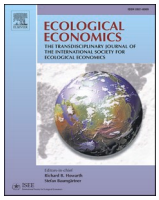
Ecological Economics 244 (2026) 108968

Contents lists available at ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon



ANALYSIS

Opinions of EU citizens about climate policy in their own words

Ivan Savin [a,b,c,*], Jeroen van den Bergh [b,d,e]

[a] ESCP Business School, Madrid, Spain
[b] Institute of Environmental Science and Technology, Universitat Autònoma de Barcelona, Bellaterra, Barcelona, Spain
[c] Graduate School of Economics and Management, Ural Federal University, Yekaterinburg, Russia
[d] ICREA, Barcelona, Spain
[e] School of Business and Economics & Institute for Environmental Studies, Vrije Universiteit, Amsterdam, the Netherlands.

ARTICLE INFO

Keywords:
Public Opinion
Topic Modelling
Climate Policy
Policy Support
European Union

ABSTRACT

To mitigate climate change, policy measures should not only be effective but also politically viable. Views of citizens are vital in this regard as they underlie voting outcomes and subsequent political decisions. The present study presents results from a public survey conducted in 13 EU countries about public support for climate policy measures. This involves analyzing 1266 open textual responses and identifying thirteen main topics. We compare the prevalence of topics between EU countries and assess how topics relate to average support for climate policy and opinions on economic growth. More prevalent topics relate to sector-specific strategies, such as aimed at waste and transport, which are relatively popular among female respondents. Only about 25% of responses mention concrete policy instruments, such as direct regulation or carbon pricing. This may indicate inadequate awareness of policy details among European citizens and contribute to limited public support for climate policy in general. Surprisingly, people claiming to have a good understanding of climate policy suggest a vague strategy like reducing consumption instead of concrete policy measures. Opponents of climate policy are found especially in Eastern European countries. Our findings point at the need for more information provision to citizens about policy details and effectiveness.

1. Introduction

The literature studying the performance of climate policies has expanded rapidly in the last decade. This tends to focus on the criteria of effectiveness, efficiency and equitability (Cullenward and Victor, 2020; Peñasco et al., 2021; van den Bergh et al., 2021). A fourth performance criterion receiving increasing attention is public support (Kallbekken, 2023). The reason is that if proposed policies do not gather sufficient support, their political feasibility will be at stake. In line with this, many recent studies assess public opinion about climate policy (Dechezleprêtre et al., 2025; Carson et al., 2025; Bretter and Schulz, 2025). Here we do this for the European Union, which has among the most stringent climate policies worldwide. However, given that its policies are still too weak and incomplete to achieve long-term climate targets (Ou et al., 2021), the question is whether there is support for making the next step to strengthen these policies or complement them with additional instruments.

Previous work in this area typically relies on surveys that are mainly composed of multiple-choice questions (Bernauer and Gampfer, 2015; Rhodes et al., 2017; Kyselá et al., 2019; Bergquist et al., 2022). However, these require pre-formulation of a finite set of options to choose from instead of letting respondents give their own unconstrained answer. An alternative approach is to let respondents freely formulate their views in response to an open-ended question. The main advantages of using open- instead of closed-ended survey questions is that they allow uncovering unexpected insights and a better understanding of the fundamental reasons for expressed opinions by revealing personal beliefs and narratives from survey respondents (Andre et al., 2022). Here we offer an analysis of responses to open-ended questions by citizens of the European Union. We address this using computational linguistics as its represents an objective and systemic approach to analyse textual responses from a large number of survey participants. This allows the mapping of citizen preferences regarding climate policies and relating these to socio-demographic characteristics of respondents. As a result, we are able to assess not only the content of people's views, but also what specific individuals and socio-demographic groups – with identifiable characteristics – tend to favour which climate policies.

The data are part of a large survey undertaken among citizens from

* Corresponding author at: ESCP Business School, Madrid, Spain.
E-mail address: isavin@escp.eu (I. Savin).

https://doi.org/10.1016/j.ecolecon.2026.108968
Received 9 December 2025; Received in revised form 6 February 2026; Accepted 7 February 2026
Available online 13 February 2026

13 member countries of the European Union. To analyse textual responses, we use structural topic modelling (STM), a method developed for open-ended questions which classifies textual responses into distinct topics (Roberts et al., 2014). It has been used in a wide range of applications, such as public perceptions of climate change and air pollution (Tvinnereim and Fløttum, 2015; Tvinnereim et al., 2017a), people's beliefs about others' climate beliefs (Mildenberger and Tingley, 2019), views of carbon taxation and its fairness (Savin et al., 2020), public debate on the free movement of people within the EU (Blauberger et al., 2023) and assessing pledges of the Paris Agreement (Savin et al., 2025a). A prior application of STM that shares some characteristics with the present study is by Tvinnereim et al. (2017b). They explored over 3000 open-ended responses of Norwegian citizens to the question "When it comes to climate change, what do you think should be done?" Applications of topic modelling have been even broader including, for example, demand-side climate mitigation (Creutzig et al., 2021) and parliamentary debates about coal in Germany (Müller-Hansen et al., 2021). For a recent literature review on applications of topic modelling see Dugoua et al. (2022).

An important novelty of our study is that it draws upon a multi-country survey conducted simultaneously across 13 EU countries. This allows to directly compare views on preferred climate policy across countries which are heterogeneous in terms of income, stringency of climate policy implementation, and CO_2 emission intensity of the economy. To the best of our knowledge, this is the first study that enables a comparison of public perception of climate policies through textual analysis.[1] Given the growing importance of EU-wide climate policies, notably through the Fit-for-55 package to reach climate neutrality by 2030, it is timely to examine similarities and differences in public views across EU countries.

2. Materials and methods

2.1. Data collection

We draw on an online survey conducted from June 24 to August 27, 2024. The survey was undertaken as part of a Horizon Europe research project, "CAPABLE". The data for the Czech Republic was collected within the SEEPIA project. The questionnaire, originally written in English, was translated into each country's main official language(s) by professional translators, and checked by native speakers. It was reviewed and approved by the Ethics Committee of ETH Zurich (EK-2024-141). The median completion time of the survey was 22 min. The overall sample included 19,328 validated responses from 13 EU countries: Austria (1594), Czechia (1726), Denmark (1591), France (1219), Germany (1591), Greece (1596), Hungary (1593), Italy (1210), the Netherlands (1219), Poland (1595), Slovenia (1201), Spain (1590) and Sweden (1597). For all countries except the Czech Republic, respondents were recruited through Dynata's commercial online panel. The survey respondents were at least 18 years old, and quota sampling was adopted for age (interlocked with gender) and education, matched to the distribution of each national population. A full comparison between sample and population is provided in Tables A1 and A2 of the Appendix (for more details, see Smith et al., 2026).

Several steps were taken to ensure the reliability of responses. These included tracking completion time relative to each country's median (with a cut-off at 45%). Median survey lengths, final sample counts, and attention-check failure rates by country are shown in Table A3.

At the beginning of this survey, about 10% of respondents (to be precise, 1922 participants) were randomly selected and asked the following open-ended question: "Which policy measures to fight climate change and reduce greenhouse gas emissions do you support the most and why?".[2] This question was posed at the beginning of the survey to avoid potential influence from other (closed-ended) questions on the responses. The general nature of the open-ended question allows participants to freely express their ideas and views about the subject, without limiting them in any way through specific information. This approach is in line with previous studies using open-ended questions (Tvinnereim and Fløttum, 2015; Savin et al., 2022). The average (median) length of responses is 14 (7) words. The response to this question was voluntary and the corresponding response rate to the question was 83% (1596 individuals). Fig. 1 disaggregates the responses for the overall survey and the open-ended question to the country level.

Apart from the open question, we have information on such socio-demographic characteristics like age, gender, education and country of origin. We also estimate the *perceived level of knowledge* about climate mitigation policies by asking "How informed would you say you were about 'Fit for 55' policies?" on a scale from 1 ("very uninformed") to 7 ("very informed").[3] Furthermore, we estimate the level of general climate policy support by asking "How much opposed, or in favour, are you of climate policies in general?" on a scale from 1 (strongly opposed) to 7 (strongly in favour). In addition, in line with Savin et al. (2025b), we measure the level of growth optimism by averaging responses on four questions related to the growth-vs-environment debate, namely on environmental protection, public services, life satisfaction and stability (see Table A4 in the Appendix). In particular, we rescaled the four responses from the Likert scale ranging from 1 to 7 to an equally distanced scale between −1 and + 1 (−1, −2/3, −1/3, 0, 1/3, 2/3, 1). Then we took an arithmetic average of the rescaled responses. The resulting measure is by construction between −1 and + 1, with −1 reflecting complete disagreement with economic growth being necessary to reach the four aforementioned goals (a strong degrowth perspective), while +1 indicates full agreement (a strong green growth perspective) (Drews et al., 2019; Savin et al., 2021). The middle-position between the two (corresponding to 0) is commonly referred in the literature as "agrowth" or "agnostic to growth" (van den Bergh, 2011). Combining the closed- and open-ended questions allows us to measure support for climate policy and economic growth (from very negative to very positive) as well as provide detailed insight into the kinds of policies that can count on most support from EU citizens. These six variables we will later use a covariates for structural topic modelling analysis.

