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Exploring climate nudge attitudes—the significance of perceived climate change knowledge, science trust, and media trust

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Attitudes toward specific nudges have been extensively studied, but there is a lack of research on attitudes toward climate nudging in a broader sense. This study investigates public attitudes toward climate nudging, utilising Climate Nudge-survey data from 2022 with 2169 respondents in Finland. A novel question set was used to capture attitudes from different perspectives on climate nudging. Employing varimax-rotated factor analysis, two key factors emerged. One was related to collective gains in supporting climate nudging over individual gains, and the other factor was related to perceived advantageousness of climate nudging. Through ordinary least squares (OLS) regression, we explored how these factors associate with perceived knowledge about climate change and trust in science, traditional media, and social media. Positive associations were found between trust in science and traditional media with both factors. However, trust in social media associated slightly negatively with prioritising collective gains. Although perceived climate change knowledge lacked a direct association with both factors, interaction effects revealed that among those with much perceived climate change knowledge, higher trust in science associated with higher scores in both factors. Conversely, high perceived climate knowledge combined with low trust in science was associated with lower scores in both factors. In summary, this study emphasises the pivotal role of public trust in science and traditional media regarding climate nudges' attitudes and prioritising of collective and individual benefits of climate nudging.

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Introduction

The concept of nudge has gained popularity since its breakthrough to a wider audience in 2008. Nudge, originally developed in behavioural economics, refers to a subtle push or encouragement that directs individuals to make choices in their daily lives that are beneficial to themselves or society. Nudging people towards better choices relies on the idea of ‘choice-architecture’, an approach where the environments are designed to influence desirable behaviour and outcome (Thaler & Sunstein, 2021). For example, encouraging people to consume more vegetables in a canteen by placing salads and other greens before other foods represents an example of influencing the choice-architecture.

The benefits of nudges have also been explored and applied in the context of environmental protection and climate action. For instance, previous research has examined the concept of green nudges. Carlsson et al. (2021) highlight that green nudges differ from self-focused nudges in that they are specifically designed to address environmental externalities rather than individual behaviour. Consequently, they serve as a complementary tool to enhance the effectiveness of policies like carbon tax (Carlsson et al., 2021).

In Finland, examples of green nudges include an app designed to help consumers make more sustainable clothing choices by providing additional information (Haque et al., 2024). Additionally, bike repair stations and parking facilities have been installed near a Finnish university campus to encourage cycling (UNEP, 2020).

In this study, we focus on a sub-category of green nudges, namely climate nudges. Climate nudges can be defined as “intentional modification of the choice architecture that aims to alter citizen behaviour towards climate-friendly actions while maintaining their earlier alternatives” (Siipi and Koi, 2022).

With increasing knowledge and understanding of the urgency of climate actions, climate nudges can be seen as an instrument to increase public support towards climate measures and shifting attitudes on environmentally friendly, everyday choices. For example, when energy companies offered green energy as a default option in Germany, it significantly increased the share of green energy agreements (Ebeling and Lotz, 2015). However, as Thaler and Sunstein (2021) point out, effective climate change mitigation needs several types of policies and nudges are only a part of its toolkit.

To effectively use nudges for climate change mitigation, it is essential to understand public opinion on climate nudges. Public opinion is also a key factor in ensuring that nudges are ethical (Lades and Delaney, 2022). However, with limited studies focusing on public attitudes towards climate nudging, there is a need for more in-depth knowledge in this area. This paper contributes to the research by providing a more comprehensive account of how climate nudging is perceived. We especially aim to explore whether citizens prioritise collective or individual interests when assessing the acceptability of climate nudges, which, to our knowledge, has not been assessed previously.

Another important aspect related to climate change mitigation is global solidarity. Climate change is a global issue, with greenhouse gases crossing borders, making it a global collective problem (e.g., Jagers et al., 2020). Here we address this topic by exploring whether respondents prioritise collective or individual benefits in the context of climate nudging, which provides us with a more profound understanding of the dynamics of public attitudes toward climate change mitigation. We examine attitudes toward climate nudging within the Finnish context, focusing on two key questions: how favourably people view nudges in general and whether global solidarity plays a role in attitudes toward nudges. Global solidarity may shape attitudes toward climate

nudges, as previous studies have shown that a stronger global identity is associated with perceiving climate change as more relevant and with greater engagement in climate protection efforts (e.g., Loy et al., 2022).

The Finnish societal context is particularly noteworthy due to its high levels of trust and the Nordic welfare state model, which is founded on the principle of universal welfare services. Additionally, Finland’s relatively high trust in science—both compared to other countries (Eichengreen et al., 2021) and in relation to other domestic institutions (Science Barometer, 2019)—makes it an interesting setting for this study.

Previous studies have found that trust towards different institutions is significantly associated with climate change-related attitudes. For example, trust in media (e.g., Fortner et al., 2000) and science (e.g., Meijers et al., 2023) have been associated with climate-friendly attitudes.

