

The role of national affluence, carbon emissions, and democracy in Europeans' climate perceptions

Pasi Pohjolainen^{a*}, Iida Kukkonen^b, Pekka Jokinen^a, Wouter Poortinga^{b,c}, Charles Adedayo Ogunbode^d, Gisela Böhm^{b,e,f}, Stephen Fisher^{b,g} and Resul Umit^{b,h}

^aFaculty of Management and Business, Tampere University, Tampere, Finland; ^bFaculty of Social Sciences, University of Turku, Turku, Finland; ^cSchool of Psychology / Welsh School of Architecture, Cardiff University, Cardiff, UK; ^dSchool of Psychology, University of Nottingham, Nottingham, UK.; ^eFaculty of Psychology, Department of Psychosocial Science, University of Bergen, Bergen, Norway; ^fDepartment of Psychology, Inland Norway University of Applied Sciences, Lillehammer, Norway; ^gTrinity College, University of Oxford, Oxford, UK; ^hARENA Centre for European Studies, University of Oslo, Oslo, Norway

(Received 24 November 2020; final version received 17 March 2021)

There are differences across Europe in elements of climate citizenship, including climate concern, perceived responsibility, and willingness to support and take climate action. This paper examines how individual-level climate perceptions correspond to a country's contribution to climate change and its ability to develop climate policies. Data from the European Social Survey Round 8 (23 European countries, $n = 44,387$) was used to explore how national-level factors (affluence as per capita GDP, carbon emissions as per capita CO₂ emissions, and democracy as electoral democracy index) are related to individual-level climate perceptions (climate concern, perceived climate responsibility, climate policy support, and personal climate action). The analysis shows that the studied individual-level perceptions are all linked, and that perceived climate responsibility is a factor that helps in understanding how individual-level climate views are connected. Further, national-level affluence and democracy are connected to stronger individual-level perceptions both directly and through mediating their connections. Our results suggest that achieving ambitious climate policy targets in Europe could benefit from focusing on the role of perceived climate responsibility in boosting policy support and action. Moreover, the connection between national-level (democratic and economic) factors and public climate perceptions emphasises the need to place climate policies in a wider context.

Keywords: climate citizenship; public climate perceptions; affluence; carbon emissions; electoral democracy; national context

1. Introduction

Climate change requires policy action across the entire globe due to the complex, multi-layered, and trans-boundary nature of the phenomenon (Lidskog and Elander 2010). Political attention has often been paid to the global responsibility of developed and industrialised nations, as they may be regarded both culpable of the climate crisis as well as

*Corresponding author. Email: pasi.j.pohjolainen@utu.fi

capable of dealing with it (Bernauer 2013). Firstly, from the perspective of culpability we may ask whether those who have contributed or currently contribute to climate change be also the ones who are responsible for solving it (Freeman and Strandberg 2014; Klinsky 2018) (cf. ‘polluter pays principle’). Such ‘culpability’ may be assessed by considering a country’s carbon emissions (e.g. Caney 2005; Höhne et al. 2011). Secondly, climate responsibility may be conceived of as a duty for those who are able to make a contribution to climate change mitigation now and in the future (cf. ‘ability to pay principle’). Such ‘capability’ implies capacities to deal with the issue (Comim 2008; Schlosberg 2012) and may include economic and political affordances.

Although conflating the responsibility as capability and culpability is ill-advised (Miller 2007), it is worth noting that they are not mutually exclusive. In the context of climate change, the individuals and countries who contribute to climate change the least also tend to be the least able to bear the costs of climate mitigation policies, and further, the most vulnerable with regards to climate change, and hence more reliant on others taking responsibility (Stern 2007; Fussell 2010). Globally, Europe may be considered a leading actor in setting ambitious climate targets and programmes (Helm 2014; European Commission 2020). However, establishing tangible carbon emission reductions has proven to be much more demanding, both in terms of decarbonising energy supplies and energy demand reduction through energy efficiency and curtailment measures. Furthermore, Europe is a heterogeneous region with differing socio-political traditions and resources (e.g. Arnold et al. 2016), which impedes the development and implementation of a joint climate policy agenda.

Another aspect of climate politics consists of the extent to which climate change mitigation is or should be a duty of individuals (often as consumers or citizens) (Middlemiss 2010; Cuomo 2011; Vihersalo 2017). Growing environmental and climate awareness has fostered the development of a new ideal of *climate citizenship*, in which individuals’ membership in a community and their commitment to rights, entitlements, and obligations happens in relation to the environment and particularly to climate change (Dobson 2007; Lane 2016; Nelson 2016).

Previous studies have found that differences in European citizens’ perceptions of climate change can reflect the level of ambitiousness of national climate policies (European Commission 2017; Obydenkova and Salahodjaev 2017). Such results suggest that climate citizenship does not take place in a vacuum but indeed in conjunction with societal and political structures (Anderson, Böhmelt, and Ward 2017; Drummond et al. 2018). A crucial empirical question here is how the interlinkages of public climate perceptions relate to national structures with their various culpabilities and capabilities. While it is well understood that public perceptions differ according to context, fewer studies have focused on how context moderates relationships between climate perceptions.

In this paper we study the interlinkages of Europeans’ climate perceptions and ask how they are conditioned by national contexts. We consider this an innovative approach, since combining individual and national-level factors in cross-national analysis in the European context has not been conducted extensively previously. At the individual level we look at climate change concerns and perceived climate responsibility, and how these relate to climate policy support and personal climate action. Of particular interest is how these elements are interlinked as well as connected to the national context in terms of national affluence, carbon emissions, and democracy. Our research questions are:

- (1) How are climate concern, perceived climate responsibility, climate policy support, and personal climate action linked at the individual level?
- (2) How are different national-level factors (affluence, carbon emissions, and democracy) linked to individual climate perceptions, in particular to perceived climate responsibility, climate policy support, and personal climate action?
- (3) Do national-level factors (affluence, carbon emissions, and democracy) have an effect on the potential links between the studied individual level factors (climate concern, perceived climate responsibility, climate policy support, and personal climate action)?

The paper proceeds as follows. We first discuss how climate concern, responsibility and action are linked. We then proceed to consider how national contexts may facilitate these linkages. Based on the literature reviewed, we develop a conceptual analytic model, which intertwines individual climate citizenship with national-level affordances. We then present our data and methods and proceed with empirical analyses and discussion.

2. Theoretical background

2.1. Public climate perceptions

Concern about the environment, and more specifically about climate change, has been on the rise for the past decades (Pidgeon 2012; Capstick et al. 2015; Telesiene and Gross 2015), partially linked to people's increasing understanding of climate change and its causes (Wolf and Moser 2011; Drews and van der Bergh 2016; European Commission 2017; Poortinga et al. 2019), as well as experiences with temperature anomalies and extreme weather events (Deryugina 2013; Donner and McDaniels 2013; Bergquist, Nilsson, and Schultz 2019). The more recent upswing in mass climate activism, including the Fridays for Future youth strikes and Extinction Rebellion, may also have played a role in raising public consciousness of the issue (e.g. Bowman 2020).

Yet, expressing concern for climate change is fundamentally different from assuming individual responsibility for it. Ascribing responsibility to oneself implies that one is implicated in fostering climate change, or in seeking solutions to the problem. Concern about climate change may also be expressed by people who do not wish or are not in a position to take action. Conceptually, then, climate concern is a necessary yet insufficient condition for climate responsibility.