2.2. Data analysis

To prepare the computational linguistic analysis, the data was translated from the official languages of the countries where the survey was conducted to English – using automatic Google Translate service. Several studies have compared it to alternative translating systems, such as DeepL, and found it to be providing good results with no statistically significant differences (De Vries et al., 2018; Maier et al., 2022; Sebo and de Lucia, 2024).

While inspecting the data, we noticed that many responses reflected a rejection to provide a substantial response, such as "I don't want to answer" or "I'm not interested". These were deleted, which reduced the sample by 211 responses to 1385. To assess potential selection bias introduced by excluding non-informative responses and people who

[1] Other multi-country studies using open-ended questions are Gregersen et al. (2023), who applied manual coding of responses from four EU countries on expected climate change consequences, and Lorenzoni et al. (2006), who undertook manual coding on textual responses regarding perceptions about climate change from the US and the UK. None of these addressed climate policy.

[2] Below the question the following instructions were provided "We would like you to take your time to answer this question and write some sentences. All kinds of answers are welcome. Please note that this is the only text-based question in the survey. You are able to skip this question if you do not want to respond."

[3] We asked for "Fit for 55" policies since these form the current package of legislative proposals by the EU to reduce net emissions by at least 55% by 2030.

Country	Total number of survey responses	Quota for open question	Complete responses to open question	Responses in the final sample
Austria	1594	152	135	106
Czechia	1726	148	105	75
Denmark	1591	152	125	84
France	1219	154	104	83
Germany	1591	151	135	108
Greece	1596	157	137	123
Hungary	1593	154	137	96
Italy	1210	152	110	94
Netherlands	1219	150	134	111
Poland	1595	155	141	112
Slovenia	1201	150	136	115
Spain	1590	134	114	95
Sweden	1597	113	83	64
Total	19322	1922	1596	1266

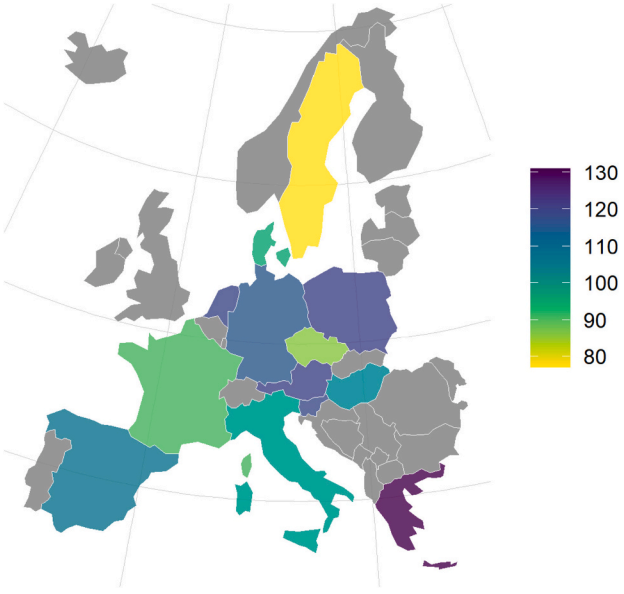


Fig. 1. Information about the survey sample size per country (left plot); number of responses to the open-ended question as a heat map (right plot).

refused to answer (another 326 observations), we compared the composition of the retained and omitted samples within each of the 13 countries across gender, age, and education. Given small sample sizes in some countries, we used the Fisher's exact test. Across virtually all country–variable combinations differences between the distributions of kept and excluded cases were statistically insignificant at the 5% level (Tables A5-A7 in the Appendix). The few significant instances did not survive false-discovery (Benjamini–Hochberg, BH henceforth) adjustment and showed no consistent pattern. Overall, the exclusion of non-informative responses does not appear to introduce any bias in the analytic sample. Another 60 observations were omitted because of missing values for one of the six covariate variables (mostly on growth optimism) we employ later in the STM analysis.

Next, we pre-processed the remaining responses as follows:

- replacing capital by lower-case letters;
- transforming words through lemmatization to their dictionary form;
- forming frequent expressions (so called bigrams, like "climate_change", "renewable_energy") using a Normalized Pointwise Mutual Information (NPMI) score (Bouma, 2009);
- deleting stop words (like pronouns, prepositions and other common words, such as "also");
- removing words with a length of less than three characters;
- removing words appearing in less than five individual responses.

This resulted in 59 discarded answers (i.e including only stopwords or very rare words), while the remaining responses contain 446 (unique) words and 7757 words in total. The final sample comprises 1266 reponses.

In the past, freely formulated textual responses have typically been analyzed through manual coding into thematic categories (Leiserowitz, 2006; Lorenzoni et al., 2006). However, this approach is not only time consuming and hard to reproduce, but is suffering from inconsistency arising from subjective and idiosyncratic assessments by distinct human coders. To overcome these problems, over the last few decades a method called topic modelling has been developed. It attributes distinct words into topics based on how ofter they co-occurr across textual responses. Hence, unlike a simple word count, topic modelling considers words in the context of. other words they appear with (Blei, 2012). For example, observing the words 'car', 'limit' and 'city' next to 'public_transport' and 'train' in the topic with a label 'Public transport' (see Table 1 below) implies that these words appeared a lot together, and that many EU citizens regard public transport as a good strategy to fight climate change.

To classify the responses into meaningful topics, we thus rely on STM. It applies Bayesian inference to identify words associated with specific topics and to determine topics present in each survey response, based on previously observed responses. The method operates under the assumption that words are generated through a two-step process: first, each response follows a unique topic distribution, from which a topic is randomly selected; second, each topic has an associated word distribution, from which a word is drawn for the chosen topic. By iterating this process multiple times, responses may contain multiple topics in varying proportions. STM uncovers both the topic distribution for each response and the word distribution for each topic by iteratively refining its estimates until it finds the optimal model that best explains the data (Blei, 2012). An advantage of STM compared to other topic-modelling algorithms is that it was developed particularly for short texts that are typical of survey responses to open-ended questions. This is because by incorporating additional information from the responses to the wider survey, such as socio-demographic or attitudinal characteristics, STM is able to produce more interpretable topics. The method was implemented using the STM package in R developed by Roberts et al. (2019).

As mentioned earlier, as additional information to form meaningful topics, we use several covariates obtained from the survey, namely gender, age, education, perceived knowledge of climate policy, climate policy support and the index of growth optimism. These covariates serve as predictors of climate policy preferences and help to distinguish some basic socio-demographic groups. In line with previous literature using STM for climate policy analysis (Tvinnereim et al., 2017b; Savin et al.,

Table 1
Topics identified for responses to the open-ended question about support of policy measures to fight climate change and reduce greenhouse gas emissions.