This study examines attitudes toward climate nudging by analysing data from a nationally representative survey conducted in Finland during the summer of 2022 ($n = 2169$). The survey included a set of nine questions specifically addressing different aspects of climate nudging. In the empirical section, we initially examine responses to these questions using factor analysis. Our analysis focuses on how trust in science, traditional media, social media, and perceived knowledge about climate change correlate with public attitudes toward climate nudging. Finally, we discuss the wider significance of our findings. Our first and second research question concern attitudes towards climate nudging:

RQ1: What do individual climate nudge questions reveal about citizens’ attitudes toward climate nudges in Finland?

RQ2: What insights does a descriptive factor analysis of the climate nudge-question set provide about citizens’ attitudes toward nudging in Finland?

Citizens’ nudge attitudes

Since the concept of nudging gained prominence in 2008, numerous studies have explored public attitudes toward it (e.g., Sunstein et al., 2018; Sunstein & Reisch, 2018; Almqvist and Andersson, 2021). Overall, people’s attitudes toward nudging tend to be relatively positive. Cross-country comparisons suggest that a majority of people in most countries approve of nudges (Sunstein et al., 2018). Factors associated with support for nudges include higher trust in institutions, being female, younger age, and a more liberal ideology (Sunstein & Reisch, 2018; Sunstein et al., 2019).

When it comes to attitudes regarding green nudging, a study in Poland found that younger age was linked with more favorable attitudes towards these environmental measures. (Miłaszewicz, 2022). Similarly, a Swedish study found that support for expert governance over parliament and government, along with support for green and left-leaning parties, predicted favourable attitudes toward nudging (Almqvist and Andersson, 2021).

Support for nudges is not only related to socio-demographic and ideological factors but also by how the nudges are framed. For instance, Grelle et al. (2024) found in a study conducted in Germany that green nudges received less support when framed as generally applicable to people, compared to when they were framed as personally relevant to the respondent. They also observed that nudges gained greater acceptance when the promoted behaviour was perceived as requiring low effort (Grelle et al., 2024).

Although there are some studies regarding green nudge attitudes (e.g., Grelle et al., 2024; Miłaszewicz, 2022), attitudes towards climate nudges have been researched significantly less. The acceptability of climate nudging may depend on the specific

context in which they are used and the goals they aim to achieve (for example, personal gain versus more collective gain).

Climate change attitudes and global identity and solidarity. Since climate change has global effects and greenhouse gases do not follow any borders, climate change can be characterised as the epitome of a global collective problem (see, Jagers et al., 2020). Thus, it may not be very surprising that people who identify as global citizens evaluate consequences of climate change as being more serious (Running, 2013), and are more supportive towards climate policies (Loy & Reese, 2019).

Global solidarity refers to the idea that individuals and nations have a shared responsibility to address global challenges such as poverty, climate change, and conflicts. This involves recognising the interconnectedness of people and nations around the world and working together to promote mutual benefit and common goals. Global solidarity can manifest in various forms, such as through international aid and development programmes, multi-lateral agreements, or grassroots activism (Archibugi, 2008).

Climate justice is a term that has gained growing attention in recent years. The Mary Robynson Foundation (2022) defines climate justice as follows: “Climate justice links human rights and development to achieve a human-centred approach, safeguarding the rights of the most vulnerable people and sharing the burdens and benefits of climate change and its impacts equitably and fairly”. Climate justice is closely related to the issue of equity between the Global North and Global South. Developed, wealthier countries (typically located in the Global North) have historically contributed the most to cumulative greenhouse gas emissions, while countries in the Global South often have fewer resources to cope with the consequences, which are frequently the most severe in those regions (Paterson, 2021).

Science and media trust and climate change attitudes and knowledge. Luhmann (1988) defines trust as an essential attitude for decision-making in the face of risks, distinguishing it from the broader concept of macro-level confidence. Confidence, according to Luhmann, refers to situations where individuals act based on preconceived assumptions without actively considering alternatives. In contrast, trust involves a deliberate choice among various options, requiring individuals to accept a certain level of risk. Trust can only exist in circumstances where the potential for unfavourable outcomes might outweigh the benefits of successful trust (Luhmann, 1988).

Trust can be understood as the expectation, whether between individuals or toward institutions, that the involved parties will adhere to agreed-upon norms or behave as desired (Paxton, 1999). De Filippi et al. (2020) describe institutional trust as a sustained belief in an institution’s alignment with the trustor’s interests, even without a complete understanding of its internal mechanisms.

The need for trust becomes especially critical in situations fraught with risk (Luhmann, 1988; Thomas, 2017). For instance, climate-related initiatives may be perceived as risky by certain segments of the population, potentially leading to higher costs or, in the context of climate nudging, being viewed as manipulative.

While access to information is crucial in shaping environmental attitudes, the effect of this influence is moderated by the level of trust individuals have in both the scientific community and the sources delivering the messages (Diamond et al., 2020). Although social media is increasingly becoming the primary news source in many countries, traditional media in Finland has maintained its strong position in information distribution, with particularly high levels of public trust. According to the Reuters Institute’s 2022 report, 69% of Finns trust the media, and political

polarisation concerning media trust is notably low (Newman et al., 2022). However, communication related to climate change is polarised on Finnish social media (Savolainen & Ylä-Anttila, 2021), and preferences regarding climate change mitigation are strongly aligned with attitudes regarding certain other policy issues, such as immigration (Chen et al., 2021).

