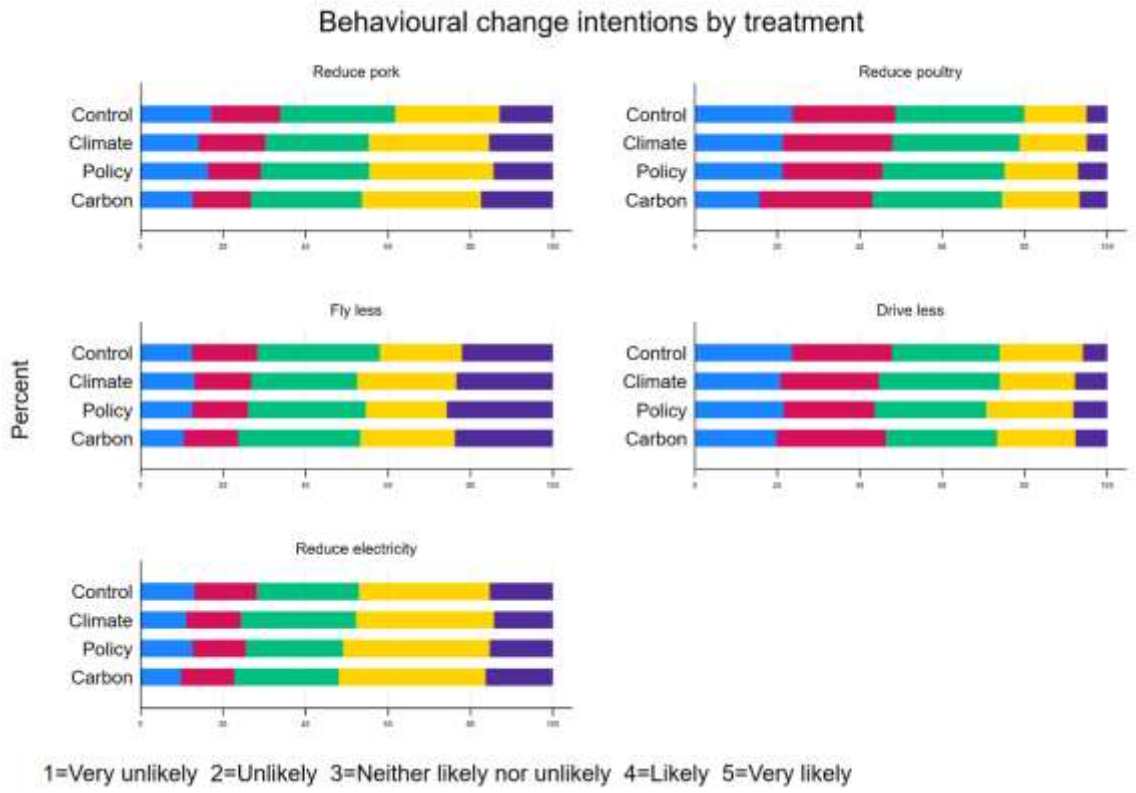


Figure 6. Distribution of answers about the intentions to take one of the actions to reduce carbon footprint.

Next, we evaluate the treatment differences by regressing the willingness to reduce carbon footprint on the treatment dummies and the control variables. As before, we use the ordered

probit regression with robust standard errors. Figure 7 shows the estimated coefficient values across the three variables, comparing each treatment to control. Error bars indicate the 95% confidence intervals. We find that carbon literacy intervention increased the intentions to reduce pork, poultry and energy consumption, while the climate policy intervention also increase the intentions to lower pork and poultry consumption, as well as car travel. Information about climate change affected only the pork consumption.