	Topic label	Most discriminating terms and two illustrative responses per topic	Topic proportion
T1	No support for climate policy	know, political_measure, one, big, climate, pay, support, effect, little, nonsense "no one supports it because man-made climate change does not exist." "i do not support any political measures to combat climate change."	11.9%
T2	Waste recycling	sort, product, bottle, waste, consumption, alternative, plastic, collection, recycling, packaging "eliminate all plastic bottles and plastic bags" "i 100% support households in denmark sorting all their waste. i like that we should sort residual waste, food waste, cardboard/paper, plastic/ metal and clothes into their own bins"	10.0%
T3	Public transport	car, city, limit, electric_car, private, train, public_transport, travel, road, bike "recycle, buy second-hand items, go to work by bike, use car-sharing platforms and public transport" "expanding free bike paths for public transport"	9.4%
T4	Clean energy	green, nuclear, power_plant, source, energy, electricity, wind, solar, fossil_fuel, renewable_energy "expansion of photovoltaic systems. Expansion of wind power plants. The energy is available practically free of charge." "transition to green energy! shutting down coal-fired power plants. Supporting those using solar and wind energy!"	9.0%
T5	Companies must reduce emissions	reduce, company, aim, greenhouse_gas, emission, deforestation, manufacturing, requirement, policy, target "large companies should be required to comply with regulations to reduce their emissions." "to make companies more responsible for reducing greenhouse gases and investing more in renewable energies"	8.4%
T6	Global efforts essential	opinion, want, must, world, party, worldwide, european, everyone, start, country "not to carry it out on the backs of the citizens. All other countries worldwide must join in, otherwise a single country alone cannot achieve anything." "common guidelines must be established for all countries; countries that do not want to participate must be excluded from international trade."	8.3%
T7	Other countries must take action	care, none, ban, politics, responsibility, problem, china, politician, choice, domestic "china and usa should do something not our cow are the problem" "ones that would force china and russia to take action."	7.4%
T8	Raise awareness	nuclear_power, good, flight, way, effective, information, people, bad, raise_awareness, idea "provide more information to people about climate change and found easy solutions" "people protesting in the streets, raising awareness of changes in the media"	7.1%
T9	Regulate traffic and factories	reduction, factory, restriction, mean, pollution, exhaust, air, vehicle, industry, comply "restriction of chemical sprays high fines for industries that do not comply with exhaust emission reduction rules incentives to reduce car use" "reduction of exhaust gases from cars and factories. Stricter measures and fines for violators"	7.1%
T10	Consume and pollute less	less, save, solar_panel, drive, produce, garbage, water, possible, much, return "less plastic, less food waste, waste separation, producing less garbage" "eat less meat, vegan, vegetarian, drive less, fly less, travel less, travel together, don't throw away food"	6.3%
T11	Carbon taxation	coal, away, tax, power, fly, stop, plane, wind_turbine, expansion, remove "flying tax, airplanes are the biggest polluters" "co2 tax simplicity of implementation"	5.4%
T12	Promote sustainable technologies	sustainable, promote, investment, technology, efficient, incentive, standard, include, infrastructure, subsidy, "introducing stricter emission standards for industry and energy. Supporting renewable energy sources: greater use of solar, wind, hydro and geothermal energy. Promoting public transport: improving public transport infrastructure and services. Promoting the use of electric vehicles: subsidies for the purchase of electric vehicles and the development of charging infrastructure. Sustainable mobility". "tackling climate change requires a concerted effort to reduce greenhouse gas emissions and transition to a sustainable economy. This includes promoting clean energy sources, boosting energy efficiency, adopting sustainable transport, protecting forests and encouraging individual lifestyle changes."	5.3%
T13	Stop pollution	pollute, necessary, battery, environment, give, zero, avoid, natural, many, close "building new zero-impact homes electric cars are not a solution reorganizing road transport is too impactful and polluting forcing companies to be zeroemissio" "i support and help with all measures against the pollution of the planet and climate change as much as i can! reducing fossil energy, introducing new ones. Slowly replacing polluting	4.4%

(*continued on next page*)

Table 1 (*continued*)

Topic label	Most discriminating terms and two illustrative responses per topic	Topic proportion
	cars, but i'm not sure that the electric solution is the best one, due to the environmental impact of battery production."	

Note: Terms shown are the most frequent and exclusive to each topic. Illustrative responses are chosen from the ten responses with the highest topic prevalence.

2020), we included the main socio-demographic variables and perceived knowledge and support of climate policy. We dediced not to include income due to a large number of missing observations. The only novelty is growth optimism, which has received considerable attention in the recent literature (King et al., 2023; Bell et al., 2025). The number of covariates for STM is traditionally kept low to avoid problems with topic model convergence. We computed Variance inflation Factor to ensure that inclusion of these covariates in a topic model does not cause multicollinearty. All VIF factors are between 1 and 2, which is a lot lower than the conservative threshold of 5. Once the topic model is formed, we use topic prevalences across responses as the dependent variable in a linear regression model specified for each of the 13 topics (indexed with k) as demonstrated below:

$$\begin{aligned} Topic\ Prevalence_k \sim\ & Constant_k + Age + Gender + Education \\ & + Perceived\ knowledge\ of\ climate\ policy \\ & + Climate\ policy\ support + Growth\ optimism + Residual_k \end{aligned} \quad (1)$$

Before analyzing the results, it is necessary to determine the appropriate number of topics (k). To achieve this, the STM algorithm is run across different values of k (ranging from three to twenty), and the outcomes are assessed based on three key criteria. First, prediction accuracy is evaluated using the held-out log-likelihood, which measures how well the model generalizes to unseen data. Second, exclusivity is examined, ensuring that the most frequently occurring words in each topic are distinct. Third, semantic coherence is checked, verifying whether words assigned to the same topic tend to appear together in individual responses. Additionally, an implicit fourth criterion considers the interpretability of the model, favoring a more concise set of topics for clarity. Fig. A1 presents the results indicating that 13 topics maximises prediction accuracy and reaches close to maximum exclusivity while peforming well on semantic coherence.

3. Results and discussion

In the following we first present the topics we identified explaining their focus and overall prevalence in our data. Next, we report the results of a regression analysis with topic prevalences as dependent variables and six explanatory variables measuring social-demographic characteristics and views. The results of this help us understand what socio-demographic groups tend to favour certain policy instruments (captured by our topics). Subsequently, we analyse how topics vary in popularity across the 13 countries to clarify difference in policy preferences across the EU. Finally, we investigate how the identified topics are distributed among people showing different levels of support of climate policy and optimism regarding economic growth. This allows us to assess whether people perceive any trade-off between the two, and how topics differ between those with distinct views.

Table 1 presents the 13 topics identified from the open-ended question on preferred climate mitigation policy instruments. For each topic, it lists the 10 most distinctive words, selected based on their frequency and exclusivity, along with two illustrative responses where that topic is highly prevalent. Additionally, the table reports the proportion of total responses associated with each topic, i.e. topic prevalence. After reviewing a broader set of illustrative responses—which are not included here for conciseness—topic labels were assigned to clearly and succinctly represent the main themes of each category. Fig. A2 presents word clouds illustrating dominant terms for the resulting topics, with font size standing for likelihood of the words and darkness for exclusivity.

The most popular topic T1 (henceforth we denote with TX topic X) rejects the need for climate policy often doubting the anthropogenic origin of climate change and covers almost 12% of all textual responses in the sample. This number is rather high when compared with past European Social Surveys which find that climate change denial typically varies from 4% to 15% in EU countries with the EU average being less than 10% (Poortinga et al., 2019; Lübke, 2022). Several topics with high prevalence focus on specific sectors producing emissions, such as waste (T2), transport (T3), energy (T4) and factories (T9). T5 stresses the responsibility of companies in reducing emissions. Two topics (T6 and T7) indicate importance of international agreements and global efforts to fight climate change. Several topics focus on specific instruments: T8 on information provision, T9 on direct regulation, T11 on carbon taxation and T12 on technology subsidies. Other topics are more generic and do not specify any concrete policy instrument to reduce emissions, such as "consume less" (T10) and "pollute less" (T13). Altogether, only about 25% of responses talk about concrete policy instruments, while most of the remaining responses talk about general strategies. This might suggest that citizens do not have a clear understanding or view on the main types of instruments of climate policy. Neither do responses explicitly go into criteria to evaluate policy performance – notably effectiveness, efficiency and equity – let alone of undesirable systemic effects, such as indirect emissions, rebound and leakage. The latter perhaps is not so surprising given that even policy experts tend to underestimate importance of those effects as a recent expert survey shows (Savin et al., 2024).

It is worth noting that some of our results echo the findings of Tvinnereim et al. (2017b) for Norway. They derived seven topics, many of which are similar to the ones we find: transportation (our T3), energy transition (our T4), attribution of climate change (our T1), emission reduction (our T13), the international dimension (our T6 and T7), lifestyle/consumption (our T2 and T10) and government measures (our T9 and T12). Like our study, they find that respondents focus more on general principles rather than concrete policies. The advantage of our analysis is a more granular distinction of topics (13 vs 7) across multiple countries. This allows not only to identify additional topics (like information provision in T8 and companies action in T5), but also to see how these topics vary in prevalence across countries (shown in Fig. 3).

We proceed with a regression analysis quantifying factors to explain the variation of topic prevalence among the responses. Put differently, this analysis allows us to find significant correlations between the tendency of respondents to stress certain policy instruments (topic) and their socio-demographic characteristics (covariates). Fig. 2 reports the results that are significant at the 5% level, while the full set of regression results is shown in Table A8 in the Appendix.