According to well-established environmental psychological models, a sense of personal responsibility is essential for linking concerns into actions (e.g. Stern 2000; Steg and de Groot 2010; Weber 2016). Previous research also suggests that a sense of personal obligation is associated with support for climate and energy policies and personal actions (Steg and de Groot 2010; Poortinga et al. 2012; Hagen, Middal, and Pijawka 2016).

It is important to recognise that climate policies and actions are heterogeneous and range all the way from technical measures to lifestyle changes (e.g. Figge, Young, and Barkemeyer 2014). Policy measures that require more commitment and effort from citizens, for example increased taxation and limitations of private motoring in certain urban areas, are typically less favoured compared to measures that take place rather unnoticed, such as technical cost-effectiveness improvements (Drews and van der Bergh 2016; Hagen, Middal, and Pijawka 2016; Rhodes, Axsen, and Jaccard 2017; Doran et al. 2019).

Therefore, if we wish to understand the political implications of individuals' perceived climate responsibility, it is important to focus on specific policy measures and actions.

2.2. National factors and climate perceptions

For individual climate policy support and action to take place, it is important that people have access to resources or capabilities that allow them to contribute to mitigating climate change. There is also emerging evidence that context is important (e.g. Lee et al. 2015; Poortinga et al. 2019). Further, it has been shown that citizens are in many ways bound to economic, environmental, and socio-cultural national structures, which affect perceptions of environmental issues (Wolf and Moser 2011; Marquart-Pyatt 2012; Drews and van der Bergh 2016). A complex interplay of resources, responsibilities and structures can either open up or limit the spaces for climate-related responsibilities and actions, which again can potentially shape the context.

Next, we explore how three core national factors concerning national economic, environmental and socio-political wellbeing and performance – affluence, carbon emissions, and democracy are associated with climate concern, perceived climate responsibility, and both climate policy support and personal climate action.

2.2.1. Affluence

The link between economic context and environmental action has been studied widely, often based on the assumption that higher levels of national affluence (typically measured as gross domestic product per capita; GDP per capita), enhances environmental concern and action. This assumption is known as *the affluence hypothesis* (Diekmann and Franzen 1999; Inglehart 1995).

The affluence hypothesis has received mixed support in cross-national empirical comparisons. While some studies report a positive relationship between (per capita) national affluence and climate concern (Running 2013; Lo and Chow 2015; Knight 2016), others report an inverse (Sandvik 2008; Givens and Jorgenson 2011; Kim and Wolinsky-Nahmias 2014; Mostafa 2016) or non-significant (Kvaloy, Finseraas, and Listhaug 2012) relationship. Similarly, previous research has found positive (Drews and van der Bergh 2016) and negative (Kim and Wolinsky-Nahmias 2014) associations of affluence with perceived climate responsibility as well as with policy support and personal action.

These inconsistencies might be due to the heterogeneity of content and methodological approaches. Studies that focus on general climate concern generally find positive association with affluence, while this is not the case for studies that more specifically focus on concern about the (negative) consequences of climate change (Kim and Wolinsky-Nahmias 2014; Lo and Chow 2015). It has also been discussed how economic resources can boost perceived responsibility to take action on climate change, and hence make population in wealthier nations potentially more climate minded (Drews and van der Bergh 2016). On the other hand, the negative consequences of climate change may not become as visible to the public in wealthier nations as they are in poorer ones – they thus may play a smaller part in everyday life in richer countries (Kim and Wolinsky-Nahmias 2014).

2.2.2. Carbon emissions

Another well-researched national-level element associated with public environmental perceptions relates to the state of the environment. Research on the topic has typically

focused on the quality of the environment or weather anomalies. Much of this research has been based on the assumption that exposure to environmental harms triggers environmental concern. This is also known as *the degradation hypothesis* (Inglehart 1995; Dunlap and Mertig 1997). Climate vulnerability indices and local air and water quality are some of the typical indicators used in this research (e.g. Mostafa 2013; Kim and Wolinsky-Nahmias 2014). While carbon emissions have also been used as a proxy (e.g. Givens and Jorgenson 2011) for climate vulnerability, carbon emissions are not directly visible to or experienced by the public (cf. Spence et al. 2011) and are as such not a direct measure of the degradation of the environment.

Carbon emissions may instead be regarded as indicators of local energy infrastructures, as they signal dependencies on certain types of energy production strategies. Further, the links between carbon emissions and climate perceptions form an interesting analytical setting for discussing climate policies, as countries with higher (per capita) emission levels may be regarded as more responsible for tackling climate issues. Yet it is unclear whether carbon emissions are linked to public climate perceptions.

There is some empirical evidence of a positive association between national (per capita) carbon emissions and climate concern (Running 2013), although the relationship often appears weak (Sandvik 2008; Kvaloy, Finseraas, and Listhaug 2012; Lo and Chow 2015; Mostafa 2016). On the other hand, evidence from across the US suggests higher carbon emissions are connected with lower levels of support for climate mitigation policies (Zahran et al. 2006).

2.2.3. *Democracy*

The relationship between democracy and environmental perceptions has received attention over the last 20 years (e.g. Dobson 1996; Lafferty and Meadowcroft 1996; Fredriksson, Sauquet, and Wollscheid 2016; Pickering, Bäckstrand, and Schlosberg 2020). Beyond discussions on whether or not democracy is conducive to more environmentally responsible societies, a prevalent question has been what kind of democracy is most effective in solving environmental problems and what an environmental democracy could look like (e.g. Smith 2003; Dryzek and Stevenson 2011; Fischer 2018). Empirical research has predominantly looked at possible connections between levels of democracy and various indicators of environmental quality or degradation, including carbon dioxide emissions, deforestation, pollution, and soil erosion; with mixed results (Midlarsky 2001; Winslow 2005; Li and Reuveny 2006).

Overall, democratic nations appear more ambitious in their environmental policy targets (e.g. Bättig and Bernauer 2009; Burnell 2012; Obydenkova and Salahodjaev 2017; Povitkina 2018). They are also more politically open, transparent and responsive to their citizens' views, which is further linked to citizen participation and action – also in relation to environmental issues (ibid.). Open and responsive societies are more trusting, and trust in political institutions predicts support of environmental protection and regulation (Lubell, Zahran, and Vedlitz 2007; Fairbrother 2016; Fairbrother, Johansson Sevä, and Kulin 2019). As such, democratic structures can be expected to be a key factor in creating active citizenship and socio-cultural space where ambitious climate policies can emerge.

There is some evidence that on the individual level democratic values are connected to environmental concern (e.g. McCright, Dunlap, and Marquart-Pyatt 2016; Lewis, Palm, and Feng 2019). However, less is known about how public perceptions are coupled with the democracy levels of nations. As an exception, Marquart-Pyatt (2012) looked at

contextual influences on environmental concerns and found democracy enhances the effects of education on environmental awareness and efficacy, but not on willingness to pay for environmental protection. As for the relationship between democracy and climate change perceptions, few studies exist. However, one study suggests democratic institutions and structures are important for translating public climate perceptions into policy (Tjernström and Tietenberg 2008).

2.3. *Research hypothesis*

Based on the reviewed literature, this paper aims to develop a new perspective on how the individual-level climate perceptions (climate concern, perceived responsibility, climate policy support, and personal climate action) are linked to the national-level contextual factors (affluence (per capita GDP), carbon emissions (per capita CO₂) and democracy (electoral democracy index)) (see Figure 1).

At the individual level, we conceptualise concern for the climate to have a social impact when people feel personally responsible to reduce climate change, being also linked to directly contributing to the problem or supporting climate policy acts.