In international comparisons, trust in science is relatively high in Finland (Eichengreen et al., 2021). Within the country, trust in science as an institution is notably higher than trust in other institutions (Science Barometer, 2019). Several studies from different countries have found a connection between public mistrust in science and climate change denialism (e.g., Clulow and Reiner, 2024; Huber et al., 2022). For instance, Meijers et al. (2023) used Dutch population data to show that mistrust in science is associated with lower support for climate policy, and that populist attitudes sceptical of climate change and climate policies are mediated by mistrust in science and other institutions. Similarly, Meijers and Bugden (2022) found that in the U.S., mistrust in science better explains the gap between Democratic and Republican voters’ attitudes toward climate policy than climate change denialism. Another U.S.-based study found that trust in science mediates the effect of news media consumption on perceptions of climate change (Hmielowski et al., 2014). Additionally, evidence suggests that trust in media is associated with more climate-friendly attitudes among students in Ohio, USA (Fortner et al., 2000), and at the University of the South Pacific, Fiji (Scott-Parker et al., 2017).

Malka et al. (2009) found that in the U.S., greater climate change knowledge increased climate concern among Democrats, independents, and those who trust scientists. However, Republicans and science sceptics consistently showed low concern about climate change, regardless of their level of knowledge (Malka et al., 2009).

When considering citizens’ knowledge about climate change, it is important to distinguish between perceived and assessed knowledge. Perceived knowledge refers to how informed an individual believes they are about climate change, while assessed knowledge refers to their actual understanding of the issue. These two types of knowledge often differ significantly (Stoutenborough & Vedlitz, 2014). According to Stoutenborough and Vedlitz (2014), those with higher perceived knowledge tend to report less concern about climate change, while those with higher assessed knowledge tend to express greater concern.

To effectively use nudges for climate change mitigation, it is crucial to understand public opinion on climate nudging. However, few studies have focused on this area, indicating a need for more research on attitudes toward climate nudging and especially how they interact with a level of perceived climate change knowledge and trust. Based on the discussion above, our third research question is:

RQ3: How are trust in science, traditional media, social media, and perceived knowledge about climate change associated with public attitudes toward the identified climate nudge factors?

Data and methods

The Climate Nudge-survey data was collected in Finland between May and August 2022 ($N = 10,000$, $n = 2169$, with a response rate of 22%). The data represents Finns aged 20 and older. To ensure a demographically representative sample, participants were randomly selected from the Finnish population register. The questionnaire was available in both paper and online formats for Finnish and Swedish-speaking respondents, while the English version was only available online. No financial incentives were offered to recruit participants.

When comparing the survey data with population-level demographic data, we find that the gender distribution closely mirrors the general population: women are slightly over-represented, comprising 51.53% of the sample compared to 50.51% of the population (Statistics Finland, 2024). However, shows that the data is somewhat underrepresented among younger age groups and overrepresented among older age groups (Table A1). Particularly overrepresented are those aged 65–79 (for both genders) and men aged 80 and older. A more detailed comparison of the sample and population demographics is provided in Table A1. To address these discrepancies, we apply weighting to correct for gender and age biases in our results.

Variables. In the invitation letter for the survey, nudging is defined as follows: “A nudge is a method based on behavioural sciences that can be used to steer people towards doing certain things without limiting their freedom of choice. In this project, we talk about climate nudges which aim to promote choices that are better for the climate. This survey is used to collect information on Finnish people’s attitudes towards nudging, climate change, and freedom of choice.” The introduction of the set of questions about nudges was as follows: “Nudging encourages and steers people to make better choices. Consequently, climate nudges aim to encourage actions that are beneficial for the climate, such as cycling to work or promoting carbon sinks. What is your opinion about these types of actions?” (scale 1–10). The scale was presented horizontally on the questionnaire, and the respondents circled or ticked the option they chose.

The questions were partly customised from a study by Sunstein et al. (2018), partially driven by our own interests. The rationale behind the nudge questions was to enquire how generally acceptable respondents consider climate nudges, and whether the respondents put more emphasis on their own benefit or the benefit to the wider collective. Descriptive statistics of the nudge questions can be seen in Table A2. To allow more intuitive interpretations (that positive attitudes towards nudging are at the top of the scale in each question), the scales of questions 1, 7, 8, and 9 are reversed from the questionnaire. The questions were as follows:

1. 1 = I think nudging is manipulation that restricts people’s freedom of choice – 10 = Nudging makes sense because it gives people a freedom of choice
2. 1 = Nudging is OK when it also benefits the person who is nudged – 10 = When the goal is important enough it does not matter if I do not benefit myself
3. 1 = Nudging is OK when it benefits Finland and Finnish people – 10 = When the goal is important enough, it does not matter if the benefits go to other people
4. 1 = Nudging is OK when it benefits Europe – 10 = When the goal is sufficiently important it is enough that the entire globe benefits
5. 1 = Nudging is an inefficient way of mitigating climate change – 10 = Nudging is an efficient way of mitigating climate
6. 1 = Nudging must lead to personal benefit – 10 = Climate nudging is a must because it benefits everyone
7. 1 = Those living in Finland already receive enough steering for making climate-friendly everyday choices – 10 = More climate actions based on nudging should be taken in Finland
8. 1 = The impacts of nudging should mainly benefit Finland and its neighbouring areas, as the climate is also changing here – 10 = Climate change is most visible in the so-called global south, which is why nudging should also mainly have an impact there

9. 1 = Finland has so little international importance that others should be responsible for promoting climate nudges – 10 = Finland should take on a leading role internationally in promoting climate nudges

In the questionnaire, trust in Finnish society’s institutions was measured with the question “To what extent do you trust the following?: 1 = “I do not trust at all” – 10 = “I trust very much”.