We find that older people tend to express topics related to direct regulation (T5,T9, T13) and support public transport (T3), while younger people emphasize carbon taxation and reduced consumption (T10 and T11). More educated people support technology subsidies and regulation of factories (T9 and T12), while less educated ones favour public transport and reduced consumption (T3 and T10). Since education is strongly positively correlated with income, the latter finding may reflect the preference of citizens to support low-income households by taxing the rich (Fabre et al., 2025). Lower consumption (T10) is also supported by people who claim they understand climate policies well. These people also find companies having to act more responsibly and reduce emissions (T5). People who perceive own knowledge of climate policies as low, stress clean energy and regulation of factories (T4 and

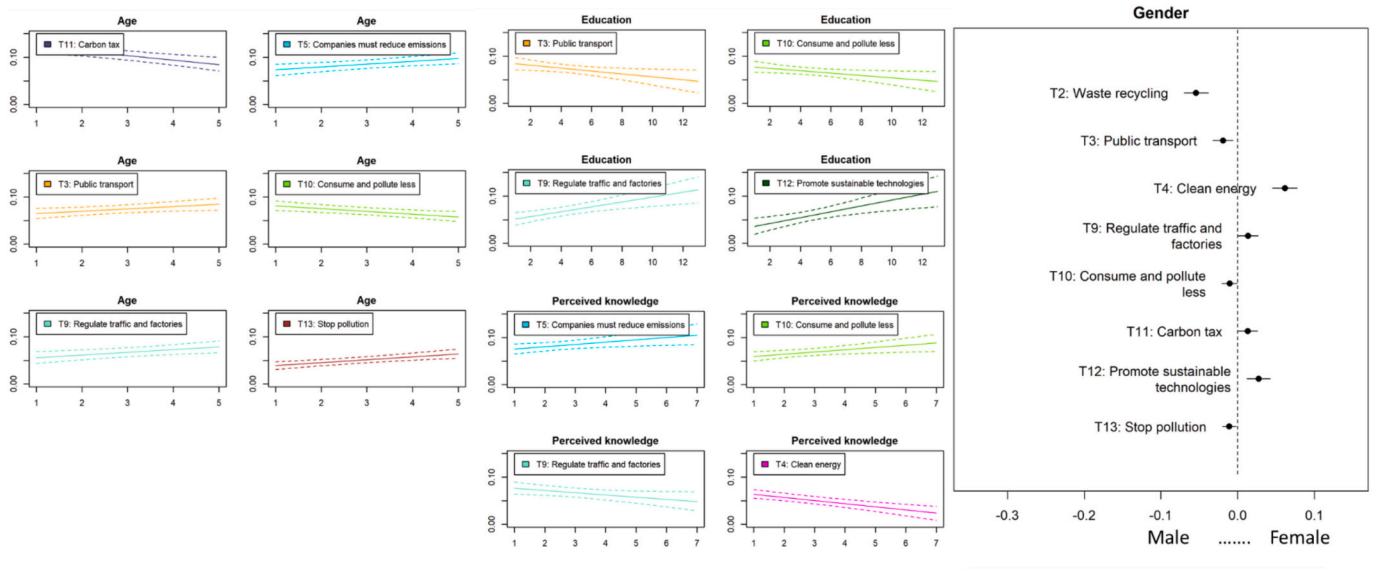


Fig. 2. Correlation between covariates and topic prevalence on most preferred climate mitigation policy.
Note: Point estimates of selected covariates on topic prevalence are plotted holding all other covariates constant. The plot for gender shows mean difference in topic proportions between male and female (a positive value on the X-axis indicates a larger prevalence for male respondents). Only results with statistical significant of 5% or higher are displayed.

T9). Finally, male respondents are more likely to support policies promoting clean energy and regulating factories, carbon taxation and technology subsidies (T4, T9, T11 and T12), while female ones stress more sector strategies like waste recycling, public transport and pollution (T2, T3, T13). The latter result on gender differences across the topics also echoes Tvinnereim et al. (2017b) where men talk more about regulation and external factors while women favour individual behavioural changes. A somehwat surprising finding compared to Tvinnereim et al. (2017b) is that gender is not correlated with T1 on "no support for climate policies". This may be due to the timing of the survey when issues related to security, migration and inflation dominated climate change as larger concerns (Hobolt et al., 2025; Ladini and Biancalana, 2025).

Subsequently, we map in Fig. 3 how topic prevalences vary across countries in the form of a heatmap (Fig. A3 in the Supplementary Information presents the same information in the form of a bubble chart), finding notable differences.

- Opposers of any climate policy (T1) are disproportionately present in Eastern European countries like Czechia and Poland, while in Greece their share is the lowest. The first is consistent with earlier studies (Dechezleprêtre et al., 2025; Umit and Schaffer, 2020; Chaisty and Whitefield, 2015).
- Waste recycling (T2) is often mentioned in Denmark and Hungary, and little in Germany, Spain and Poland. The relatively high concern in Denmark and Hungary can be explained by several factors. Denmark has one of the highest rates of waste generation in the EU and historically heavily relies on inceneration rather than reuse and recycling (Magazzino et al., 2021). Regarding Hungary, while still below the EU average municipal waste, it has recently experienced serious microplastic contamination of its main river Tisza (Kiss et al., 2021).
- Citizens of Spain are strong in favour of public transport (T3) and subsidies for low-carbon technologies (T12), while in Czechia people value these topics much less. Such differences may be explained by different development experiences. Czechia, as a former communist country, has since long a well developed and affordable public transport system (Patino-Artaza et al., 2024), while energy generation is relying on nuclear power plants (Osička and Černoch, 2017). Spain, in contrast, is leading among EU countries in terms of installed solar and wind energy, which installation is subsidised by the state. In addition, Spain still experiences a shortage of public transport services in many peripheral and tourist-heavy zones (Moragues et al., 2024) and low satisfaction with proximity, intermodality and quality of public transport(De Oña et al., 2021).
- Greek citizens strongly favour regulation of factories (T9). This echoes another survey among Greek citizens which finds that over 70% of the population find climate mitigation to be the responsibility of industry and only less than a third find it to be a personal responsibility (Erbach and Meinardi, 2025).

As one may question robustness of our results given the small sample sizes we have per country, we aggregated the 13 countries into six country groups based on their geographical and cultural proximity (e.g. Sweden with Denmark, Germany with Austria, Czechia with Poland) and subsequently repeated the analysis (Fig. A4 in the Appendix). As one can see, our major results hold. For example, opposition to climate policy is the strongest in North-Eastern Europe and the weakest in Southern Europe; and public transport and waste recycling are greater concerns in Southern and Western Europe than in Eastern Europe, where there is more attention for the issue of clean energy.

To better understand how the generated topics correspond to the level of support expressed to climate policy in general and the views of respondents towards economic growth (whether it is desirable like in the green growth paradigm or detrimental as suggested by degrowth proponents), we plot the topics on a two-dimensional scale with the corresponding variables (Fig. 4). Here the position of each topic on the horizontal and vertical axes reflects the weighted average responses on these two dimensions (the weights reflect the prevalence of the topic in the corresponding response). This way we take into account responses containing two or more topics. The sizes of each bubble indicate the topic proportion in the whole set of responses.