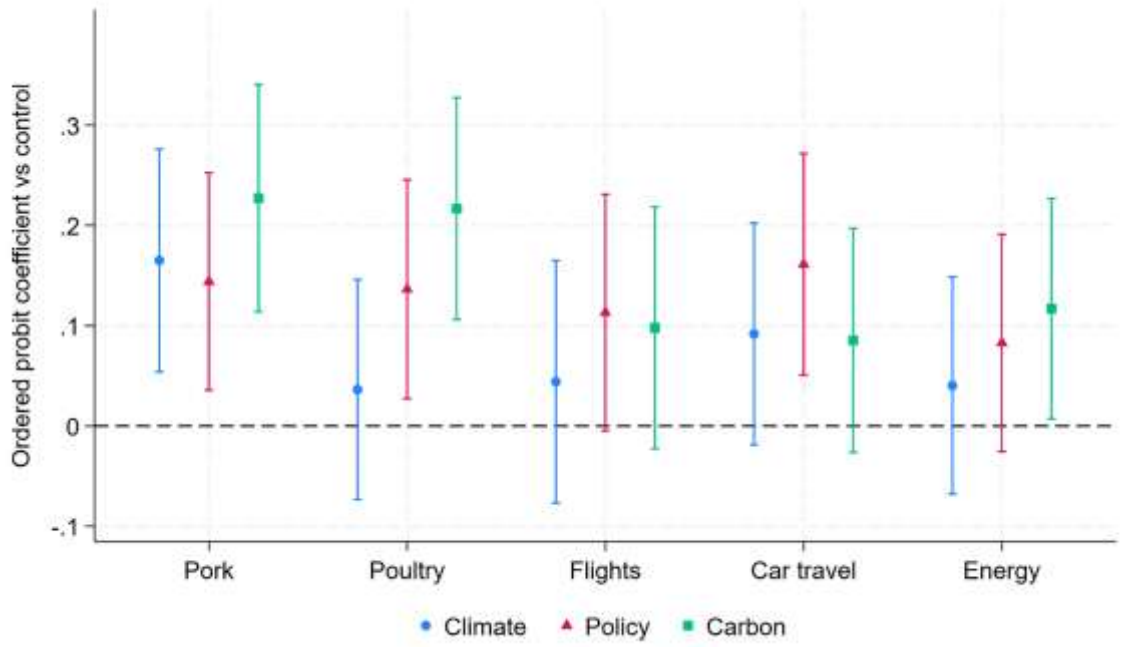


Figure 7. Ordered probit regression coefficients with 95% confidence intervals for the three treatment dummy variables

Table 4 shows the full results of the ordered probit regression. Besides the treatment effects, we find that climate skepticism reduces the willingness to engage in all of the activities, just as was found with the previous variables. There is also some evidence that risk-seeking individuals are more willing to reduce their pork, poultry and electricity consumption. Age is also important, as the older respondents demonstrate higher intentions to reduce nearly all of the proposed activities (marginally significant for electricity use). The gender effect varies by the type of activity, with a higher willingness to undertake diet-related activities among women,

but more willingness to reduce transport-related activities for men. The two trust variables are also associated with the behavioral intentions but while higher political trust leads to higher willingness to reduce the carbon footprint, the association for general trust is negative. None of the literacy variables have any significant effect on behavioral change intentions.

Table 4. Treatment effects on behavioral change intentions. Ordered probit regressions with robust standard errors.

	Reduce pork	Reduce poultry	Fly less	Drive less	Reduce electricity
Climate	0.165**	0.036	0.044	0.092	0.040
	(0.004)	(0.516)	(0.474)	(0.103)	(0.466)
Policy	0.144**	0.136*	0.113	0.161**	0.083
	(0.009)	(0.014)	(0.060)	(0.004)	(0.133)
Carbon	0.227***	0.217***	0.098	0.085	0.117*
	(0.000)	(0.000)	(0.111)	(0.134)	(0.037)
Climate skepticism	-0.313***	-0.274***	-0.241***	-0.262***	-0.283***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Climate change literacy	0.014	-0.067	0.023	-0.072	-0.224
	(0.919)	(0.616)	(0.879)	(0.585)	(0.087)
Carbon literacy	0.170	0.124	0.059	0.163	-0.114
	(0.057)	(0.164)	(0.540)	(0.074)	(0.191)
Policy literacy	-0.064	-0.128	-0.059	-0.015	0.162
	(0.582)	(0.260)	(0.637)	(0.898)	(0.146)
Risk preference	0.027**	0.040***	-0.006	0.018	0.032**
	(0.008)	(0.000)	(0.587)	(0.077)	(0.001)
Political trust	0.032*	0.071***	0.041*	0.060***	0.014
	(0.033)	(0.000)	(0.012)	(0.000)	(0.342)
General trust	0.008	-0.052*	-0.076**	-0.029	0.025
	(0.741)	(0.040)	(0.008)	(0.252)	(0.300)
Age (years)	0.004*	0.011***	0.006**	0.004*	0.003
	(0.021)	(0.000)	(0.006)	(0.032)	(0.126)
Female	0.344***	0.133**	-0.122*	-0.166***	0.077
	(0.000)	(0.004)	(0.014)	(0.000)	(0.091)
N	2837	2906	2445	2860	2961
Pseudo R-squared	0.068	0.052	0.045	0.056	0.047

Notes: p-values in parentheses; * p<0.05, ** p<0.01, *** p<0.001. Additional controls (nationality, income, employment, education, party, urbanicity, and car ownership) are included but not shown.

A remaining question concerns why the carbon literacy intervention had a larger effect on diet-related activities than on transport-related ones. One potential explanation is that the carbon footprint of diet-related activities tends to be more systematically underestimated, such that an intervention revealing true carbon footprints exerts a stronger updating effect on beliefs (Imai et al., 2022). This hypothesis can be tested by examining the extent to which the footprint of

each action is under- or over-estimated, and by assessing how treatment effects vary across different levels of misperception. We operationalize misperception as the difference between a participant's perceived rank of an activity's effectiveness and its actual rank, where lower numbers denote greater effectiveness. A positive value thus indicates that a participant underestimated the relative effectiveness of that action, while a negative value indicates overestimation. The bars in Figure 8 show the distribution of misperception across the five activities, pooled across the Carbon and Control conditions (distributions are near-identical when all treatment arms are included). Because reducing flights is the single most effective activity, it cannot by definition be overestimated in relative terms; nevertheless, nearly half of respondents correctly identified it as such. Accuracy was considerably lower for the remaining activities. Reducing pork consumption is the second most effective action, yet only just over 10% of respondents correctly ranked it as such; the modal response placed it fourth, underestimating its impact by two ranks. Results for poultry consumption followed a similar pattern, with respondents far more likely to underestimate than overestimate its carbon impact.