At the national level, we first expect to see a positive effect of national-level affluence in our analyses, as we are focusing on general level climate concern, perceived climate responsibility, climate policy support and personal climate action, and not on concerns about the negative consequences of climate change.

Second, we expect national carbon emissions to be less relevant to public climate perceptions than national affluence. We acknowledge high carbon emissions are linked to fossil energy infrastructures, which may create a feeling of a certain path dependency and consecutive helplessness or unwillingness to question and tackle the status quo. On the other hand, very low national carbon emissions could engender a feeling that one is not implicated in climate change at all.

Third, we expect higher levels of climate concern, perceived climate responsibility, and support for climate policies and action in more democratic nations. Though studies that look at how democracy is connected to public climate views are mostly lacking, based on the notion that democracy is typically coupled with stronger environmental governance and performance nationally, citizens' views could be expected to be in line with this.

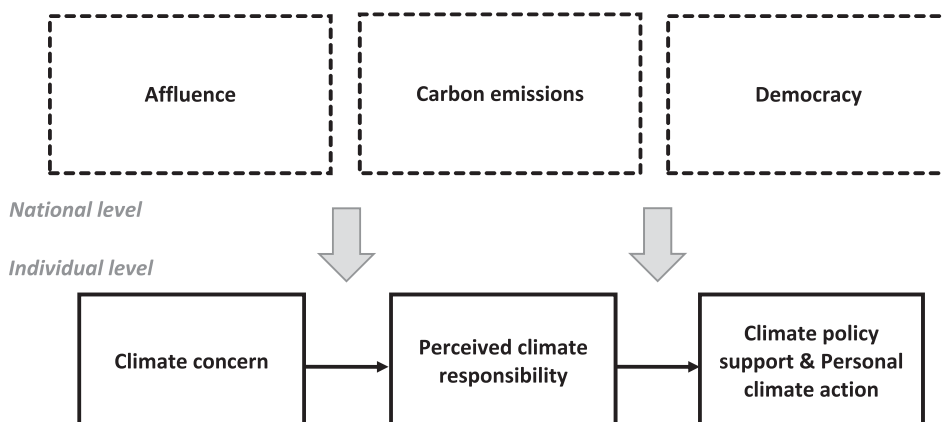


Figure 1. Conceptual analytic model.

Fourth, and following the previous hypothesis, we expect all the national level factors to have an effect on the translation of climate concern and perceived responsibility into the endorsement of climate policies and actions.

3. Data and methods

3.1. The European Social Survey

This paper uses data from Round 8 of the European Social Survey (ESS8), which featured a dedicated module on public attitudes to climate change and energy (European Social Survey 2016). The ESS has been conducted every other year from 2001 onwards, and each time consists of a core section on a number of substantive issues alongside a range of demographic variables and two rotating modules on issues of interest to the social sciences. Data for ESS8 were collected in 2016 and 2017, and included 23 European countries, mostly from the EU/EFTA area (Austria, Belgium, Czechia, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom), plus Russia and Israel. Data were collected through face-to-face interviews ($n_{\text{total}} = 44,387$) in people's own homes. The ESS has a number of specifications to ensure quality of data in all countries and to optimise comparability of data, with major efforts taken to enhance response rates. Detailed information on the dataset and procedures can be found on the ESS website (<http://www.europeansocialsurvey.org>), and in particular in the data documentation report.¹

3.2. Measures

The analyses included measures of the concepts of *Climate concern*, *Perceived climate responsibility*, *Climate policy support*, as well as people's willingness to take *Personal climate action* in the form of energy-saving behaviours. All variables were standardised by turning them into Z-scores.

Climate concern was measured by the item 'How worried are you about climate change?' Respondents could answer with 1 (not at all worried), 2 (not very worried), 3 (somewhat worried), 4 (very worried), or 5 (extremely worried).

Perceived climate responsibility was assessed by asking respondents 'To what extent do you feel a personal responsibility to try to reduce climate change?' The endpoint-labelled 11-point answer scale ranged from 0 (not at all) to 10 (a great deal).

Climate policy support for two different climate policies entered the analyses. This included a *fossil fuel tax* ('increasing taxes on fossil fuels, such as oil, gas and coal') and a *ban on energy inefficient appliances* ('a law banning the sale of the least energy efficient household appliances'). These two policies may have an impact on individuals' everyday life in that they may make certain products and services more expensive and limit the availability of household appliances, respectively. Respondents could indicate their support for the two policies on a fully-labelled 5-point scale ranging from 1 (strongly against) to 5 (strongly in favour), with 3 (neither in favour nor against) as the midpoint.

Personal climate action was measured with two items on *individual energy-saving behaviours*. First, to reflect people's willingness to take *efficiency measures* to save household energy, respondents were asked 'If you are to buy a large electrical appliance for your home, how likely is it that you would buy one of the most energy efficient ones?' The endpoint-labelled 11-point scale ranged from 0 (not at all likely) to 10 (extremely likely).

Second, to assess people's willingness to engage in *curtailment behaviours* to save household energy, respondents were asked 'In your daily life, how often do you do things to reduce your energy use?' This question was preceded by the following introductory text: 'There are some things that can be done to reduce energy use, such as switching off appliances that are not being used, walking for short journeys, or only using the heating or air conditioning when really needed'. Respondents could answer the question using a fully-labelled 6-point scale ranging from 1 (never) to 6 (always).

Three national-level indicators were considered in addition to these individual-level variables. These comprised (a) *per capita gross domestic product* (GDP), as an indicator of national affluence, (b) *per capita carbon emissions* (CO₂), as an indicator of a country's contribution to climate change, and (c) *electoral democracy index* (ED), as an indicator of the extent to which a country operates a representative democracy under the rule of law. Just as the individual-level variables, these national-level indicators were standardised so that the effects can be compared.

Per capita GDP figures for 2016 are in current U.S. dollars, and obtained from data produced by the World Bank (<https://datacatalog.worldbank.org>) and OECD (<https://data.oecd.org>). They are calculated without making deductions for depreciated assets or for depletion and degradation of natural resources.

Per capita fossil fuel carbon emissions figures for 2014 were obtained from the Carbon Dioxide Information Analysis Center, Environmental Sciences Division, Oak Ridge National Laboratory, Tennessee, United States (<http://cdiac.ess-dive.lbl.gov>). This can be considered a valid indicator for the total greenhouse gas emissions, as, for example, greenhouse gas (GHG) emissions from the EU28 are dominated by fossil CO₂ emissions, which are more than 80% of the total GHGs (Crippa et al. 2019).

We used the *Electoral democracy index* generated by the Varieties of Democracy project (V-Dem Institute, <https://www.v-dem.net/en>). It covers electoral principles of democracy plus freedom of association and access to alternative sources of information (ibid). The V-Dem project assesses also four other aspects of democracy, namely, the liberal, participatory, deliberative, and egalitarian components (Lindberg et al. 2014). However, these can be seen to focus on aspects that are somewhat marginal to the core definition of democracy, in other words potentially blurring the effect that the electoral system and civil liberties can have on public climate perceptions. Hence, we choose to focus merely on the electoral democracy (ED) in our analysis.

All analyses included the demographic variables of *gender*, *age*, *level of education*, and *income* as covariates. Gender was included as a dummy variable (0 female, and 1 male). Age was centred on its grand mean (47.0), and expressed in 10 year deviations from that mean. The level of education consisted of the ESS version of the International Standard Classification of Education (ISCED) and was centred on its grand mean of 4.0 on a scale from 1 (less than lower secondary) to 7 (higher tertiary education/ \geq MA level). As for income, dummy variables were used to indicate national-level quintile groups of household income as well as those with missing values.