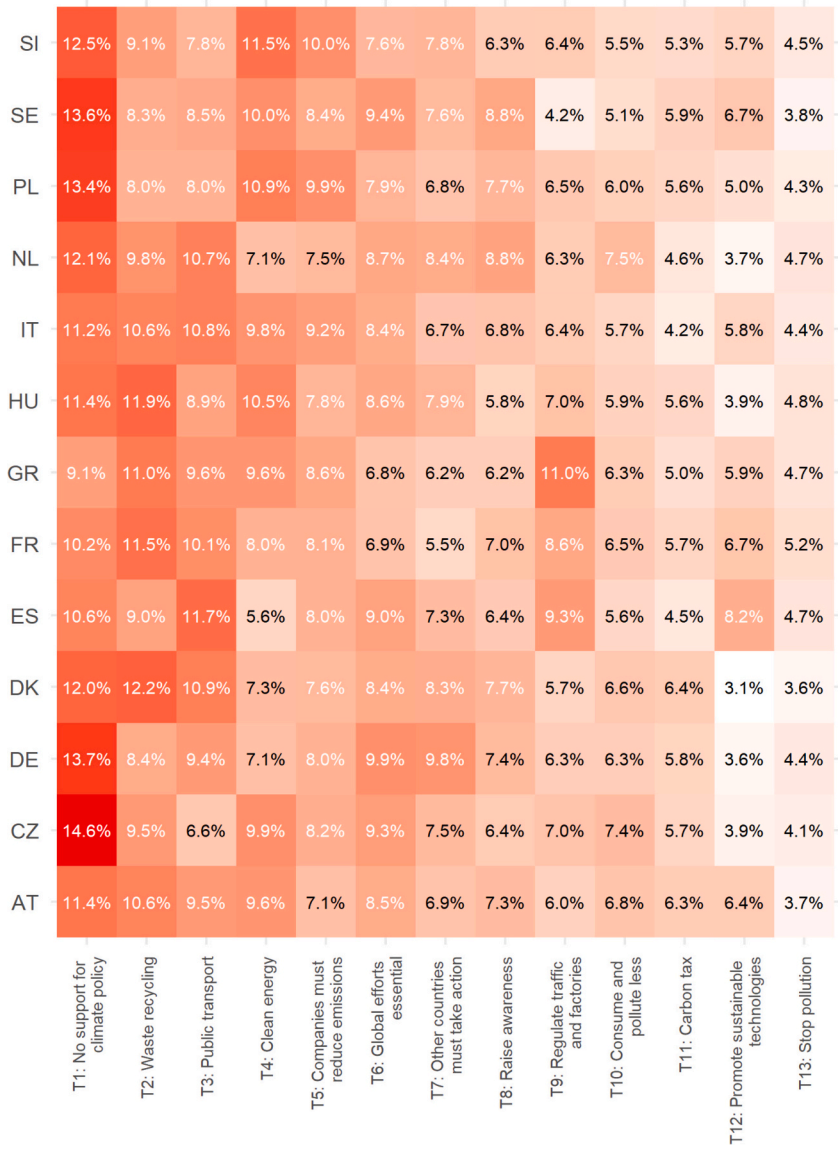


Fig. 3. Topic prevalence across countries in the form of a heat map.

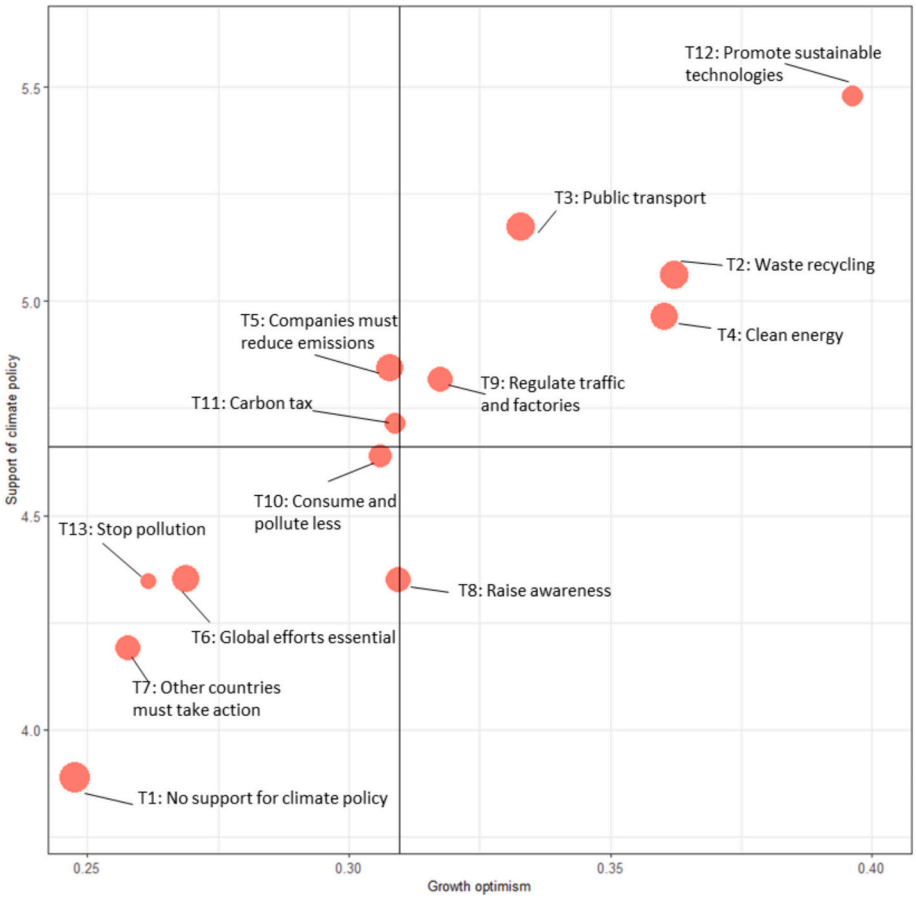


Fig. 4. Correspondence of topics on most favoured climate policy instruments with general climate policy support and degree of growth optimism.
Note: The size of a sphere reflects the prevalence of the respective topic in the overall set of responses. The position of each topic on the horizontal and vertical axes reflects the weighted (by prevalence of the topic in the corresponding response) average response on the corresponding closed question on climate policy support and on the growth optimism index (see details in Section 2.1). Lines indicate average values on the two dimensions in our sample. On the vertical axis: 4 stand for neutral, 5 – somewhat in favour, 6 – strongly in favour (of climate policy), On the horizontal axis: 0 indicates to agnostic to growth, 1 – fully in favour and − 1 fully against.

We find that perspectives of people on growth and climate policy support are quite aligned, that is, topics expressed by people having a higher support of climate policy tend to also exhibit more positive sentiment towards economic growth. The strongest supporters are more likely to make statements in favour of technology subsidies (T12), expansion of public transport, waste recycling and green energy transition (T2-T4). Unsurprisingly, the strongest opponents of climate policy are most likely to state they do not support it (T1). Surprising, though, they are also least positive about the need of economic growth. Next, people giving low policy support are more likely to shift the responsibility to other countries (T6 and T7). Finally, information provision (T8) is a common theme among people with relatively low climate support, supposedly as this instrument leaves a lot of freedom to emitters while at the same time it is unlikely to achieve considerable emission reductions on its own (Stechemesser et al., 2024). Interestingly, topics on carbon taxation and reduction of consumption seem to be mentioned by people exhibiting similar level of support for climate policy and growth optimism. Given the emphasis on lower consumption, we expected a more negative sentiment towards economic growth for T10. Since carbon taxation is often criticised for having little public support, we expected people proposing it to exhibit stronger climate policy support than the average. However, we do not find any evidence for this. Finally, people most enthusiastic about economic growth logically emphasize more subsidies for low carbon technologies (T12) but not carbon taxation (T11), arguably as it has a more uncertain effect on economic growth – which is in line with previous studies (Savin et al., 2025b).

4. Conclusions

Based on a survey of citizens in 13 EU countries we obtained insight into which policy measures can count on most public support. This represents the first study using computational linguistics to assess public opinion on climate policy covering multiple countries.

A total of thirteen main topics were identified. The most popular one, accounting for almost 12% of all responses, expresses a denial of the need for climate policy. Additional large topics focus on specific domains producing emissions, such as waste (10%), transport (9.4%), energy (9%) and factories (7.1%). One topic with a prevalence of 8.4% stresses the responsibility of companies in reducing emissions, while two topics (jointly accounting for 15.7%) indicate the importance of global efforts and the role of other countries.

Only about 25% of the responses talk about concrete policy instruments, such as direct regulation, carbon pricing, information provision or technology subsidies. Other topics are more generic, notably “consume less” (T10) and “pollute less” (T13). Altogether, we conclude that there European citizens show little awareness and knowledge of policy details, which in turn may explain a lack of public support for

climate policy in general. Indeed, if people do not understand that certain instruments are essential to achieve a transition to a low-carbon production system and lifestyle, they will accept them less easily (Mildenberger et al., 2022; Savin et al., 2020). This contributes to scepticism about voters' capacity to judge policy proposals regarding climate mitigation and points at the need for providing citizens with more information about policy details and effectiveness. At the same time, information provision should not be understood as a purely technical exercise. Climate policy debates take place in a contested public sphere in which organised interests actively seek to delay, distort or discredit effective mitigation measures. In this context, improving public understanding requires not only clearer communication of policy mechanisms and impacts, but also transparency about distributional consequences and the economic interests at stake.

Analysis of socio-demographic and attitudinal factors to explain the variation in topic prevalence among respondents suggests that age, gender and education matter. For example, older people tend to support public transport and direct regulation, while younger people emphasize carbon taxation and reduced consumption. At the level of countries, we find notable differences as well. For example, opponents of any climate policy are disproportionately present in certain Eastern European countries.

Finally, we analyzed how topic prevalence relates to average support for climate policy and perceptions of economic growth, finding that perspectives of people on growth and climate policy support are quite aligned. This indicates that framing of climate policies as reducing economic growth may undercut public support.

The findings of this study suggest that while public support for climate action exists across the EU countries, it is often rooted in general values or sectoral preferences rather than in a good understanding of differences between policy instruments. For policy makers, this implies a twofold challenge. First, to design communication strategies that improve public understanding of the need for effective instruments, such as carbon pricing and direct regulation. Second, to frame policies in ways that resonate with citizens' everyday experiences – such as improving waste systems, transport infrastructure, or energy access. Furthermore, significant country-level and demographic variation in climate preferences means that EU-wide climate strategies should be complemented by tailored national initiatives that address local concerns like about public transport or local air pollution. Finally, the observed alignment between climate policy support and pro-growth attitudes is an additional reason to not frame climate action as a sacrifice but to connect it with widely held aspirations regarding economic prosperity.