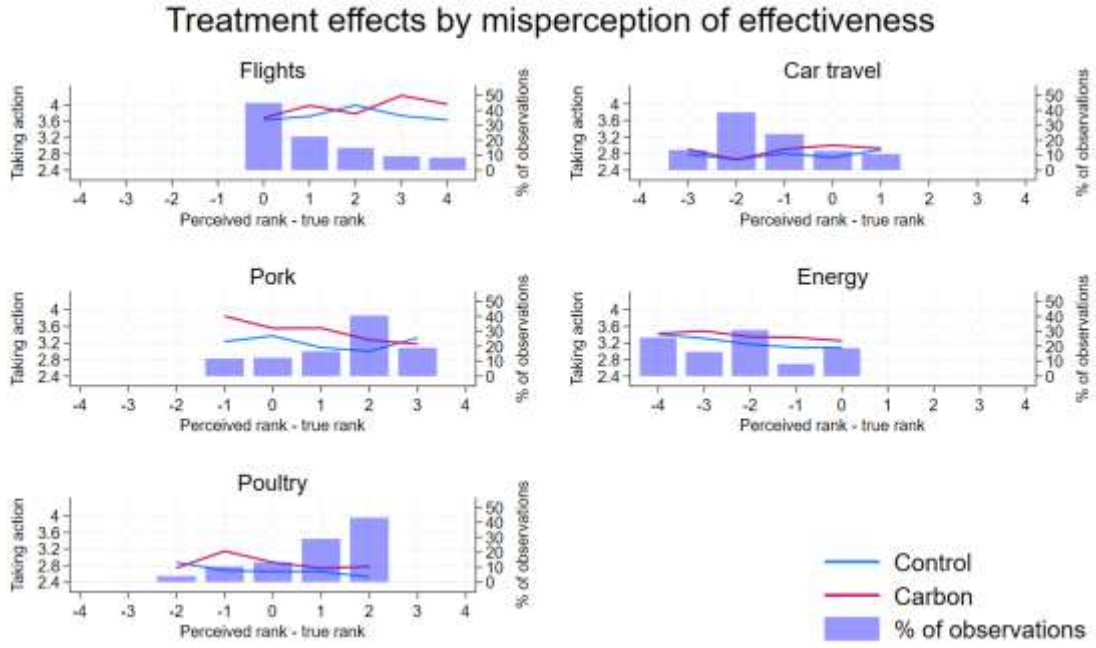


Figure 8. Distribution of misperception about the relative carbon footprint of five activities (bars; positive values indicate underestimation) and mean stated intentions to reduce emissions in each domain, by treatment condition (lines).

The lines in Figure 8 offer support for the hypothesis that the carbon literacy intervention is more effective for activities whose impact is more widely underestimated. The two lines represent average stated willingness (measured on a 1–5 Likert scale, excluding respondents who reported not engaging in that activity) to reduce carbon footprint in each specific domain, separately for the Carbon and Control conditions. For flights, the two lines converge among respondents who correctly identified this as the most effective action, suggesting that accurate prior knowledge leaves little room for the intervention to operate. However, among the small share of respondents who severely underestimated flight emissions (misperception of 3 or 4), the intervention did increase willingness to fly less. Because such severe underestimation of flight emissions was relatively rare, the aggregate treatment effect for this activity remains modest. By contrast, underestimation of the greenhouse gas emissions associated with diet-related behaviors was far more prevalent, and this subsample exhibited meaningfully greater willingness to reduce meat consumption following the intervention, producing a significant overall treatment difference. For car travel, whose carbon footprint tends to be overestimated, respondents who overestimated showed little difference between conditions. For household energy, a consistent treatment effect was observed across most of the distribution, with the exception of those who most severely overestimated the importance of electricity consumption. Overall, these findings suggest that the greater effectiveness of the carbon literacy intervention for diet-related intentions is attributable, at least in part, to the widespread underestimation of the carbon footprint associated with those behaviors.

4. Conclusions

This paper examines whether information interventions that aim to enhance different dimensions of climate literacy – namely, climate change literacy, carbon literacy, and climate

policy literacy – influence individuals' engagement in climate action. Using a nationally representative survey experiment in Lithuania, we compared the effects of three types of information designed to improve knowledge about (i) the causes and consequences of climate change, (ii) the carbon footprint of everyday activities, and (iii) the design and functioning of carbon taxes. We evaluated the impact of these interventions on three outcomes: willingness to mitigate climate change through an incentivized donation decision, support for carbon taxation, and stated intentions to reduce personal carbon footprints.

Our findings show that the behavioral impact of climate-related information depends strongly on its domain. Information about the carbon footprint of everyday activities strengthened intentions to reduce diet- and energy-related emissions. In contrast, this information did not significantly influence travel-related behaviors. Information explaining the design and functioning of carbon taxes significantly increased support for carbon taxation, suggesting that improving understanding of policy instruments can enhance public acceptance of climate policy. By comparison, providing general information about the causes and consequences of climate change had no statistically significant effect on the main outcomes.