3.3. Data analysis

The data were analysed using a multilevel modelling approach, with the MLwiN 2.36 software package, based on our conceptual analytic model (see Figure 1). Individual responses (level 1) were nested within the 23 countries (level 2) that took part in Round 8 of the ESS. Distributions of the studied variables can be found in the Appendix.

A series of multilevel models were constructed with personal responsibility, policy support, and personal action as the dependent variables, respectively. In order to examine the association of the socio-demographics with perceived responsibility and climate policy support and action we constructed a number of baseline models (Models 0) in which we only included the variables of gender, age, level of education, and household income.

The first set of analytical models (Models 1a, 1b, and 1c) focuses on the interactions between the individual-level variables of climate concern, perceived climate responsibility, and both climate policy support and personal climate action (Research question 1). The models first predict perceived responsibility by including *climate concern* as the independent variable (Model 1a). Second, climate policy support and action are predicted by incorporating *perceived climate responsibility* (Model 1b), and thirdly, both *climate concern* and *perceived climate responsibility* (Model 1c) as the independent variables. In all cases, the demographic variables of gender, age, level of education, and household income were included as controls. First, random intercept models were constructed to estimate the fixed effects for the independent variables. Subsequently, a series of random intercept, random slope models were constructed to estimate the cross-country variation in the size of these effects.

The second set of models (Models 2a and 2b) focuses on effect of national-level indicators on individual-level variables of *perceived climate responsibility* (Model 2a), and both *climate policy support and personal climate action* (Model 2b) (Research question 2). They included the national-level indicators of (a) *per capita GDP*, (b) *per capita carbon emissions*, and (c) *electoral democracy* as additional independent variables, respectively. Separate models were constructed for each of these indicators. This approach was chosen as the number of countries involved is not sufficient to reliably estimate multiple national-level parameters at the same time. Only the fixed effects for the contextual indicators are reported.

The third set of models (Models 3a and 3b) further expands the analysis to examine the effect of national-level indicators on the interactions between individual-level variables (Research question 3). This was done by looking at the cross-level interactions. For the Model 3a that have *perceived climate responsibility* as the dependent variable, interactions of *climate concern* with the contextual national-level variables of (a) *per capita GDP*, (b) *per capita carbon emissions*, and (c) *electoral democracy* were included, respectively. For the Model 3b that have *climate policy support and personal climate action* as the dependent variable, interactions of *perceived climate responsibility* with the contextual national-level variables of (a) *per capita GDP*, (b) *per capita carbon emissions*, and (c) *electoral democracy* were included, respectively. Again, separate models were constructed for each of these cross-level interactions. Overall, these interaction models also include the constituent variables on their own.

4. Results

Our first research question (RQ1) concerned the individual-level effects between climate concern, perceived climate responsibility (PCR), climate policy support, and personal climate action. Models 1a, 1b and 1c (Table 1) show that these effects are statistically significant, as expected. The effect is particularly strong between climate concern and PCR, but can be seen clearly also in how climate policy support and personal climate action is determined. Interestingly, PCR has a somewhat stronger effect on policy support and personal action than climate concern alone.

Table 1. Individual level effects on perceived climate responsibility and climate policy support & personal climate action.

	Perceived climate responsibility	Climate policy support & personal climate action			
		Fossil fuel tax	Inefficient appliances ban	Energy curtailment	Energy efficiency
Model 1a					
Climate concern	0.421 (0.004)***	0.174 (0.05)***	0.202 (0.005)***	0.178 (0.005)***	0.150 (0.0005)***
Model 1b					
Climate concern	–	0.103 (0.006)***	0.141 (0.006)***	0.117 (0.005)***	0.088 (0.005)***
Perceived climate responsibility	–	0.172 (0.006)***	0.151 (0.006)***	0.139 (0.005)***	0.142 (0.005)***
Model 1c					
Climate concern	–	0.103 (0.006)***	0.141 (0.006)***	0.117 (0.005)***	0.088 (0.005)***
Perceived climate responsibility	–	0.172 (0.006)***	0.151 (0.006)***	0.139 (0.005)***	0.142 (0.005)***

n.s., non-significant; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 2. National-level effects on perceived climate responsibility and climate policy support & personal climate action.

		Perceived climate responsibility	Climate policy support & personal climate action			
Model 2a	Model 2b		Fossil fuel tax	Inefficient appliances ban	Energy curtailment	Energy efficiency
[a] Gross domestic product (GDP)	[a] Gross domestic product (GDP)	0.218 (0.041)***	0.125 (0.039)***	-0.035 (0.036) ^{n.s.}	-0.031 (0.032) ^{n.s.}	-0.058 (0.044) ^{n.s.}
[b] Carbon emissions (CO ₂)	[b] Carbon emissions (CO ₂)	-0.101 (0.062) ^{n.s.}	0.020 (0.054) ^{n.s.}	-0.025 (0.038) ^{n.s.}	-0.036 (0.033) ^{n.s.}	-0.054 (0.043) ^{n.s.}
[c] Electoral democracy (ED)	[c] Electoral democracy (ED)	0.334 (0.110)**	0.071 (0.083) ^{n.s.}	0.033 (0.066) ^{n.s.}	0.144 (0.052)**	0.170 (0.076)*

n.s., non-significant; *P < 0.05; **P < 0.01; ***P < 0.001.

Our second research question (RQ2) was to look at the effect of the national-level variables on these individual-level perceptions. Models 2a and 2b in [Table 2](#) shows that both GDP and electoral democracy (ED) have a positive effect on PCR, and CO2 emissions a negative effect. For climate policy support, GDP is linked to favouring fossil fuel tax, but no other connection between contextual level factors and climate policy support are statistically significant. For personal climate action, there is perceived significant effect between electoral democracy and energy curtailment and efficiency, but no other connections between national-level factors.

Our third research focus (RQ3) concerned the moderating effect that the national-level potentially has on the connections between both climate concern and PCR, and PCR and climate policy support and personal climate action (Models 3a and 3b in [Table 3](#)). For the former, testing the cross-level interactions points out that only electoral democracy significantly interacts with climate concern: hence in democratic societies the connection between concern and responsibility becomes stronger. For the PCR – climate policy support and personal climate action link, GDP and electoral democracy interact with all the climate policy support and personal climate action variables, and carbon emissions interact with the energy curtailment negatively. This suggests that particularly affluence and democracy can strengthen the effect that the PCR has on both climate policy support and personal climate action.

5. Discussion and conclusions

This study looked at both how individual climate perceptions of concern, perceived responsibility, policy support, and personal action are connected and shaped by national-level factors of affluence, carbon emissions and democracy. We asked how climate concern, perceived climate responsibility, climate policy support, and personal climate action are interlinked at the individual level (RQ1). Next, we looked at how national-level affluence (per capita GDP), carbon emissions (per capita CO₂), and democracy (electoral democracy) shape perceived climate responsibility, climate policy support, and personal climate action (RQ2). Finally, we looked at whether the relationships between climate concern, perceived climate responsibility, climate policy support, and personal climate action differ according to the aforementioned national-level factors (RQ3).