- Parliament
- Finnish government
- political parties
- universities and research institutes in general
- traditional news media (newspapers, television, radio)
- social media (posts, blogs, groups, discussions)

Political trust was measured by creating a sum variable that combined trust in three institutions: “Parliament”, “Finnish government”, and “political parties”. To ensure consistency in our analysis, we transformed the political trust scale from 3–30 to 1–10. The other two trust-related variables were based on one question only (either traditional or social media).

To enquire about self-perceived knowledge level of climate change, the following question was asked: How much do you know about climate change? (1) “I know very well what climate change is about”, (2) “I know reasonably well what climate change is”, (3) “I know roughly what climate change is about”, (4) “I have little knowledge of what climate change is about”, and (5) “I do not know what climate change is about”. To ensure that there are enough observations in each category, categories 4 and 5 were combined, and to allow more intuitive interpretation, the scale was reversed.

Gender was also self-reported in our survey, with options including “Woman”, “Man”, “Other”, and “I do not want to tell.” Due to low numbers in the two latter options, we only analysed data from the “Woman” and “Man” categories. Participants were also asked to rate their current financial situation, with response options of “Very good”, “Quite good”, “Moderate”, “Quite poor”, and “Very poor.” To ensure that we have enough observations in each category, we combined the “Quite poor” and “Very poor” categories into a single “Poor” category.

To assess political preferences, we asked participants which political party they would vote for if parliamentary elections were held at the time of the survey. Response options included all parties represented in parliament, and we grouped the smallest parties (Swedish People’s Party of Finland, Christian Democrats of Finland, and Movement Now) into an “Other” category for analytical purposes. In the context of Finnish politics, the Left Alliance is a left-of-centre party, while the Social Democrats represent the centre-left. The Green League is a green-centre-left party, the Centre Party is focused on rural issues and centrist politics, and the National Coalition Party is a centre-right party (Saarinen et al., 2018). The Finns Party can be characterised as a populist-right party. Political party is a relevant variable when examining climate nudge attitudes, since people often take cues from parties that they support, and parties may affect the supporter’s identities as well as opinions (Linde, 2017).

Participants’ education level was also derived from the questionnaire, with response options of “Comprehensive school”, “Vocational school or intermediate vocational training”, “High school degree”, “Lower university degree”, “Higher university degree”, or “Doctoral or licentiate degree.” For analysis, we categorised education responses into four categories: “Primary”, “Secondary”, “Bachelor”, and “Higher”. Age was determined by birth year, with participants ranging in age from 20 to 96 years old. We categorised age into five groups: 20–34, 35–49, 50–64,

65–79, and 80 or more years old. Descriptive statistics for all variables used in our analysis can be found in Table A3.

Methods. In this study, we conducted an exploratory factor analysis using varimax rotation to identify the latent constructs that underlie the observed variables. We extracted factors with an eigenvalue greater than 1 and applied varimax rotation. We examined the factor loadings of the variables on each factor to interpret the meaning of the underlying constructs. Based on the factors found, we created sum variables and conducted an OLS regression for both of them. We use robust standard errors since our data is neither hierarchical nor panel data. Furthermore, we carried out interaction effects analysis on the effects of perceived climate change knowledge and science trust on the climate nudge attitudes (measured with the factors in question). Analyses were conducted using Stata version 17.

The methodological choices in this study are suited to its objectives: The use of exploratory factor analysis with varimax rotation effectively uncovers latent constructs underlying the nine nudge-related questions. OLS regression is an appropriate method for analysing the relationships between independent variables and the dependent (sum) variables, as they are treated as continuous measures. Additionally, the analysis of interaction effects provides valuable insights into how perceived climate knowledge and trust in science interact to shape these attitudes.

Results

First, we examine specific individual questions related to climate nudge attitudes (Table A2). Respondents expressed the clearest opinions on question 1, which asked whether they view climate nudging as manipulative or sensible. The majority leaned towards finding it sensible (on a scale of 1–10, mean = 7.22). Another question where respondents showed a relatively clear attitude was question 6: on average, Finns indicated that they prioritise collective benefits over individual ones when evaluating climate nudges (mean = 7.02).

However, respondents had less clear opinions on question 3, in which it was asked whether nudging is acceptable when it benefits Finland versus when the goal is important enough that it doesn't matter who the beneficiaries are (mean = 5.84). Despite ongoing debates about the effectiveness of nudges (e.g., Mertens et al., 2022; Maier et al., 2022), responses to question 5 indicate that Finns generally perceive climate nudges as somewhat effective rather than ineffective measure in terms of climate change mitigation (mean = 6.26).

We conducted an exploratory factor analysis with varimax rotation to identify the underlying constructs influencing the observed variables. Based on the eigenvalue criterion, two factors were determined to be optimal for the nine questions (as two

factors had eigenvalues exceeding 1). Table 1 presents the rotated factor loadings for these variables.