These results provide several important insights for climate communication and policy design. First, they suggest that not all types of climate information are equally effective in promoting behavioral change. Information that directly connects everyday activities with their emissions consequences appears more effective in motivating personal mitigation actions than general climate science information. However, this result may not extend to contexts where the impacts of climate change are more visible or severe. Second, improving understanding of policy instruments such as carbon taxes can increase public support for climate policies, which is crucial for their political feasibility.

Several limitations should be acknowledged. Although the experimental design allows us to identify causal effects of information interventions in the short term, the persistence of these effects over time remains uncertain. In addition, some of our analyzed behavioral outcomes rely on stated intentions rather than observed actions. Future research could explore the long-term impacts of climate literacy interventions (e.g., educational programs at schools or universities), examine their effectiveness across different cultural and institutional contexts, and investigate how climate literacy interacts with other behavioral mechanisms such as social norms or economic incentives.

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Supplementary materials

Full instructions

A. Consent, Screener & Introduction

Informed Consent

This experiment aims to analyse people's knowledge, behaviour, and beliefs about climate change and measures to combat it. The study is conducted by researchers from Vilnius University (VU) — Dr. Laura Galdikienė (contact person, laura.galdikiene@evaf.vu.lt), Dr. Jūratė Jaraitė-Kažukauskė, and Dr. Aidas Masiliūnas. The study is funded by the Research Council of Lithuania.

During the experiment you will answer various questions and make decisions, including providing information about your socio-demographic characteristics and political beliefs. The experiment lasts approximately 20 minutes. Indirectly identifying information is recorded (gender, age, county, education, nationality); these data are sufficiently aggregated that identification of specific individuals is not possible.

Data will be stored in a scientific research data archive accessible only to the study team, and made publicly available upon project completion under a CC BY licence. Participation is entirely voluntary; you may withdraw at any time and all data collected up to that point will be immediately deleted. You may also withdraw within 1 month after the experiment ends.

By participating you have the opportunity to receive an additional bonus, awarded to 75 randomly selected participants via Norstat coins.

If you understood and agree to participate, click ‘I agree’ and ‘Next’. If you do not agree, click ‘I disagree’ and ‘Next’.

□ I agree

□ I disagree

Screener

How old are you? (please select)

▼ 15 … 100

Socio-Demographic Questions

What gender is listed in your identity document?

□ Male

□ Female

Your place of residence:

□ Large city (Vilnius, Kaunas, Klaipėda, Šiauliai, Panevėžys)

□ Another city

□ Town or rural area

In which county of Lithuania do you live?

▼ Alytus … Vilnius

Introduction

Welcome to the experiment! Before answering the questions, please think carefully and answer honestly. It is very important to keep your attention focused on the screen throughout the experiment. Please complete the survey without interruption.

Attention Check 1

This is an attention check. When asked to select a letter, please select the letter 'D'. Based on the text you just read, which letter were you asked to select?

□ A

□ B

□ C

□ D

□ E

B. Baseline Scales

Climate Attitudes

How much do you agree or disagree with each of the following statements about climate change?

Scale: 1 (Strongly disagree) – 7 (Strongly agree)

– Climate change is happening.

– Climate change is mostly caused by human activity.

– The issue of climate change is personally important to me.

– I am worried about climate change.

– Climate change will harm me personally.

– Climate change will harm future generations.

Risk Preference

How do you assess yourself: are you generally inclined to take risks, or do you try to avoid risks?

Scale: 0 (Not at all risk-taking) – 10 (Very risk-taking)

Trust

How much do you trust political institutions, such as politicians in general, the Seimas, political parties, or the courts?

Scale: 1 (Completely distrust) – 7 (Completely trust)

How much do you trust science?

Scale: 1 (Completely distrust) – 7 (Completely trust)

C. Literacy Scales

Bonuses for each scale are paid to 10 randomly selected participants (€2 per correct answer; €0.50 per 'I don't know'). Each question has a 50-second time limit. Correct answers are underlined.

C1. Climate Change Literacy

1. What does the scientific community consider the main cause of the rise in air temperature over the last 100 years?

□ Human activity

□ Scientists do not know the main cause

□ Mostly natural changes in nature

□ None of the listed factors

□ I don't know

2. The greenhouse effect is the main driver of climate change. The greenhouse effect is:

□ Earth’s protective ozone layer

□ Pollution causing acid rain

□ A process caused by atmospheric gases that trap heat

□ A process caused by photosynthesis

□ I don’t know

3. Which greenhouse gas emitted into the atmosphere contributes the most to global warming?

□ Nitrous oxide (N_2O)

□ Hydrofluorocarbons (HFCs)

□ Carbon dioxide (CO_2)

□ Other gases

□ I don’t know

4. Which of the following statements is correct?

□ Climate often changes every year.

□ Weather is the average climate conditions in a region.

□ Climate is the average weather conditions in a region.

□ Climate and weather mean almost the same thing.

□ I don’t know

5. Which of the following raw materials is a fossil fuel?

□ Solar and wind energy

□ Oil and natural gas

□ Hydrogen

□ Wood

□ I don’t know

6. What gases are produced when burning fossil fuels?

□ Oxygen

□ Hydrogen

□ Helium

□ Carbon dioxide (CO_2)

□ I don't know

7. Which country/region emits the largest total amount of CO_2?

□ United States

□ China

□ India

□ European Union

□ I don't know

8. Which country/region emits the most CO_2 per person?

□ United States

□ China

□ India

□ European Union

□ I don't know

9. Which of the following statements about the consequences of climate change is INCORRECT? Due to climate change:

□ Heat waves, fires, and floods occur more frequently.