We found a strong positive connection between climate concern and perceived climate responsibility, and further, between both climate concern and perceived climate responsibility and various climate policy support & personal climate action measures (cf. Rhodes, Aksen, and Jaccard 2017; Hagen, Middal, and Pijawka 2016; Drews and van der Bergh 2016). In the latter case the effects were stronger between perceived climate responsibility and both climate policy support and action, suggesting that climate concern alone is not particularly strongly related to both policy support and action compared to perceived responsibility. Yet the connection between climate concern and perceived responsibility makes it an important element that helps to understand the role of perceived responsibility in public climate views. Hence our study suggests that perceived climate responsibility can be regarded a factor that helps to understand how individual level climate views are connected (RQ1) (cf. Steg and de Groot 2010; Weber 2016). Further studies could test how these interactions might vary with more nuanced measurements of perceived responsibility, such as those focusing on certain specific themes and action.

We found national affluence and democracy are positively connected to perceived climate responsibility, and that people in more affluent countries are also more likely to

Table 3. Interaction effects of individual and national-level on perceived climate responsibility and climate policy support & personal climate action.

	Perceived climate responsibility	Climate policy support & personal climate action			
		Fossil fuel tax	Inefficient appliances ban	Energy curtailment	Energy efficiency
		Model 3b			
Model 3a					
[a] GDP × Climate concern	0.000 (0.004) n.s.	0.065 (0.005)***	0.053 (0.005)***	0.049 (0.005)***	0.060 (0.05)***
[b] CO ₂ × Climate concern	0.004 (0.004) n.s.	-0.002 (0.005) n.s.	0.006 (0.005) ^{n.s.}	-0.015 (0.005)**	-0.009 (0.005) ^{n.s.}
[c] ED × Climate concern	0.031 (0.008)***	0.058 (0.010)***	0.059 (0.010)***	0.050 (0.009)***	0.035 (0.009)***

n.s., non-significant; *P < 0.05; **P < 0.01; ***P < 0.001.

support higher taxation of fossil fuels (RQ2). However, affluence was not significantly linked to our other measures of climate policy support and personal climate action. We also found that people in more democratic countries are more likely to engage in climate action, but the level of democracy had no effect on support of climate policy.

Our analyses suggest that the link between climate concern and perceived climate responsibility is stronger in more democratic countries (RQ3). Moreover, both national affluence and democracy strengthen the link between perceived climate responsibility and all our measures for both climate policy support and personal climate action. This suggests national affluence and democracy may provide citizens with capabilities that facilitate individual action.

Overall, there were differences in how the national-level factors are connected to public climate perceptions. In our analyses the effect of affluence was central, as expected (Lo and Chow 2015; Drews and van der Bergh 2016; Knight 2016). It is important to note that democracy, which has seen far less study in this regard, had a similarly robust effect. Democracy is known to be coupled with more ambitious environmental policy targets and institutions (Bättig and Bernauer 2009; Povitkina 2018), in addition to which citizens of democratic nations are politically more involved and able to participate in decision-making (Burnell 2012; Obydenkova and Salahodjaev 2017).

Indeed, the importance of democracy merits further study. There is a need to investigate how different forms of democracy are linked to attitudes towards climate change. In this study we only touched upon the issue, and moreover, we utilised a broad measure of electoral democracy. Future studies may be able to explore how different forms of democracy, such as liberal, egalitarian, deliberative or participatory democracy (see e.g. V-dem 2018), are linked to climate perceptions, and to what extent these different types are helpful in translating climate concerns into responsibility and endorsement of climate policies.

When it comes to carbon emissions, the effects were practically nonexistent throughout our analyses, suggesting that they are not essentially linked to, for example, individual climate responsibility among citizens as much of the previous literature suggests (Kvaloy, Finseraas, and Listhaug 2012; Lo and Chow 2015; Mostafa 2016). However, as the data were collected in 2016, and there has been a rather recent, strong upswing in the public climate policy discussions in Europe (Bergquist and Warshaw 2019; Wright and Nyberg 2019), public perceptions may look different at the moment. Public discussion can be considered a particularly powerful tool when it comes to carbon emissions, as they engender an ‘invisible threat’ locally; climate change is a more complex problem to perceive compared to many other environmental hazards. It is also important to note that we used a measure of carbon emissions per capita and not per nation. It is possible the latter might produce a different effect on feeling responsibility, steering the focus more towards (inter)national climate policies.

One practical policy implication from our study concerns public campaigns that could not only inform people on climate change but also encourage them to take personal responsibility to increase climate policy support and action. Moreover, national affluence and democracy are clearly connected to individual-level perceptions, and our data also shows that there is remarkable variation in how the national determinants and public perceptions are distributed between countries (see Appendix). This suggests that ambitious long-term climate targets and related execution of global climate agreements in Europe can potentially be achieved better by focusing also on country-level differences in political and economic conditions.

Addressing these issues could help build active climate citizenship and usher societies towards a stronger joint agreement for structuring successful climate polity solutions. We may raise the question of to what extent Europe can afford to be locked into narrow-minded thinking, concerning not only climate change, but the future of the continent in general. Even before the COVID-19 crisis it was anticipated that Europe would face turbulent times not only concerning sustainable energy transitions (de la Esperanza Mata Pérez, Scholten, and Smith Stegen 2019), but also wider economic, environmental and socio-cultural development (e.g. Giddens 2014). Hence it would be particularly important to address these issues in the current situation.

Disclosure statement

The authors declare that they have no conflict of interest.

Funding

This work was supported by the ERA.Net RUS Plus initiative (PAWCER project: Public attitudes to welfare, climate change and energy in the EU and Russia).

Supplementary material

Supplemental data for this article can be accessed at <https://doi.org/10.1080/13511610.2021.1909465>.

Notes on contributors

Pasi Pohjola (M.Sc.) has worked as a project researcher in environmental policy at the Tampere University, Finland. He is currently conducting doctoral studies at the Unit of Economic Sociology, University of Turku, Finland. His fields of interest include sociology of consumption, food studies, and environmental and energy policies.

Iida Kukkonen is a PhD student at the Unit of Economic Sociology, Faculty of Social Sciences, University of Turku, Finland. Her research interests revolve around consumption and inequality. She has published on topics including physical appearance-related inequalities, social media, ethical consumption and attitudes towards climate change.

Pekka Jokinen is professor of environmental policy at the Tampere University, Finland. His research interests cover environmental governance, sustainability transitions, and climate policy.

Wouter Poortinga (PhD) is professor of environmental psychology at Cardiff University, Wales, UK. His research focuses on environmental risk perceptions, sustainable behaviours and lifestyles, and environment and health.

Charles Adedayo Ogunbode is an Assistant Professor in Applied Psychology at the University of Nottingham, UK. His research interests are in environmental and social psychology with a focus on understanding how personal experiences, the informational environment and social influence shape individual engagement with climate change.

Gisela Böhm is professor at the Department of Psychosocial Science, University of Bergen, Norway, and adjunct professor at the Department of Psychology, Inland Norway University of Applied Sciences, Lillehammer, Norway. Her main research interests are in risk perception and decision making in the context of environmental risks such as climate change, with a focus on the interplay between risk, morality, and emotion in responses to such risks.

Stephen Fisher is Associate Professor of Political Sociology, and Fellow and Tutor in Politics at Trinity College, University of Oxford, UK. His research interests include social and political attitudes, especially ethnicity, environmental attitudes, electoral behaviour, quantitative methods and election forecasting.

Resul Umit is a post-doctoral researcher in political science at the ARENA Centre for European Studies, University of Oslo, Norway.

Data availability statement

The data that support the findings of this study are openly available in European Social Survey (ESS) website at <http://www.europeansocialsurvey.org>.