Table 1 shows that while most variables clearly loaded onto either factor 1 or factor 2, question 8 (regarding who should benefit from nudging) did not load onto any factor. While factor 1 relates to global solidarity aspect of climate nudges, factor 2 characterises how advantageous climate nudges are perceived in general. Factor 1 is labelled 'global solidarity' and factor 2 is labelled 'advantageousness of nudging'.

Creating variables based on factor loadings can be problematic due to the issue of indeterminacy; this refers to the difficulty in determining the exact influence of individual factors on observed data, as overlapping effects among factors can obscure precise calculation of factor scores (Grice, 2001). To address this, we created sum variables (e.g., Vuorenlinna et al., 2023; Bengtsson and Wass, 2010) by summing the values of the variables associated with factors 1 and 2. Both sum variables were constructed from four variables each, with scales ranging from 4 to 40 (more details are provided in Table A3).

After creating these sum variables, which we labelled "global solidarity" and "advantageousness of nudging", we conducted two linear regression analyses to identify the factors associated with attitudes toward these variables. The "advantageousness of nudging" variable has a Cronbach's alpha value of 0.827, and the "global solidarity" variable has a value of 0.844, both indicating a good level of internal consistency.

The OLS regression results in Table 2 illustrate how independent and control variables are associated with attitudes toward the "advantageousness of nudging." Trust in science, traditional media, and political institutions were all linked with more favourable attitudes toward climate nudging. However, perceived knowledge about climate change and trust in social media did not show a significant association with this variable in a model that included the other trust variables.

Compared to voters of the National Coalition Party, voters of the Green League and the Left Alliance are more supportive of climate nudging, while voters of the Finns Party are less supportive (Table 2). Individuals with a university degree tend to favour climate nudging more than those whose highest level of education is comprehensive school. Although the assessment of one's financial situation did not significantly impact attitudes toward climate nudging, gender did: women are more supportive of climate nudging than men. Additionally, younger respondents (ages 20–34) are more favourable toward climate nudging compared to those aged 80 and older.

Table 3 presents results of the OLS regression on how the independent and the control variables are associated with the global solidarity-factor. Trust in science, traditional media and political institutions were associated with enhancing global solidarity, but trust in social media associated with negatively on this

Table 1 Rotated factor loadings. Factor loadings over 0.50 (strong associations) are bolded.

	Factor 1	Factor 2	Uniqueness
1 Nudging = manipulation vs. Nudging = sensible	0.002	0.747	0.442
2 Self-benefit vs. global importance in nudging	0.779	0.008	0.389
3 Benefit Finland vs. Benefit other people	0.814	–0.046	0.361
4 Benefit Europe vs. Global benefit	0.820	–0.046	0.350
5 Ineffective vs. effective for climate change mitigation	–0.110	0.712	0.534
6 Personal benefit vs. Collective benefit	0.586	0.218	0.524
7 Need more nudging vs. Enough nudging in Finland	–0.023	0.770	0.418
8. Benefit Finland vs. Focus on global south	–0.106	0.052	0.990
9 Finland lacks influence vs. Finland should lead in nudging	0.097	0.704	0.450

Values that are larger than 0.5 are bolded.

Table 2 OLS regression about advantageousness of nudging-attitudes.

	Coef.	SE	p-Value
<i>Climate change knowledge (ref. No or little)</i>			
Moderate	-0.811	1.270	0.523
Quite much	-0.515	1.277	0.687
Much	-0.107	1.387	0.938
Science trust	0.814	0.160	0.000
Traditional media trust	0.465	0.139	0.001
Social media trust	-0.113	0.107	0.293
Political trust	0.487	0.159	0.002
<i>Party preference (ref. National Coalition Party)</i>			
Social Democrats	0.917	0.560	0.102
Finns Party	-4.938	0.920	0.000
Centre Party	0.986	0.662	0.137
Green League	4.898	0.606	0.000
Left Alliance	4.258	0.754	0.000
<i>Education (ref. comprehensive school)</i>			
Secondary	1.336	0.700	0.056
Bachelor	1.364	0.755	0.071
Higher	2.380	0.782	0.002
<i>Assessment of financial situation (ref. moderate)</i>			
Poor	0.679	0.752	0.367
Quite good	0.542	0.439	0.217
Very good	0.111	0.617	0.858
Gender (ref. female)	-1.995	0.390	0.000
<i>Age group (ref. 80+)</i>			
20-34	2.345	0.988	0.018
35-49	1.315	0.969	0.175
50-64	1.713	0.938	0.068
65-79	1.629	0.901	0.071
Cons.	11.008	1.886	0.000

R² = 0.39.

Table 3 OLS regression of individual benefit of nudges versus collective benefit composite variable.