□ Precipitation changes, glaciers melt, sea levels rise.

□ Human mortality increases, migration increases, fertility decreases.

□ The intensity of hurricanes, fires, and floods decreases.

□ I don't know

10. What is climate neutrality?

□ A situation where a country completely stops using fossil fuels.

□ A balance between GHG emissions and removal, resulting in no net climate impact.

□ A policy in which only renewable energy sources are used to generate electricity.

□ A situation in which companies voluntarily reduce their CO_2 footprint without government direction.

□ I don't know

C2. Climate Policy Literacy

1. The main goal of the Paris Agreement on Climate Change is:

□ To increase investments in sustainable farming technologies by 300% by 2035.

□ To limit the average rise in global air temperature to well below 2°C compared to pre-industrial levels.

□ To ensure that at least 90% of the world's energy is generated from renewable sources.

□ To establish an international fund for climate refugees by 2040.

□ I don't know

2. The main long-term goal of the EU Green Deal is:

□ To make the EU a climate-neutral region by 2050.

□ To reduce EU air pollution by 20% by 2030.

□ To completely abandon fossil fuel use in the EU by 2040.

□ To plant one million trees across the EU.

□ I don't know

3. The EU Emissions Trading System (ETS) works as follows:

□ Companies are allowed to emit unlimited CO_2 if they pay an annual fee.

□ Companies are allowed to emit CO_2 for free if they plant a specified number of trees.

□ A CO_2 emission ceiling is set, but companies can ignore it if they recycle waste.

□ The number of allowances is capped at the EU-set CO_2 level; polluting companies can trade allowances freely.

□ I don’t know

4. Which statement describes a CO_2 tax?

□ A tax paid by all major companies listed on a stock exchange.

□ A tax paid by companies and/or individuals for CO_2 emissions.

□ A tax paid by individuals for single-use plastic packaging.

□ An additional electricity tax for companies without solar panels.

□ I don’t know

5. Which of the following is an example of adaptation to climate change?

□ Strengthening flood defences to protect cities from rising sea levels.

□ Investing in wind and solar energy to reduce CO_2 emissions.

□ Closing coal-fired power plants and transitioning to renewable energy.

□ Introducing a CO_2 tax to reduce fossil fuel use.

□ I don’t know

6. Which of the following is an example of climate change mitigation?

□ Developing coastal infrastructure to protect against rising sea levels.

□ Reforesting areas to absorb CO_2 from the atmosphere.

□ Creating early warning systems for extreme weather events.

□ Relocating communities affected by climate-related disasters.

□ I don’t know

7. The ‘polluter pays’ principle means that:

□ The government should cover all environmental clean-up costs.

□ Consumers should pay a tax on all goods with a carbon footprint.

□ Companies and individuals responsible for pollution should bear the costs of the damage caused.

□ Countries should share the costs of climate change equally regardless of emissions.

□ I don’t know

8. In Lithuania, subsidies are provided to individuals purchasing which type of vehicles?

□ New and used all-electric vehicles.

□ Used hybrid and plug-in hybrid vehicles.

□ New diesel and biofuel vehicles.

□ New hydrogen and natural gas vehicles.

□ I don’t know

9. Which statement best describes electricity market liberalisation?

□ Electricity generation and distribution are fully transferred to state institutions.

□ Competition is introduced, allowing several companies to generate and sell electricity.

□ A system in which only renewable energy sources are used.

□ Regulation in the electricity sector is completely abolished.

□ I don’t know

10. What is the main goal of green finance?

□ To increase the profits of companies engaged in fossil fuel extraction.

□ To reduce regulation in financial markets.

□ To increase investments in projects promoting environmental sustainability.

□ To reduce interest rates on housing loans.

□ I don’t know

C3. Carbon Literacy

We will now ask you to answer questions about activities that contribute to GHG emissions. Bonuses will be paid to 10 randomly selected participants.

C3a. Ranking Task (4-minute time limit)

Rank these actions according to how much you think they would reduce GHG emissions per year. If you are among 10 randomly selected participants, your bonus will depend on how accurately you ranked the five actions. At the end of the experiment, two of the five actions will be randomly selected; if ranked correctly, you will receive a €10 bonus.

Click to see a detailed description of the activities.

Replacing pork with vegetables. Imagine that every year, once a week, instead of 220 g of pork you consumed 500 g of vegetables (e.g. potatoes). This portion provides a similar number of calories. 220 g is the average daily meat consumption in Lithuania.

Replacing poultry with vegetables. Imagine that every year, once a week, instead of 220 g of poultry you consumed 500 g of vegetables (e.g. potatoes). Same calorie equivalent; same reference consumption.

Replacing a flight with a train journey. Imagine that instead of one Vilnius–Antalya–Vilnius flight (4,000 km, ~6 hours) you travelled by train on the Vilnius–Klaipėda–Vilnius route (750 km, ~8 hours). GHG per passenger is calculated by dividing total vehicle GHG by average passengers.