Note

1. https://www.europeansocialsurvey.org/docs/round8/survey/ESS8_data_documentation_report_e02_1.pdf.

ORCID

Wouter Poortinga  <http://orcid.org/0000-0002-6926-8545>

Gisela Böhm  <http://orcid.org/0000-0002-5324-6990>

Stephen Fisher  <http://orcid.org/0000-0002-1006-1638>

Resul Umit  <http://orcid.org/0000-0003-1586-7128>

References

- Anderson, B., T. Böhmelt, and H. Ward. 2017. "Public Opinion and Environmental Policy Output." *Environmental Research Letters* 12: 114011.
- Arnold, A., G. Böhm, A. Corner, C. Mays, N. Pidgeon, W. Poortinga, M. Poumadère, et al. 2016. *European Perceptions of Climate Change. Socio-Political Profiles to Inform a Cross-National Survey in France, Germany, Norway and the UK*. Oxford: Climate Outreach. <http://climateoutreach.org/resources/european-perceptions/>.
- Bättig, M. B., and T. Bernauer. 2009. "National Institutions and Global Public Goods: Are Democracies More Cooperative in Climate Change Policy?" *International Organization* 63: 281–308.
- Bergquist, M., A. Nilsson, and P. W. Schultz. 2019. "Experiencing a Severe Weather Event Increases Concern About Climate Change." *Frontiers in Psychology* 10: 220. doi:10.3389/fpsyg.2019.00220.
- Bergquist, P., and C. Warshaw. 2019. "Does Global Warming Increase Public Concern About Climate Change?" *The Journal of Politics* 81: 686–691.
- Bernauer, T. 2013. "Climate Change Politics." *Annual Review of Political Science* 16: 421–448.
- Bowman, B. 2020. "Imagining Future Worlds Alongside Young Climate Activists: a new Framework for Research." *Fennia* 197: 295–305.
- Burnell, P. 2012. "Democracy, Democratization and Climate Change: Complex Relationships." *Democratization* 19: 813–842.
- Caney, S. 2005. "Cosmopolitan Justice, Responsibility, and Global Climate Change." *Leiden Journal of International Law* 18: 747–775.
- Capstick, S., L. Whitmarsh, W. Poortinga, N. Pidgeon, and P. Upham. 2015. "International Trends in Public Perceptions of Climate Change Over the Past Quarter Century." *WIRE's Climate Change* 6: 35–61.
- Comim, F. 2008. "Climate Injustice and Development: A Capability Perspective." *Development* 51: 344–349.
- Crippa, M., G. Oreggioni, D. Guizzardi, M. Muntean, E. Schaaf, E. Lo Vullo, E. Solazzo, F. Monteforti-Ferrario, J. Olivier, and E. Vignati. 2019. *Fossil CO2 and GHG Emissions of all World Countries - 2019 Report*. Luxembourg: Publications Office of the European Union. <https://doi.org/10.2760/687800>.
- Cuomo, C. J. 2011. "Climate Change, Vulnerability, and Responsibility." *Hypatia* 26: 690–714.

- de la Esperanza Mata Pérez, M., D. Scholten, and K. Smith Stegen. 2019. "The Multi-Speed Energy Transition in Europe: Opportunities and Challenges for EU Energy Security." *Energy Strategy Reviews* 26: 100415.
- Deryugina, T. 2013. "How do People Update? The Effects of Local Weather Fluctuations on Beliefs about Global Warming." *Climatic Change* 118: 397–416.
- Diekmann, A., and A. Franzen. 1999. "The Wealth of Nations and Environmental Concern." *Environment and Behavior* 31: 540–549.
- Dobson, A. 1996. "Representative Democracy and the Environment." In *Democracy and the Environment: Problems and Principles*, edited by W. Lafferty, and J. Meadowcroft, 124–139. Cheltenham: Edward Elgar.
- Dobson, A. 2007. "Environmental Citizenship: Towards Sustainable Development." *Sustainable Development* 15: 276–285.
- Donner, S., and J. McDaniels. 2013. "The Influence of National Temperature Fluctuations on Opinions About Climate Change in the U.S. since 1990." *Climatic Change* 118: 537–550.
- Doran, R., G. Böhm, H.-R. Pfister, K. Steentjes, and N. Pidgeon. 2019. "Consequence Evaluations and Moral Concerns About Climate Change: Insights from Nationally Representative Surveys Across Four European Countries." *Journal of Risk Research* 22: 610–626.
- Drews, S., and J. C. J. M. van der Bergh. 2016. "What Explains Public Support for Climate Policies? A Review of Empirical and Experimental Studies." *Climate Policy* 16: 855–876.
- Drummond, A., L. C. Hall, J. D. Sauer, and M. A. Palmer. 2018. "Is Public Awareness and Perceived Threat of Climate Change Associated with Governmental Mitigation Targets?" *Climatic Change* 149: 159–171.
- Dryzek, J. S., and H. Stevenson. 2011. "Global Democracy and Earth System Governance." *Ecological Economics* 70: 1865–1874.
- Dunlap, R. E., and A. G. Mertig. 1997. "Global Environmental Concern: An Anomaly for Postmaterialism." *Social Science Quarterly* 78: 24–29.
- European Commission. 2017. *Climate Change*. Special Eurobarometer 459. March 2017. TNS Political & Social.
- European Commission. 2020. *EU Climate Action and the European Green Deal*. European Commission / Energy, Climate change, Environment / Climate Action / EU Action. Accessed 8 May 2020. https://ec.europa.eu/clima/policies/eu-climate-action_en.
- European Social Survey. 2016. Data from: European Social Survey Round 8 Data. File Edition 2.0 (data set). Bergen: Norwegian Centre for Research Data. <http://www.europeansocialsurvey.org/data>.
- Fairbrother, M. 2016. "Trust and Public Support for Environmental Protection in Diverse National Contexts." *Sociological Science* 3: 359–382.
- Fairbrother, M., I. Johansson Sevä, and J. Kulin. 2019. "Political Trust and the Relationship between Climate Change Beliefs and Support for Fossil Fuel Taxes: Evidence from a Survey of 23 European Countries." *Global Environmental Change* 59: 102003.
- Figge, F., W. Young, and R. Barkemeyer. 2014. "Sufficiency or Efficiency to Achieve Lower Resource Consumption and Emissions? The Role of the Rebound Effect." *Journal of Cleaner Production* 69: 216–224.
- Fischer, F. 2018. "Environmental Democracy: Participation, Deliberation and Citizenship." In *Environment and Society*, edited by M. Boström, and D. J. Davidson, 257–279. Cheltenham: Palgrave Macmillan.
- Fredriksson, P. G., A. Sauquet, and J. R. Wollscheid. 2016. "Democracy, Political Institutions, and Environmental Policy." *Reference Module in Earth Systems and Environmental Sciences* 2016: 9780124095489. doi:10.1016/B978-0-12-409548-9.09714-1.
- Freeman, M., and G. Strandberg. 2014. "Historical Responsibility for Climate Change: Science and the Science-Policy Interface." *WIRE's Climate Change* 5: 297–316.
- Füssell, H.-M. 2010. "How Inequitable Is the Global Distribution of Responsibility, Capability, and Vulnerability to Climate Change: A Comprehensive Indicator-Based Assessment." *Global Environmental Change* 20: 597–611.
- Giddens, A. 2014. *Turbulent and Mighty Continent*. Cambridge: Polity Press.
- Givens, J., and A. K. Jorgenson. 2011. "The Effects of Affluence, Economic Development, and Environmental Degradation on Environmental Concern: A Multilevel Analysis." *Organization & Environment* 24: 74–91.