Future research can build on our results in several ways. First, repeating similar open-ended questions over time would allow tracking how citizens' climate-policy narratives evolve in response to major policy reforms, energy price developments, or geopolitical events, thereby enabling a dynamic analysis of changes in public reasoning. Second, combining open-ended responses with experimental survey designs could help identify which types of messages increase awareness of concrete policy instruments and their effectiveness. Third, future work could link topic prevalence more directly to behavioural outcomes, such as voting intentions or willingness to accept specific policy costs, to better understand how narratives translate into political feasibility. Finally, applying the same methodology to other countries and regions than the EU would allow identifying how institutional and cultural contexts shape citizens' views on climate policy instruments.

CRediT authorship contribution statement

Ivan Savin: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jeroen van den Bergh:** Writing – original draft.

Funding

This work was supported by the EU Horizon Europe research and innovation programme under the grant agreement CAPABLE (101056891).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Appendix

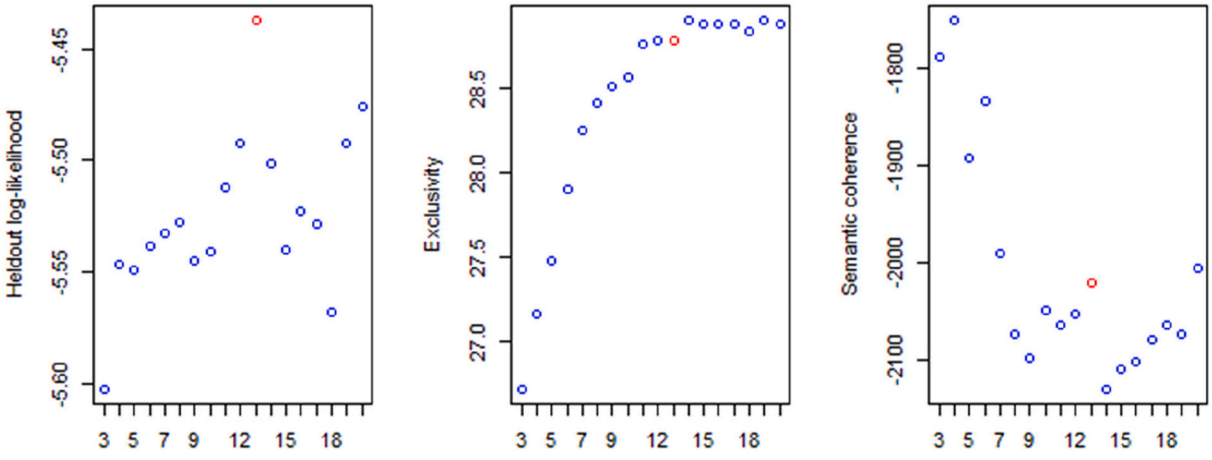


Fig. A1. Topic model performance on three key criteria for distinct number of topics.

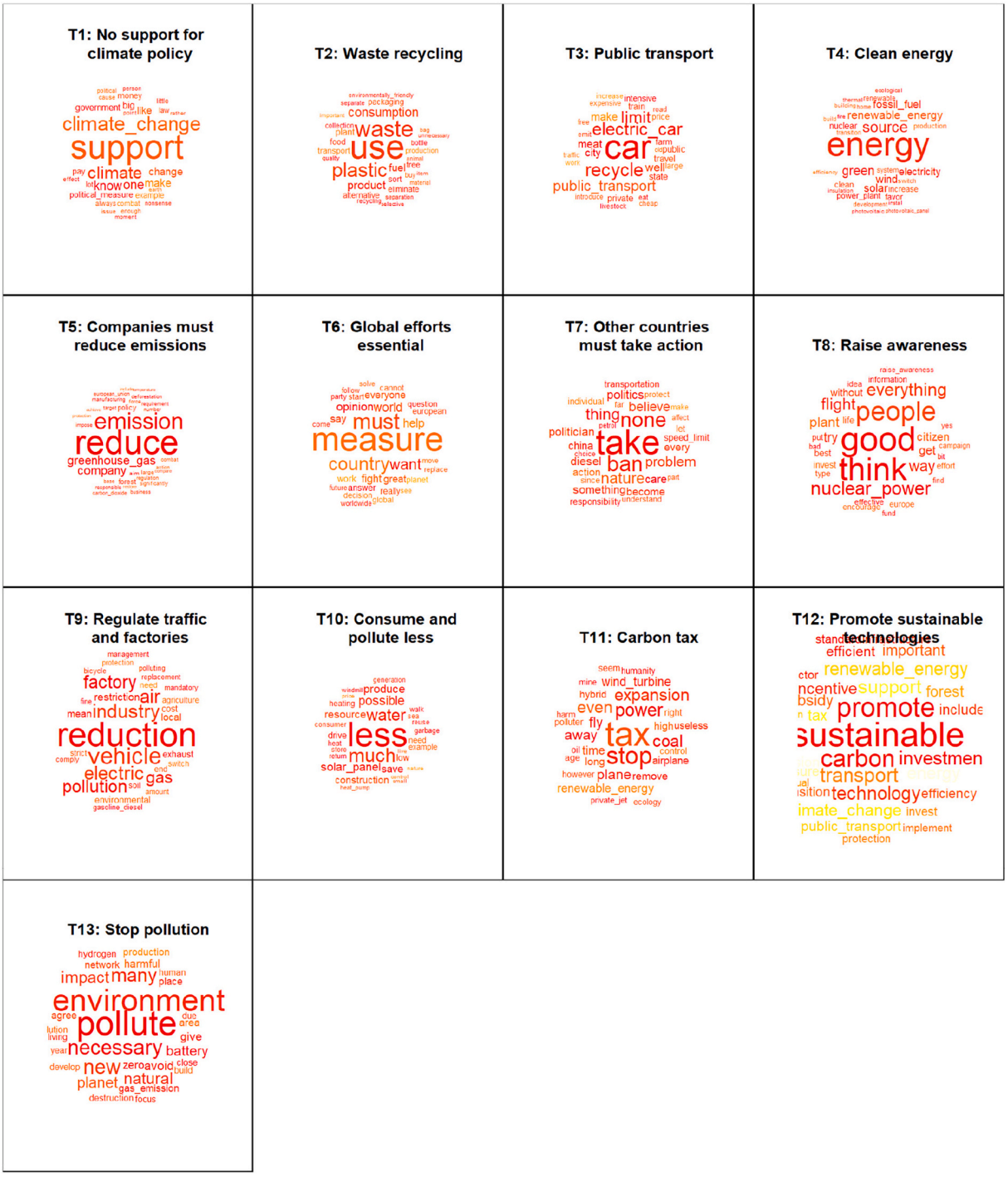


Fig. A2. Word clouds of thirteen topics generated from the open-ended question.
Note: Font size indicates the probability (weight) of the respective word given the topic, while the colour of the word corresponds to its exclusivity (the darker the colour, the more exclusive the words).

Fig. A3. Topic prevalence across countries in the form of a bubble chart.