Replacing a car trip with a train journey. Imagine that instead of one Vilnius–Klaipėda–Vilnius trip (600 km, ~7 hours) in a medium-sized diesel car (driven alone), you took the train (750 km, ~8 hours). GHG per passenger calculated as above.

Reducing electricity consumption by 90 kWh. Imagine that every day you reduced the use of two 40W light bulbs by three hours. Over a year you would save ~90 kWh, approximately 8% of average Lithuanian household consumption.

Rank these actions by dragging them up or down, from most (#1) to least (#5) GHG-reducing.

- Replacing pork with vegetables one day per week
- Replacing poultry with vegetables once a week
- Replacing one Vilnius–Antalya–Vilnius flight with a train journey within Lithuania
- Replacing one Vilnius–Klaipėda–Vilnius car trip with a train journey
- Reducing electricity consumption by 90 kWh

C3b. Magnitude Estimation (4-minute time limit)

Estimate how much more GHG each action reduces compared to the next. Actions are listed in the order you specified above.

Bonus calculation: At the end, two of the five actions will be randomly selected. Your bonus will be €10 (< 10% error), €6 (10–30%), €3 (30–50%), or €0 (> 50%).

[Rank 1 action] reduces GHG by __ times more than [Rank 2 action] (slider)

[Rank 2 action] reduces GHG by __ times more than [Rank 3 action] (slider)

[Rank 3 action] reduces GHG by __ times more than [Rank 4 action] (slider)

[Rank 4 action] reduces GHG by __ times more than [Rank 5 action] (slider)

Note: Action labels are dynamically filled based on each respondent's ranking.

D. Information Treatment

Participants were randomly assigned to one of four conditions. The information text and comprehension questions below vary by condition; all other survey content is identical.

D1. Climate Change Literacy Treatment

Please read the following text carefully, prepared on the basis of scientific research results and reports from international institutions. You will later be asked questions related to this text. If you answer the questions correctly, you will have a chance to earn an additional ***bonus****.*

Scientists agree that almost all of the rise in air temperature over the last 100 years has been caused by human activity, especially the burning of fossil fuels (coal, oil, gas). This releases greenhouse gases such as carbon dioxide and methane, which trap heat in the atmosphere and warm the planet. The main sources are transport, industry, agriculture, and deforestation.

The average temperature of the Earth is now 1.2°C higher than in the pre-industrial period, and the last decade was the warmest on record. For Lithuania, 2024 was the warmest year in almost 250 years of meteorological observation history. In 2024, natural disasters in Lithuania became more frequent and intense: 2 catastrophic, 17 meteorological, and 12 hydrological extreme events were recorded.

Climate change is a very serious threat affecting many areas of life. It causes more frequent and intense droughts, floods, and fires, worsens fresh water quality and availability, and disrupts ecosystems and agriculture. These consequences harm people's property, health, and infrastructure.

It is projected that in the near future, climate hazards will increase further in all regions of the world. Heat-related mortality and morbidity will increase, coastal and lowland flooding will grow, biodiversity will decline, food production will decrease, and forced migration will increase.

Comprehension Check — Climate Change Literacy Treatment

Please answer the three questions below related to the information you just read. For each correct answer, 10 randomly selected participants will receive a €2 bonus (€0.30 for 'I don't know'). Time limit: 90 seconds.

1. What is the main cause of the rise in air temperature over the last 100 years?

□ Changes in solar activity.

□ Large volcanic eruptions.

□ Human activity, especially the burning of fossil fuels.

□ I don't know

2. What are the social consequences of climate change?

□ Longer life expectancy.

□ Worsening human health and food access.

□ Higher birth rates.

□ I don't know

3. Which of the following events were recorded in Lithuania in 2024?

□ Earthquakes and volcanic eruptions.

□ More frequent natural disasters.

□ Snow avalanches.

□ I don't know

D2. Policy Literacy Treatment

Please read the following text carefully, prepared on the basis of scientific research results and reports from international institutions. You will later be asked questions related to this text. If you answer the questions correctly, you will have a chance to earn an additional ***bonus****.*

Please read the following text carefully, prepared on the basis of scientific research results and reports from international institutions. You will later be asked questions related to its content.

Most scientists are convinced that a carbon dioxide (CO_2) tax is one of the most effective and cheapest ways to reduce greenhouse gas (GHG) emissions. Such a tax levies charges on GHG emissions from burning fossil fuels (oil, gas, coal), calculated per tonne of CO_2 equivalent, paid by the emitting entity — whether a company or an individual.

A carbon tax is a simple and transparent solution that allows the market to find the cheapest ways to reduce GHG emissions. Because high-emission activities become more expensive, companies and households are incentivised to invest in cleaner technologies, accelerating the transition to a climate-friendly economy.

Although this tax raises the cost of high-emission goods and services (petrol, coal-generated electricity, flights), redistribution of tax revenues can reduce the negative impact on the most vulnerable households. Directing revenues to those living in poverty with few alternatives to fossil fuels ensures that the tax is fair and socially responsible. Tax revenues may also be allocated to finance other important areas or to reduce other taxes.