- Hagen, B., A. Middel, and D. Pijawka. 2016. "European Climate Change Perceptions: Public Support for Mitigation and Adaptation Policies." *Environmental Policy and Governance* 26: 170–183.
- Helm, D. 2014. "The European Framework for Energy and Climate Policies." *Energy Policy* 64: 29–35.
- Höhne, N., H. Blum, J. Fuglestedt, R. Bieltvedt Skeie, A. Kurosawa, G. Hu, J. Lowe, et al. 2011. "Contributions of Individual Countries' Emissions to Climate Change and Their Uncertainty." *Climatic Change* 106: 359–391.
- Inglehart, R. 1995. "Public Support for Environmental Protection: Objective Problems and Subjective Values in 43 Societies." *PS: Political Science and Politics* 28: 57–72.
- Kim, S. Y., and Y. Wolinsky-Nahmias. 2014. "Cross-National Public Opinion on Climate Change: The Effects of Affluence and Vulnerability." *Global Environmental Politics* 14: 79–106.
- Klinsky, S. 2018. "An Initial Scoping of Transitional Justice for Global Climate Governance." *Climate Policy* 18: 752–765.
- Knight, K. W. 2016. "Public Awareness and Perception of Climate Change: A Quantitative Cross-National Study." *Environmental Sociology* 2: 101–113.
- Kvaloy, B., H. Finseraas, and O. Listhaug. 2012. "The Publics' Concern for Global Warming: A Cross-National Study of 47 Countries." *Journal of Peace Research* 49: 11–22.
- Lafferty, W. M., and J. Meadowcroft. 1996. *Democracy and the Environment*. Cheltenham: Edward Elgar.
- Lane, M. 2016. "Political Theory on Climate Change." *Annual Review of Political Science* 19: 107–123.
- Lee, T. M., E. M. Markowiz, P. D. Howe, C.-Y. Ko, and A. A. Leiserowitz. 2015. "Predictors of Public Climate Change Awareness and Risk Perception Around the World." *Nature Climate Change* 5: 1014–1020.
- Lewis, G. B., R. Palm, and B. Feng. 2019. "Cross-National Variation in Determinants of Climate Change Concern." *Environmental Politics* 28: 793–821.
- Li, Q., and R. Reuveny. 2006. "Democracy and Environmental Degradation." *International Studies Quarterly* 50: 935–956.
- Lidskog, R., and I. Elander. 2010. "Addressing Climate Change Democratically. Multi-Level Governance, Transnational Networks and Governmental Structures." *Sustainable Development* 18: 32–41.
- Lindberg, S. I., M. Coppedge, J. Gerring, J. Teorell, D. Pemstein, E. Tzelgov, Y. ting Wang, et al. 2014. "V-Dem: A new way to Measure Democracy." *Journal of Democracy* 25: 159–169.
- Lo, A. Y., and A. T. Chow. 2015. "The Relationship between Climate Change Concern and National Wealth." *Climatic Change* 131: 335–348.
- Lubell, M., S. Zahran, and A. Vedlitz. 2007. "Collective Action and Citizen Responses to Global Warming." *Political Behavior* 29: 391–413.
- Marquart-Pyatt, S. T. 2012. "Contextual Influences on Environmental Concerns Cross-Nationally: A Multilevel Investigation." *Social Science Research* 41: 1085–1099.
- McCright, A. M., R. E. Dunlap, and S. T. Marquart-Pyatt. 2016. "Political Ideology and Views About Climate Change in the European Union." *Environmental Politics* 25: 338–358.
- Middlemiss, L. 2010. "Reframing Individual Responsibility for Sustainable Consumption: Lessons from Environmental Justice and Ecological Citizenship." *Environmental Values* 19: 147–167.
- Midlarsky, M. I. 2001. "Democracy and the Environment." In *Environmental Conflict*, edited by P. F. Diehl, and N. P. Gleditsch, 155–178. Boulder: Westview Press.
- Miller, D. 2007. *National Responsibility and Global Justice*. Oxford: Oxford University Press.
- Mostafa, M. M. 2013. "Wealth, Post-Materialism and Consumers' pro-Environmental Intentions: A Multilevel Analysis Across 25 Nations." *Sustainable Development* 21: 385–399.
- Mostafa, M. M. 2016. "Post-Materialism, Religiosity, Political Orientation, Locus of Control and Concern for Global Warming: A Multilevel Analysis Across 40 Nations." *Social Indicators Research* 128: 1273–1298.
- Nelson, A. 2016. "The Praxis of Sustainability Citizenship." In *Sustainability Citizenship in Cities. Theory and Practice*, edited by R. Horne, J. Fien, B. B. Beza, and A. Nelson, 17–28. London: Routledge.
- Obydenkova, A. V., and R. Salahodjaev. 2017. "Climate Change Policies: The Role of Democracy and Social Cognitive Capital." *Environmental Research* 157: 182–189.

- Pickering, J., K. Bäckstrand, and D. Schlosberg. 2020. "Between Environmental and Ecological Democracy: Theory and Practice at the Democracy-Environment Nexus." *Journal of Environmental Policy & Planning* 22: 1–15.
- Pidgeon, N. 2012. "Public Understanding of, and Attitudes to, Climate Change: UK and International Perspectives and Policy." *Climate Policy* 12: S85–S106.
- Poortinga, W., A. Spence, C. Demski, and N. F. Pidgeon. 2012. "Individual-Motivational Factors in the Acceptability of Demand-Side and Supply-Side Measures to Reduce Carbon Emissions." *Energy Policy* 48: 812–819.
- Poortinga, W., L. Whitmarsh, L. Steg, G. Böhm, and S. Fisher. 2019. "Climate Change Perceptions and Their Individual-Level Determinants: A Cross-European Analysis." *Global Environmental Change* 55: 25–35.
- Povitkina, M. 2018. "The Limits of Democracy in Tackling Climate Change." *Environmental Politics* 27: 411–432.
- Rhodes, E., J. Axsen, and M. Jaccard. 2017. "Exploring Citizen Support for Different Types of Climate Policy." *Ecological Economics* 137: 56–69.
- Running, K. 2013. "World Citizenship and Concern for Global Warming: Building the Case for a Strong International Civil Society." *Social Forces* 92: 377–399.
- Sandvik, H. 2008. "Public Concern Over Global Warming Correlates Negatively with National Wealth." *Climatic Change* 90: 333–341.
- Schlosberg, D. 2012. "Climate Justice and Capabilities: A Framework for Adaptation Policy." *Ethics and International Affairs* 26: 445–461.
- Smith, G. 2003. *Deliberative Democracy and the Environment*. London: Routledge.
- Spence, A., W. Poortinga, C. Butler, and N. F. Pidgeon. 2011. "Perceptions of Climate Change and Willingness to Save Energy Related to Flood Experience." *Nature Climate Change* 1: 46–49.
- Steg, L., and J. I. M. de Groot. 2010. "Explaining Prosocial Intentions: Testing Causal Relationships in the Norm Activation Model." *British Journal of Social Psychology* 49: 725–743.
- Stern, P. C. 2000. "New Environmental Theories: Toward a Coherent Theory of Environmentally Significant Behavior." *Journal of Social Issues* 56: 407–424.
- Stern, N. H. 2007. *The Economics of Climate Change: The Stern Review*. Cambridge: Cambridge University Press.
- Telesiene, A., and M. Gross, eds. 2015. *Green European. Environmental Behaviour and Attitudes in Europe in a Historical and Cross-Cultural Comparative Perspective*. London: Routledge.
- Tjernström, E., and T. Tietenberg. 2008. "Do Differences in Attitudes Explain Differences in National Climate Change Policies?" *Ecological Economics* 65: 315–324.
- V-dem. 2018. *Democracy for all. V-dem Annual Democracy Report 2018*. University of Gothenburg. Båras: Response Tryck. Accessed 10 June 2020. <https://www.v-dem.net/en/news/democracy-all-v-dem-annual-democracy-report-2018/>.
- Vihersalo, M. 2017. "Climate Citizenship in the European Union: Environmental Citizenship as an Analytical Concept." *Environmental Politics* 26: 343–360.
- Weber, E. U. 2016. "What Shapes Perceptions of Climate Change? New Research Since 2010" *WIRE's Climate Change* 7: 125–134.
- Winslow, M. 2005. "Is Democracy Good for the Environment?" *Journal of Environmental Planning and Management* 48: 771–783.
- Wolf, J., and S. C. Moser. 2011. "Individual Understandings, Perceptions, and Engagement with Climate Change: Insights from in-Depth Studies Across the World." *WIRE's Climate Change* 2: 547–569.
- Wright, C., and D. Nyberg. 2019. "Climate Change and Social Innovation." In *Handbook of Inclusive Innovation: The Role of Organizations, Markets and Communities in Social Innovation*, edited by G. George, T. Baker, P. Tracey, and H. Joshi, 47–60. Cheltenham: Edward Elgar.
- Zahran, A., S. D. Brody, H. Grover, and A. Vedlitz. 2006. "Climate Change Vulnerability and Policy Support." *Society & Natural Resources* 19: 771–789.