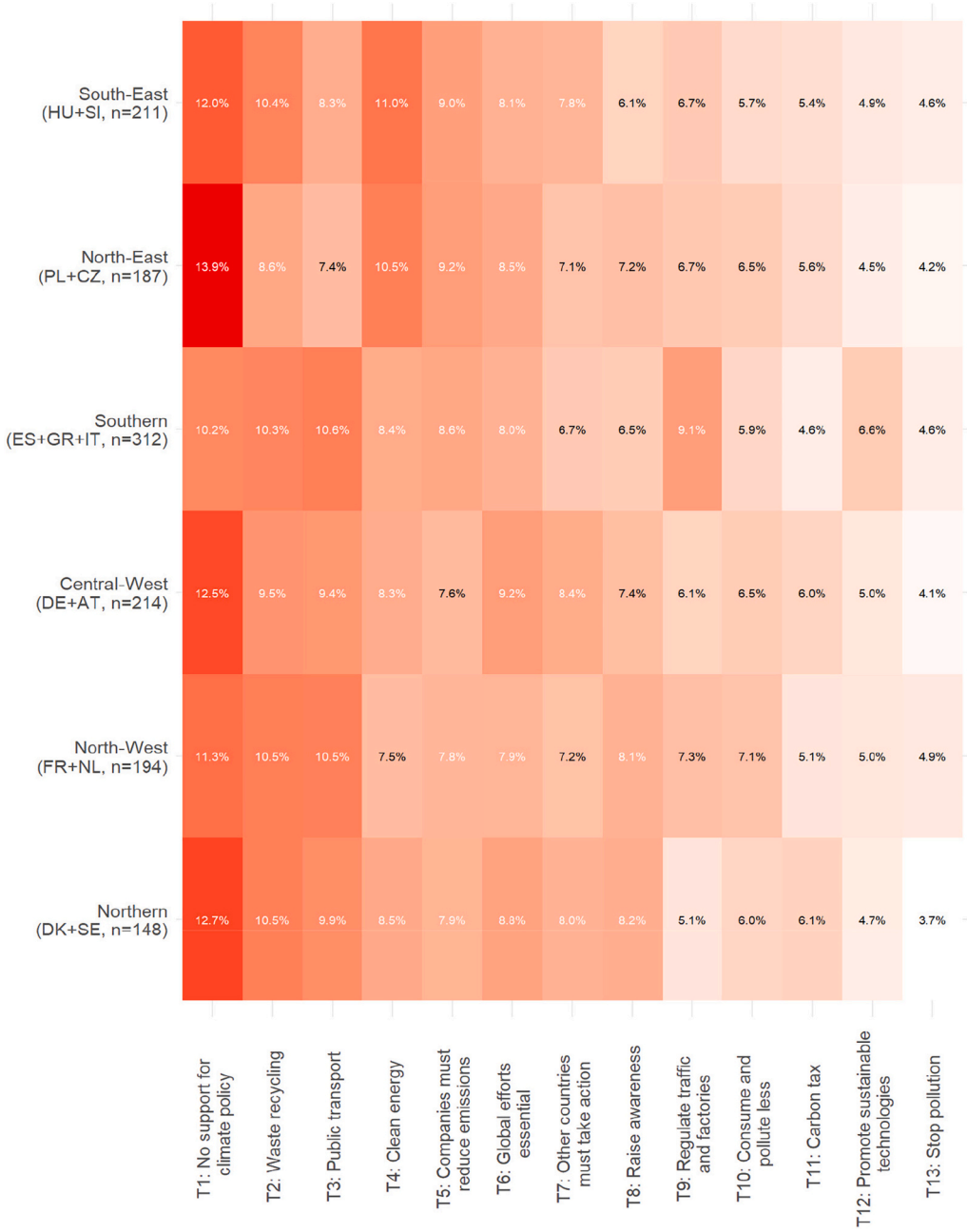


Fig. A4. Topic prevalence across countries in the form of a heat map for aggregated country groups.

Table A1
Age and Gender Quotas: Population and Sample Composition by Age and Gender for Each Country.

		Male					Female				
		18–29	30–39	40–49	50–59	60–74	18–29	30–39	40–49	50–59	60–74
Austria	Target (n)	159	153	143	169	174	150	148	143	170	191
Austria	Target (%)	9.9%	9.6%	8.9%	10.6%	10.9%	9.4%	9.3%	8.9%	10.6%	11.9%
Austria	Sample (n)	109	134	141	178	189	173	164	147	172	200
Czechia	Target (n)	136	152	186	143	185	128	142	176	140	212
Czechia	Target (%)	8.5%	9.5%	11.6%	8.9%	11.6%	8.0%	8.9%	11.0%	8.8%	13.3%
Czechia	Sample (n)	126	141	196	162	205	136	156	198	163	243
Denmark	Target (n)	181	140	142	156	184	173	135	142	154	193
Denmark	Target (%)	11.3%	8.8%	8.9%	9.8%	11.5%	10.8%	8.4%	8.9%	9.6%	12.1%
Denmark	Sample (n)	159	138	140	149	203	177	135	142	161	203
France	Target (n)	120	103	108	112	142	118	109	112	116	160
France	Target (%)	10.0%	8.6%	9.0%	9.3%	11.8%	9.8%	9.1%	9.3%	9.7%	13.3%

(*continued on next page*)

Table A1 (*continued*)

		Male					Female				
		18–29	30–39	40–49	50–59	60–74	18–29	30–39	40–49	50–59	60–74
France	Sample (n)	93	98	115	122	167	100	106	114	132	186
Germany	Target (n)	152	149	134	175	194	140	141	133	173	209
Germany	Target (%)	9.5%	9.3%	8.4%	10.9%	12.1%	8.8%	8.8%	8.3%	10.8%	13.1%
Germany	Sample (n)	118	134	124	188	233	121	135	135	179	237
Greece	Target (n)	140	134	169	160	188	130	131	170	168	210
Greece	Target (%)	8.8%	8.4%	10.6%	10.0%	11.8%	8.1%	8.2%	10.6%	10.5%	13.1%
Greece	Sample (n)	129	130	236	196	115	141	161	242	187	66
Hungary	Target (n)	152	144	178	139	169	142	135	174	144	223
Hungary	Target (%)	9.5%	9.0%	11.1%	8.7%	10.6%	8.9%	8.4%	10.9%	9.0%	13.9%
Hungary	Sample (n)	128	147	183	137	172	140	143	167	160	223
Italy	Target (n)	104	94	119	132	147	95	92	120	136	161
Italy	Target (%)	8.7%	7.8%	9.9%	11.0%	12.3%	7.9%	7.7%	10.0%	11.3%	13.4%
Italy	Sample (n)	97	97	124	139	153	85	97	122	141	167
Netherlands	Target (n)	130	106	100	120	145	126	103	101	120	149
Netherlands	Target (%)	10.8%	8.8%	8.3%	10.0%	12.1%	10.5%	8.6%	8.4%	10.0%	12.4%
Netherlands	Sample (n)	100	89	97	122	180	106	115	107	138	171
Poland	Target (n)	142	170	165	127	180	137	164	162	131	222
Poland	Target (%)	8.9%	10.6%	10.3%	7.9%	11.3%	8.6%	10.3%	10.1%	8.2%	13.9%
Poland	Sample (n)	137	163	155	129	182	147	166	172	135	221
Slovenia	Target (n)	104	114	130	119	149	92	101	117	115	159
Slovenia	Target (%)	8.7%	9.5%	10.8%	9.9%	12.4%	7.7%	8.4%	9.8%	9.6%	13.3%
Slovenia	Sample (n)	79	99	136	132	139	108	131	145	122	118
Spain	Target (n)	139	134	180	166	174	134	134	179	169	191
Spain	Target (%)	8.7%	8.4%	11.3%	10.4%	10.9%	8.4%	8.4%	11.2%	10.6%	11.9%
Spain	Sample (n)	130	125	178	166	189	129	135	176	163	199
Sweden	Target (n)	174	163	147	149	181	160	154	142	145	185
Sweden	Target (%)	10.9%	10.2%	9.2%	9.3%	11.3%	10.0%	9.6%	8.9%	9.1%	11.6%
Sweden	Sample (n)	141	163	135	160	199	136	153	148	158	204

Table A2
Education Quotas: Population and Sample Composition by Education Levels for Each Country.

Country	Group	Low (%)	Middle (%)	High (%)
Austria	Target	14.0	49.0	37.0
Austria	Sample	1.6	51.0	47.4
Czechia	Target	42.0	37.0	21.0
Czechia	Sample	41.2	36.9	21.9
Germany	Target	17.0	50.0	33.0
Germany	Sample	15.7	50.8	33.6
Denmark	Target	17.8	39.3	42.9
Denmark	Sample	15.4	40.2	44.4
France	Target	16.0	41.0	42.0
France	Sample	19.0	27.7	53.4
Greece	Target	18.9	46.7	34.3
Greece	Sample	4.9	46.0	49.1
Hungary	Target	12.6	57.5	29.8
Hungary	Sample	11.6	55.6	32.8
Italy	Target	34.5	43.9	21.6
Italy	Sample	21.3	48.4	30.4
Netherlands	Target	19.3	36.4	44.3
Netherlands	Sample	20.2	36.5	43.4
Poland	Target	5.7	56.4	37.9
Poland	Sample	6.1	55.1	38.8
Slovenia	Target	11.5	54.7	33.8
Slovenia	Sample	4.1	55.8	40.2
Spain	Target	35.8	22.7	41.4
Spain	Sample	34.9	23.2	41.9
Sweden	Target	10.0	41.0	49.4
Sweden	Sample	7.6	42.3	50.1

Table A3
Survey Duration, Sample Size, and Attention Check Failure Rate by Country.