Comprehension Check — Policy Literacy Treatment

Time limit: 90 seconds. Same incentive structure as above.

1. Why is a carbon tax considered an effective way to reduce GHG emissions?

- □ The tax prohibits the use of fossil fuels.
- □ The tax allows market participants themselves to find the cheapest ways to reduce GHG emissions.
- □ The tax increases the thickness of the ozone layer.
- □ I don't know

2. How can the impact of a carbon tax on the most vulnerable households be reduced?

- □ Encourage people to move closer to workplaces to reduce transport costs.
- □ Ignore the tax's impact on such households, as the market will regulate itself.
- □ Redistribute revenues from the tax to the most vulnerable households.
- □ I don't know

3. What does a carbon tax encourage?

- □ Investment in cleaner technologies.
- □ Investment in fossil fuels.
- □ Falling prices of high-emission goods.
- □ I don't know

D3. Carbon Literacy Treatment

Below we present the GHG reduction impact of the activities discussed in the previous section, starting from the least effective. Please read the text carefully. You will later be asked questions related to its content. Answering correctly gives you the opportunity to earn a bonus.

5. Reducing electricity consumption by 90 kWh per year reduces GHG emissions by 42 kg CO_2

Although reducing electricity consumption is beneficial, it does not significantly contribute to reducing GHG emissions. A small reduction in consumption leads to only a slight decrease — approximately 42 kg CO_2.

4. Replacing one long car trip with a train journey reduces GHG emissions by 74 kg CO_2

Transport, especially cars, is one of the main sources of GHG emissions. Cars emit significantly more GHG per kilometre than trains, particularly when railway lines are electrified. Replacing a long car trip with a train journey can reduce emissions by approximately 74 kg CO_2.

3. Replacing poultry with vegetables once a week reduces GHG emissions by 100 kg CO_2 per year

Food choices contribute significantly to GHG emissions. Although poultry generates fewer emissions than red meat, they are substantially higher than plant-based products due to feed production, land use, and methane emissions. Replacing poultry with vegetables once a week reduces emissions by approximately 100 kg CO_2. Even small, consistent dietary changes can have a meaningful positive impact on the climate.

2. Replacing pork with vegetables once a week reduces GHG emissions by 128 kg CO_2 per year

Pork generates more emissions than chicken due to more intensive feed consumption, manure management, and land use. Replacing pork with vegetables once a week reduces emissions by approximately 128 kg CO_2 per year.

1. Replacing one long-haul flight with a train journey reduces GHG emissions by 290 kg CO_2

Flights are one of the most GHG-intensive activities: aircraft consume large amounts of fuel and emissions at high altitude further amplify the greenhouse effect. Replacing just one long-haul flight with a train journey can reduce emissions by as much as 290 kg CO_2 — the greatest impact of all actions listed here.

Comprehension Check — Carbon Literacy Treatment

Time limit: 90 seconds. Same incentive structure as above.

1. Which of these three activities would reduce GHG the most per year?

□ Replacing one Vilnius–Antalya–Vilnius flight with a similar train journey

□ Replacing pork with vegetables once a week

□ Replacing one Vilnius–Klaipėda–Vilnius car trip with a similar train journey

□ I don’t know

2. Which of these three activities would reduce GHG the least per year?

□ Reducing electricity consumption by 90 kWh per year

□ Replacing poultry with vegetables once a week

□ Replacing one Vilnius–Antalya–Vilnius flight with a similar train journey

□ I don’t know

3. Which of these three activities would reduce GHG the most per year?

□ Replacing pork with vegetables once a week

□ Replacing poultry with vegetables once a week

□ Reducing electricity consumption by 90 kWh per year

□ I don’t know

D4. Control Condition

Please read the following text carefully, prepared on the basis of scientific research results and reports from international institutions. You will later be asked questions related to this text. If you answer the questions correctly, you will have a chance to earn an additional ***bonus****.*

Weather forecasting has a long history dating back to the first civilisations. People have long tried to understand atmospheric phenomena and their effect on daily life. The first attempts were based on simple observations — cloud formations, wind direction, or animal behaviour.

Later, more systematic attempts to explain natural phenomena emerged. The ancient thinker Aristotle described the origins of rain, clouds, wind, and other meteorological phenomena. Although some of his theories were inaccurate, they remained the principal reference on weather for a long time. In the Middle Ages, forecasts were mostly based on nature observation and complex astrological calculations based on planetary motion.

A new era in weather forecasting began with the development of measuring instruments. Hygrometers, thermometers, and barometers allowed more precise determination of weather conditions. Combined with communication technologies such as the telegraph, data could be transmitted more quickly and the first weather maps produced, significantly improving forecast reliability.

Another important step was the deployment of instruments lifted into the atmosphere, which send information about temperature, pressure, and humidity at higher levels. Today such measurements are made worldwide and the collected data are used in computer models, making forecasts more accurate — though nature often remains unpredictable.

Comprehension Check — Control Condition

Time limit: 90 seconds. Same incentive structure as above.

1. What were the early attempts to forecast weather based on?

□ Computer models.

□ Observations of clouds, wind, and animal behaviour.

□ Satellite data.

□ I don't know

2. Which instruments helped determine weather conditions more accurately?

□ Hygrometers, thermometers, and barometers.