Appendix

Table A: Descriptives of the studied individual and national level variables in 23 European countries

Country	Sample size	Climate concern ⁽¹⁾	Perceived responsibility ⁽²⁾	Fossil fuel tax ⁽³⁾	Inefficient appliances ban ⁽⁴⁾	Energy curtailment ⁽⁵⁾	Energy efficiency ⁽⁶⁾	GDP ⁽⁷⁾	CO2 emissions ⁽⁸⁾	Electoral Democracy ⁽⁹⁾
	N	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)			
Austria	2,010	3.07 (0.90)	6.04 (2.68)	3.18 (1.24)	2.25 (1.14)	3.98 (1.20)	8.02 (2.07)	44,676	6.874	0.836
Belgium	1,766	3.17 (0.86)	5.96 (2.37)	3.28 (1.23)	2.27 (1.09)	4.24 (1.15)	8.01 (1.91)	41,236	8.328	0.861
Czech Republic	2,269	2.77 (1.05)	3.42 (2.58)	3.38 (1.27)	2.56 (1.36)	4.01 (1.19)	8.01 (2.06)	18,492	9.166	0.842
Estonia	2,019	2.65 (0.95)	4.33 (2.86)	3.40 (1.04)	2.70 (1.07)	4.16 (1.19)	7.64 (2.35)	17,727	14.849	0.895
Finland	1,925	3.05 (0.82)	6.53 (2.28)	2.66 (1.08)	2.48 (1.01)	4.19 (1.04)	7.79 (2.13)	43,403	8.661	0.844
France	2,070	3.21 (0.93)	6.91 (2.25)	3.46 (1.18)	2.36 (1.13)	4.39 (1.18)	7.81 (2.13)	36,855	4.572	0.933
Germany	2,852	3.36 (0.85)	6.62 (2.28)	3.00 (1.14)	2.17 (1.17)	4.43 (1.07)	8.41 (2.01)	42,070	8.889	0.866
Hungary	1,614	3.05 (0.85)	4.29 (2.62)	3.34 (1.26)	2.53 (1.18)	4.31 (1.11)	7.58 (2.44)	12,815	4.266	0.659
Iceland	880	3.13 (0.92)	6.25 (2.51)	2.83 (1.18)	2.81 (1.19)	3.82 (1.19)	6.71 (2.86)	59,977	6.06	0.875
Ireland	2,757	2.83 (0.92)	5.80 (2.46)	3.30 (1.28)	2.64 (1.22)	4.15 (1.18)	7.64 (2.20)	63,862	7.378	0.844
Israel	2,557	2.64 (1.05)	5.11 (3.13)	3.40 (1.23)	2.48 (1.21)	3.61 (1.47)	7.46 (2.91)	37,176	7.863	0.720
Italy	2,626	3.21 (0.84)	5.28 (2.56)	3.42 (1.24)	2.23 (1.05)	4.28 (1.26)	8.26 (1.92)	30,675	5.271	0.847
Lithuania	2,122	2.82 (0.91)	4.81 (2.65)	3.31 (1.28)	2.84 (1.14)	4.06 (1.20)	8.05 (2.01)	14,880	4.378	0.820
Netherlands	1,681	3.01 (0.86)	5.82 (2.32)	3.07 (1.24)	2.62 (1.22)	4.04 (1.12)	7.38 (2.26)	45,670	9.92	0.890

Norway	1,545	3.00 (0.83)	6.22 (2.28)	2.84 (1.23)	2.66 (1.11)	4.02 (1.10)	6.86 (2.41)	70,912	9.271	0.904
Poland	1,694	2.75 (0.86)	5.55 (2.52)	3.66 (1.03)	2.40 (1.09)	4.04 (1.12)	8.19 (2.02)	12,421	7.517	0.827
Portugal	1,270	3.48 (0.92)	5.73 (3.02)	3.49 (1.28)	2.16 (1.18)	4.43 (1.20)	8.38 (2.10)	19,840	4.332	0.898
Russia	2,430	2.75 (0.97)	3.81 (2.60)	3.36 (1.10)	2.79 (1.07)	3.45 (1.38)	6.15 2.67()	8,748	11.858	0.269
Slovenia	1,307	3.17 (0.86)	5.33 (2.74)	3.37 (1.23)	2.30 (1.18)	4.37 (1.15)	8.03 (2.24)	21,652	6.214	0.869
Spain	1,958	3.42 (0.88)	5.98 (2.62)	3.54 (1.24)	2.31 (1.10)	4.38 (1.26)	7.98 (2.20)	26,640	5.034	0.837
Sweden	1,551	2.86 (0.87)	6.44 (2.24)	2.52 (1.22)	2.71 (1.19)	4.03 (1.10)	7.34 (2.23)	51,949	4.478	0.911
Switzerland	1,525	3.12 (0.85)	6.86 (2.25)	2.78 (1.18)	2.20 (1.14)	4.22 (1.12)	8.15 (2.14)	79,891	4.312	0.892
UK	1,959	2.96 (0.94)	5.99 (2.41)	3.05 (1.18)	2.53 (1.12)	4.30 (1.17)	7.19 (2.53)	40,341	6.497	0.869

Note: (1) scale ranging from 1 (not at all worried) to 5 (extremely worried); (2) scale ranging from 0 (not at all) to 10 (a great deal); (3) scale ranging from 1 (strongly against) to 5 (strongly in favour); (4) scale ranging from 1 (strongly against) to 5 (strongly in favour); (5) scale ranging from 1 (never) to 6 (always); (6) scale ranging from 0 (not at all likely) to 10 (extremely likely); (7) 2016 GDP per capita in USD; (8) 2014 CO2 emissions in metric tonnes per capita; (9) 2016 Electoral democracy index from the Varieties of Democracy project.