	Coef.	SE	p-Value
<i>Climate change knowledge (ref. No or little)</i>			
Moderate	-1.298	1.241	0.296
Quite much	-0.927	1.241	0.455
Much	-0.558	1.563	0.676
Science trust	0.606	0.145	0.000
Traditional media trust	0.551	0.142	0.000
Social media trust	-0.254	0.114	0.026
Political trust	0.515	0.166	0.002
<i>Party preference (ref. National Coalition Party)</i>			
Social Democrats	2.079	0.629	0.001
Finns Party	-1.388	0.832	0.096
Centre Party	-0.146	0.762	0.848
Green League	4.868	0.822	0.000
Left Alliance	5.796	0.932	0.000
<i>Education (ref. comprehensive school)</i>			
Secondary	-1.409	0.699	0.044
Bachelor	-0.614	0.771	0.426
Higher	0.135	0.819	0.869
<i>Assessment of financial situation (ref. moderate)</i>			
Poor	-0.884	0.778	0.256
Quite good	-0.078	0.492	0.874
Very good	1.811	0.685	0.008
Gender (ref. female)	-0.939	0.425	0.027
<i>Age group (ref. 80+)</i>			
20-34	-0.931	1.011	0.357
35-49	-1.201	0.987	0.224
50-64	-0.430	0.956	0.653
65-79	-0.553	0.925	0.550
Cons.	17.060	1.816	0.000

R² = 0.22.

factor, suggesting a preference for more local gains from climate nudging. Perceived climate change knowledge did not exhibit a statistically significant association with the dependent variable. When the National Coalition Party was the reference group, Left Alliance, Green League, and Social Democrats voters got higher points in the global solidarity scale on average.

Those with secondary-level education got on average slightly fewer points on the global solidarity scale than those with a comprehensive school education (Table 3). Those who assessed their economic situation as very good got higher points than those who assessed it as moderate. Women on average got averagely higher points than men, while age group did not have a significant association with the dependent variable.

To further explore the associations, we conduct an interaction analysis to examine how knowledge, trust in science, and attitudes on climate nudging are interconnected. Figure 1 illustrates the interaction effects of perceived climate change knowledge and trust in science on advantageous of climate nudging. While there is no significant difference among those with little or no climate change knowledge, respondents with at least some perceived knowledge differed depending on their level of trust in science: those with higher trust were more supportive of climate nudging.

Figure 2 presents the interaction effects of climate change knowledge and science trust on global climate solidarity attitudes. Global solidarity was higher among those who were perceived to have much knowledge about climate change and had high trust in science than those who had low science trust (and much climate change knowledge). The other levels of knowledge did not differ significantly from each other among different categories of science trust.

In summary, trust in science, traditional media, and political institutions were positively associated with both dependent sum

variables, while trust in social media showed a slight negative association with global climate solidarity. Education, political affiliation, and age were also associated with these attitudes. Additionally, the interaction effects indicated that higher perceived climate change knowledge combined with trust in science was linked to greater points in both advantageous of climate nudging and global solidarity scales. However, those with higher perceived climate change knowledge but low trust in science tended to score lower on both scales.

Conclusion

In this study, we examined how trust in science, traditional media, social media, and perceived knowledge about climate change are associated with attitudes toward climate nudging. To our knowledge, this is the first study to cover extensively climate nudge attitudes among Finns or elsewhere, which underlines the importance of this research. Additionally, our investigation into whether citizens prioritise collective or individual benefits from climate nudging offers a novel contribution to the research literature. In short, our results suggest that respondents view climate nudges as a favourable tool for mitigating climate change, and they emphasise collective benefits over individual ones in climate nudging.

The first research question (RQ1) aimed to explore what individual climate nudge questions reveal about attitudes toward climate nudging in Finland. Responses suggest that Finns generally perceive climate nudging as a sensible and pragmatic tool rather than a manipulative one. This indicates that attitudes toward climate nudging are relatively positive, at least on a general level. The result can be interpreted to align with cross-

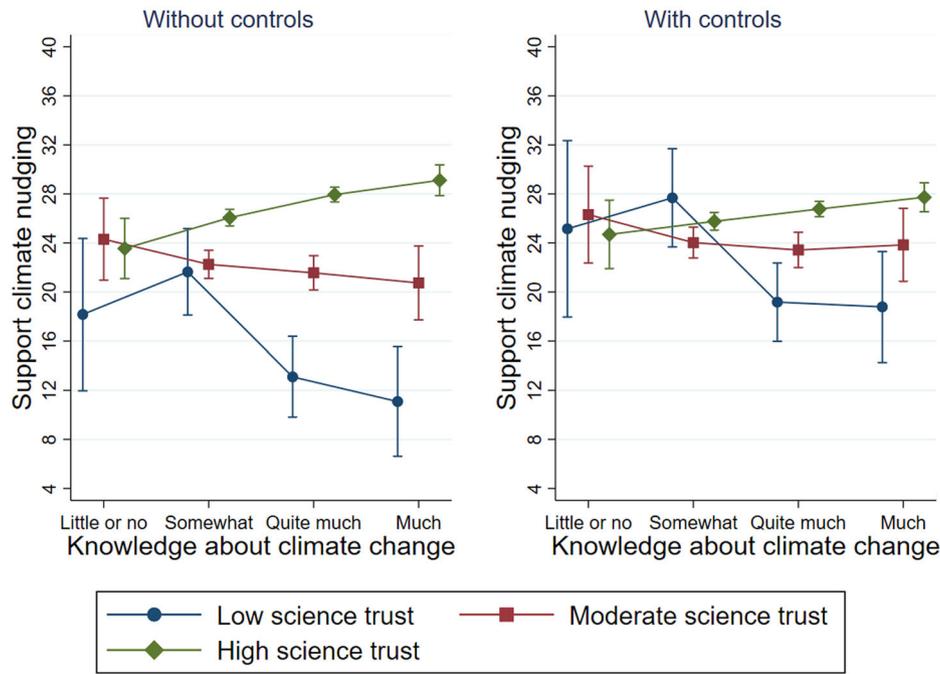


Fig. 1 Interaction effects of perceived climate change knowledge and science trust on climate nudge attitudes.