□ Compasses and sundials.

□ Microscopes and telescopes.

□ I don't know

3. How do instruments lifted into the atmosphere help with weather forecasting?

□ They observe the position of stars.

□ They send data on temperature, pressure, and humidity.

□ They observe animal behaviour.

□ I don't know

E. Outcomes & Post-Treatment Measures

Donation Decision

On the next page, you will make a monetary support decision. If you are selected, your decision will be implemented and you will be paid a bonus of up to €50.

You have the opportunity to split €50 between yourself and the charitable foundation „Nacionalinis neliečiamojo miško paramos fondas". The mission of this fund is to contribute to the preservation and expansion of forests.

Tree planting and forest nurturing helps reduce CO_2 in the atmosphere. One adult tree absorbs approximately 22 kg of CO_2 per year — the amount emitted by an average car driving approximately 200 km.

After the experiment, 5 participants will be randomly selected whose decisions will be implemented. Choose the amount (in euros) by moving the slider below.

How much of the €50 would you like to donate to „Nacionalinis neliečiamojo miško paramos fondas"? Move the slider.

Slider: 0 – 50 euros

Attention Check 2

This is an attention check. When asked to select a colour, please select 'Yellow'. Based on the text you just read, what colour were you asked to select?

- □ Red
- □ White
- □ Blue
- □ Orange
- □ Yellow

Carbon Tax Support

We will now ask you three questions about the implementation of a CO_2 tax in Lithuania. A CO_2 tax would tax GHGs emitted from burning fossil fuels (oil, gas, coal). Aggregated anonymous information on your expressed opinion will be presented to representatives of the Lithuanian Ministry of Environment.

Do you support the implementation of a CO_2 tax in Lithuania, if the revenues were distributed to the poorest households and those who have no alternatives to fossil fuel use?

Scale: 1 (Strongly oppose) – 5 (Strongly support)

Do you support the implementation of a CO_2 tax in Lithuania, if the revenues were allocated to environmental protection?

Scale: 1 (Strongly oppose) – 5 (Strongly support)

Do you support the implementation of a CO_2 tax in Lithuania, if the revenues were allocated to strengthening national defence?

Scale: 1 (Strongly oppose) – 5 (Strongly support)

Behavioural Change Intentions

How likely are you to take the following actions in the next year to contribute to reducing GHG emissions?

Scale: 1 (Very unlikely) – 5 (Very likely); I do not engage in this activity

– Reduce pork consumption

– Reduce poultry consumption

– Fly less

– Drive less

– Reduce electricity consumption

F. Demographics & Current Habits

Political Views

Which political party would you vote for in parliamentary elections if they were held next week?

□ Lithuanian Social Democratic Party

□ Lithuanian Peasants and Greens Union

□ Democratic Union 'For Lithuania'

□ Political party 'Dawn of Nemunas'

□ Homeland Union – Lithuanian Christian Democrats

□ Liberal Movement

□ Freedom Party

□ Lithuanian Polish Electoral Action – Christian Families Alliance

□ Other

□ I would not vote

□ I prefer not to answer

Demographics

What is your nationality?

□ Lithuanian

□ Polish

□ Russian

□ Other

What is the highest level of education you have attained?

□ Incomplete secondary education

□ Secondary education

□ Vocational education

□ Higher education – Bachelor's degree

□ Higher education – Master's or doctoral degree

What is your monthly net income (after taxes)?

□ Up to €500

□ €501–€1,000

□ €1,001–€1,500

□ €1,501–€2,000

□ €2,001–€2,500

□ More than €2,500

What is your employment status?

□ Working full-time

□ Working part-time

□ Starting work within the next month

□ Currently unemployed but looking for work

□ Not working because studying

□ Not working and not planning to (e.g. retirement, disability)

□ Other

Car Ownership

If you own a car, please indicate what fuel it mainly runs on. If you own more than one car, answer about the one you use most.

□ Petrol

□ Diesel

□ Electric

□ Other fuel

□ I do not own a car

Current Habits

Please answer these questions so we can better understand your habits related to food and travel.

How often do you eat chicken?

□ Never

□ Less than once a week

□ 1–2 times a week

□ 3–5 times a week

□ Every day or almost every day

How often do you eat pork?

□ Never

□ Less than once a week

□ 1–2 times a week

□ 3–5 times a week

□ Every day or almost every day

How many times per year do you fly?

□ Never

□ 1–2 times

□ 3–5 times

□ 6–10 times

□ More than 10 times

How often do you travel by car (as a driver or passenger)?

□ Never

□ Less than once a week

□ 1–2 times a week

□ 3–5 times a week

□ Every day or almost every day

G. Post-Experiment Questions

Was the information provided earlier understandable to you?

□ Yes

□ No

Do you think the information provided earlier is credible?

□ Yes

□ No

End of Survey

Thank you for participating in the study! If you are lucky and win a bonus, it will be awarded to you as Norstat coins. The selection of winners and the awarding of bonuses may take up to 1 month.

Click ‘Next’ to save your answers. If you have questions about this study or bonus payments, you can contact the researchers at laura.galdikiene@evaf.vu.lt.

Do you have any comments about this experiment? Leave them below (up to 500 characters).