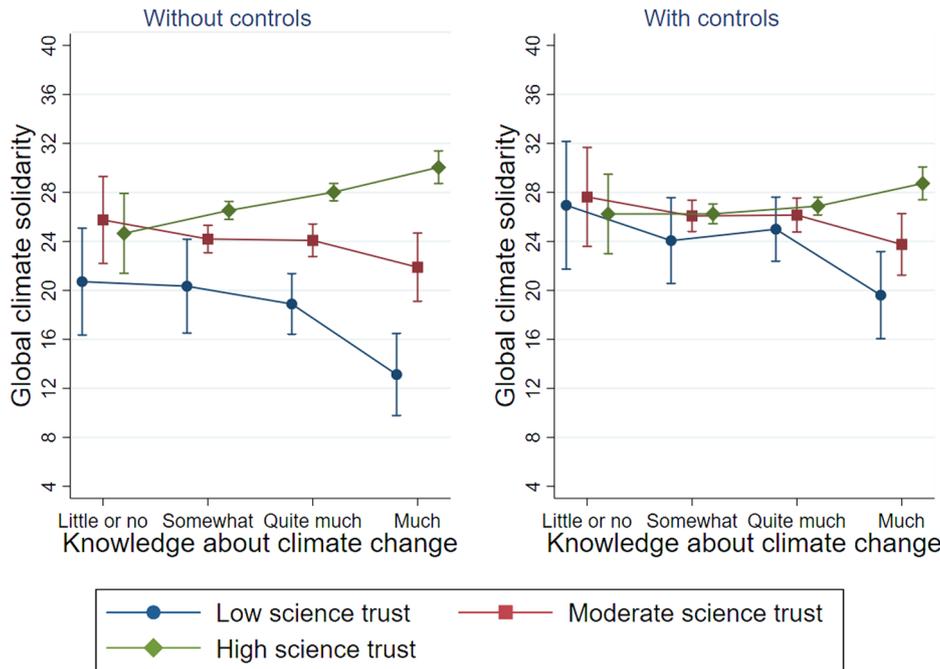


Fig. 2 Interaction effects of perceived climate change knowledge and science trust on global climate solidarity attitudes.

country studies by Sunstein et al. (2019) and Miłaszewicz (2022), which find relatively high support for green nudging.

The question of whether climate nudging should result in personal benefits or whether people should be nudged for the collective good reveals that Finns tend to favour the latter. This preference indicates a collective mindset, where broader societal or global benefits are prioritised over individual gains. Furthermore, when analysing responses to statements like “When the goal is important enough, it does not matter if I do not benefit myself” and “When the goal is sufficiently important, it is enough that the entire globe benefits,” We observe relatively high levels of

prioritisation of collective gains over individual gains. This indicates that climate change mitigation is seen as an issue of such importance that respondents do not feel the need to benefit directly from the efforts. This sentiment underscores a broader willingness among Finns to engage in or support actions that primarily benefit the collective, even at a potential personal cost.

There has been considerable debate in the literature regarding the effectiveness of nudging, with arguments both in favour of it (Mertens et al., 2022) and against it (Maier et al., 2022). While the debate continues, the Finnish public appears to lean slightly more toward viewing climate nudging as an effective tool in the fight

against climate change. However, it is important to note that mitigating climate change requires different types of climate policies, and nudges represent just a small part of this extensive framework.

First, a factor analysis—addressing our second research question (RQ2)—revealed that attitudes toward climate nudging (based on our series of questions) can be grouped into two central dimensions: whether they prioritise collective or individual-level benefits in their support for climate nudging and how advantageous respondents perceive climate nudging to be in general. The former dimension also encompasses the aspect of global climate justice or solidarity. This suggests that, although climate nudging is a relatively soft measure for climate change mitigation, it is still connected to broader issues like the collective action problems (see Jagers et al., 2020) and questions of collective, even global, solidarity.

Turning to the third research question (RQ3), both trust in science and in traditional media were associated with higher support for climate nudging and higher points on the global climate solidarity-scale. In contrast, trust in social media was associated slightly negatively with global solidarity. These findings accentuate the need to foster public trust in credible sources of information: in the context of climate change, science as a producer of reliable information and journalistic media as its mediator.

According to the interaction analysis, individuals with a good (self-evaluated) knowledge-level about climate change—coupled with a high degree of trust in the scientific community—are especially likely to endorse and support climate nudging, but they also got higher points on the global solidarity scale. Additionally, we explored the interaction between climate change knowledge and science trust on attitudes towards global solidarity. We found those with high levels of both climate change knowledge and science trust to express more global solidarity compared to those who were perceived to have extensive knowledge on climate change but did not trust science.

However, the role of social media appears to be more problematic in this context. The research indicates that trust in social media is associated with slightly lower levels of global solidarity, meaning that individuals who rely on social media for information may be less inclined to embrace collective global efforts to combat climate change. This could be attributed to the highly polarised nature of climate change discussions on social media, where misinformation, echo chambers, and conflicting viewpoints can foster confusion and scepticism. In Finland, for instance, the polarisation of climate change communication on social media platforms (Savolainen & Ylä-Anttila, 2021) may contribute to diminishing trust in climate science and undermine climate actions.

When it comes to the control variables, political party preference was especially significant. Support of green and left-wing parties, especially the left-of-centre-left party Left Alliance, was found to be associated with higher points on the global solidarity scale. This can be considered a somewhat expected finding in the sense that the left-wing parties have traditionally emphasised international solidarity as part of their ideology. Generally speaking, support for climate nudging and weighing international solidarity as sufficient conditions for climate nudging are associated with relatively similar background variables.

To our knowledge, there is no prior research on Finns' attitudes toward climate nudges. However, previous studies have examined attitudes towards measures such as carbon taxes, subsidies for renewable energy, and bans on energy-inefficient appliances. When it comes to taxation, Finns stood out from the rest of Europe with relatively positive attitudes, while their views on subsidies and bans were closer to the European average

(Davidovic and Harring, 2020). In this survey, where attitudes toward climate nudges in Finland were quite positive, it seems that Finns generally hold favourable views toward climate actions overall.

Overall, the findings of this study suggest that trust in science and traditional media are crucial factors in shaping attitudes towards climate nudging and global solidarity. These factors can potentially be leveraged to promote more support for climate policy measures, including nudging. However, the study also highlights the role of social media as a potential barrier to climate action. Given the growing influence of social media in shaping public opinion, it is important for climate advocates and policy-makers to consider ways to counteract misinformation and build trust in credible sources of information.

The results also indicate that respondents place more emphasis on collective rather than individual-level benefits. This finding could be useful in the framing of climate nudges: emphasising that nudging is not just for the individual's benefit but for the broader collective good. This insight could be combined with the study by Grelle et al. (2024), which found that green nudges framed as addressing people personally receive more support than those framed to address people collectively.

Moreover, the study underscores the ideological differences between left-wing and right-wing parties when it comes to attitudes towards global solidarity and climate change. This suggests that efforts to promote climate policy measures need to consider also political divisions to find ways to bridge ideological gaps.

As always, it is essential to recognise limitations in our study. One limitation of our study is that the alignment of scale end-points in the questions for our dependent variables may not always correspond or align conceptually, which could lead respondents to interpret the scales differently. This misalignment might have contributed to varied interpretations and affected the reliability of those responses in reflecting consistent attitudes toward climate nudging. Part of the problem may be related to the translation from Finnish to English, although there were only ten English-speaking respondents, so the impact of the translation on the results is minimal. Additionally, the formulation of questions intended for a general audience may differ slightly from how the same question would be phrased for an academic audience only.

Despite these challenges, considering how the questions clearly loaded onto different factors and the internal consistency of the responses across various factors, as demonstrated by metrics such as Cronbach's alpha, support the reliability of our findings. The consistency underscores that while some survey items could benefit from further refinement, the overall patterns of response are likely to reflect genuine phenomena. These include the perceived benefits of climate nudging both globally and locally, underscoring a sense of global solidarity and the overall efficacy of climate nudging as viewed by the Finnish public.

Other limitations of this study include the use of cross-sectional data; since attitudes can change over time, further research is needed to draw more robust conclusions. Although we attempted to control relevant variables, we cannot exclude the possibility that certain omitted variable bias exists in the analysis. One other possible problem is the risk of self-selection, i.e., only people who are really interested in the topic respond to the survey. This need to be considered carefully when one makes generalisations based on these results. Moreover, causal conclusions cannot be drawn based on our research.

From a global standpoint, Finland is a relatively unique example of a country with high levels of trust in institutions; In future studies, it would be interesting to see to what extent these findings from Finland apply in different—including low-trust—country

contexts. Furthermore, other possibly significant background variables, such as social class position, could be explored in future studies.

Data availability

The data is not currently publicly available but will be added to the Finnish Social Science Data Archive (fsd.tuni.fi).

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Author contributions

J.S.: writing, editing, and empirical analysis. V.H.: planning of data collection, writing, and editing. S.K.: planning of data collection, writing, and editing.

Competing interests

The authors declare no competing interests.

Ethical approval

Approval for the Climate Nudge-survey was obtained from the Institutional review board (IRB) of The Finnish Institute for Health and Welfare (THL) on November 16, 2021 (approval ID was THL/5836/6.02.01/2021). The scope of approval included research plan, questionnaire, cover letter, and privacy statement. The procedures used in this study adhere to the tenets of the Declaration of Helsinki. Data were gathered following the General Data Protection Regulation of the European Union.

Informed consent

The cover letter sent to participants emphasised that their involvement was voluntary, and their information would be kept confidential and anonymous, and that individual respondents cannot be identified in the results. Participants were also informed that the anonymized data will be transferred to the Finnish Social Science Data Archive. The consent was obtained from the participants when the data was collected, between May and August 2022.

Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1057/s41599-025-04783-2>.

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