Country	Median Duration (m:s)	Sample Size	% Failed Attention Checks
Austria	20:18	1594	6.6%
Czechia	29:10	1726	
Germany	19:06	1597	6.4%
Denmark	20:46	1591	6.3%
Spain	22:56	1590	
France	21:19	1219	6.3%
Greece	20:43	1596	6.6%
Hungary	23:21	1593	7.7%
Italy	20:42	1210	3.3%
Netherlands	18:53	1219	6.5%
Poland	21:55	1595	6.1%
Sweden	23:40	1597	
Slovenia	22:59	1201	5.9%

Table A4
Survey statements corresponding to the Growth-vs-Environment Module (GEM).

GEM statement	Survey statement
Environmental Protection	Economic growth is necessary to finance environmental protection.
Life Satisfaction	Continued economic growth is essential for improving people's life satisfaction.
Public Services	Economic growth is necessary to finance public health and pension systems.
Stability	Without economic growth, the economy will be less stable.

Table A5
Comparison of retained and omitted observations by gender.

Gender	Male		Female		Fisher p	BH q
Country	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)		
AT	51 (42.5%)	12 (37.5%)	69 (57.5%)	20 (62.5%)	0.5860	1.0000
CZ	51 (57.3%)	30 (50.8%)	38 (42.7%)	29 (49.2%)	0.5010	1.0000
DE	50 (43.1%)	15 (42.9%)	66 (56.9%)	20 (57.1%)	1.0000	1.0000
DK	47 (49.5%)	31 (54.4%)	48 (50.5%)	26 (45.6%)	0.8350	1.0000
ES	48 (44.4%)	12 (46.2%)	60 (55.6%)	14 (53.8%)	0.8250	1.0000
FR	48 (52.2%)	28 (45.2%)	44 (47.8%)	34 (54.8%)	0.5510	1.0000
GR	64 (49.2%)	13 (48.1%)	66 (50.8%)	14 (51.9%)	1.0000	1.0000
HU	49 (46.7%)	12 (24.5%)	56 (53.3%)	37 (75.5%)	0.0694	0.3007
IT	56 (56.0%)	30 (57.7%)	44 (44.0%)	22 (42.3%)	1.0000	1.0000
NL	59 (50.0%)	15 (46.9%)	59 (50.0%)	17 (53.1%)	1.0000	1.0000
PL	64 (53.8%)	9 (25.0%)	55 (46.2%)	27 (75.0%)	0.0564	0.3007
SE	49 (63.6%)	13 (36.1%)	28 (36.4%)	23 (63.9%)	0.0083	0.1076
SI	59 (50.0%)	10 (31.3%)	59 (50.0%)	22 (68.8%)	0.4530	1.0000

Table A6
Comparison of retained and omitted observations by age.

Age	18–29		30–39		40–49		50–59		60–74		Fisher p	BH q
Country	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)		
AT	37 (30.8%)	8 (25.0%)	25 (20.8%)	6 (18.8%)	19 (15.8%)	5 (15.6%)	12 (10.0%)	5 (15.6%)	27 (22.5%)	8 (25.0%)	0.7670	0.9510
CZ	15 (16.9%)	10 (16.9%)	13 (14.6%)	7 (11.9%)	23 (25.8%)	13 (22.0%)	18 (20.2%)	11 (18.6%)	20 (22.5%)	18 (30.5%)	0.8590	0.9510
DE	25 (21.6%)	7 (20.0%)	13 (11.2%)	6 (17.1%)	13 (11.2%)	5 (14.3%)	21 (18.1%)	8 (22.9%)	44 (37.9%)	9 (25.7%)	0.2720	0.7072
DK	39 (41.1%)	11 (19.3%)	13 (13.7%)	10 (17.5%)	9 (9.5%)	8 (14.0%)	8 (8.4%)	13 (22.8%)	26 (27.4%)	15 (26.3%)	0.0625	0.4063
ES	39 (36.1%)	12 (46.2%)	12 (11.1%)	2 (7.7%)	18 (16.7%)	5 (19.2%)	19 (17.6%)	3 (11.5%)	20 (18.5%)	4 (15.4%)	0.8880	0.9510
FR	25 (16.2%)	6 (19.4%)	22 (14.3%)	4 (12.9%)	25 (16.2%)	10 (32.3%)	34 (22.1%)	7 (22.6%)	16 (10.4%)	5 (16.1%)	0.5000	0.9181
GR	32 (23.9%)	5 (16.7%)	14 (10.4%)	5 (16.7%)	26 (19.4%)	5 (16.7%)	36 (26.9%)	5 (16.7%)	23 (17.2%)	6 (20.0%)	0.1200	0.5200
HU	26 (17.0%)	6 (11.1%)	22 (14.4%)	10 (18.5%)	13 (8.5%)	8 (14.8%)	9 (5.9%)	10 (18.5%)	38 (24.8%)	11 (20.4%)	0.0423	0.4063

(*continued on next page*)

Table A6 (*continued*)

Age	18–29		30–39		40–49		50–59		60–74		Fisher p	BH q
Country	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)		
IT	23 (15.2%)	8 (14.8%)	16 (10.6%)	11 (20.4%)	19 (12.6%)	9 (16.7%)	25 (16.5%)	12 (22.2%)	17 (11.2%)	12 (22.2%)	0.2190	0.7072
NL	31 (26.1%)	8 (25.8%)	25 (21.0%)	8 (25.8%)	17 (14.3%)	4 (12.9%)	9 (7.6%)	4 (12.9%)	37 (31.1%)	7 (22.6%)	0.9230	0.9510
PL	48 (40.0%)	10 (28.6%)	16 (13.3%)	5 (14.3%)	13 (10.8%)	5 (14.3%)	9 (7.5%)	4 (11.4%)	34 (28.3%)	11 (31.4%)	0.9510	0.9510
SE	31 (40.3%)	22 (61.1%)	8 (10.4%)	3 (8.3%)	7 (9.1%)	2 (5.6%)	10 (13.0%)	4 (11.1%)	21 (27.3%)	5 (13.9%)	0.3430	0.7432
SI	12 (10.2%)	5 (15.6%)	19 (16.1%)	8 (25.0%)	32 (27.1%)	7 (21.9%)	33 (28.0%)	7 (21.9%)	22 (18.6%)	5 (15.6%)	0.5650	0.9181

Table A7
Comparison of retained and omitted observations by gender.

Level of education	Low		Medium		High		Fisher p	BH q
Country	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)	Kept n (%)	Excl n (%)		
AT	1 (0.8%)	7 (21.9%)	40 (33.3%)	9 (28.1%)	79 (65.8%)	16 (50.0%)	0.1490	0.2879
CZ	36 (40.4%)	30 (40.0%)	32 (36.0%)	30 (40.0%)	21 (23.6%)	15 (20.0%)	0.5980	0.6478
DE	38 (32.8%)	12 (63.2%)	57 (49.1%)	5 (26.3%)	21 (18.1%)	2 (10.5%)	0.0519	0.1687
DK	20 (21.1%)	16 (28.6%)	47 (49.5%)	28 (50.0%)	28 (29.5%)	13 (23.2%)	0.1920	0.3120
ES	29 (26.9%)	10 (38.5%)	35 (32.4%)	8 (30.8%)	44 (40.7%)	8 (30.8%)	0.5150	0.6086
FR	15 (16.3%)	20 (31.7%)	28 (30.4%)	23 (36.5%)	49 (53.3%)	20 (31.7%)	0.1550	0.2879
GR	6 (4.6%)	9 (34.6%)	35 (26.7%)	9 (34.6%)	90 (68.7%)	8 (30.8%)	0.0261	0.1687
HU	16 (15.2%)	15 (30.6%)	48 (45.7%)	19 (38.8%)	41 (39.0%)	15 (30.6%)	0.1420	0.2879
IT	25 (25.0%)	21 (40.4%)	37 (37.0%)	16 (30.8%)	38 (38.0%)	15 (28.8%)	0.0198	0.1687
NL	41 (34.5%)	13 (41.9%)	37 (31.1%)	8 (25.8%)	41 (34.5%)	10 (32.3%)	0.4240	0.5512
PL	15 (12.5%)	7 (20.6%)	49 (40.8%)	14 (41.2%)	56 (46.7%)	14 (41.2%)	0.9450	0.9450
SE	4 (5.2%)	4 (11.1%)	41 (53.2%)	25 (69.4%)	32 (41.6%)	7 (19.4%)	0.0451	0.1687
SI	7 (5.9%)	5 (19.2%)	53 (44.9%)	16 (61.5%)	58 (49.2%)	5 (19.2%)	0.2480	0.3582

Table A8
Results of the regression analysis for the STM model.

Variable	Topic 1 No support for climate policy	Topic 2 Waste recycling	Topic 3 Public transport	Topic 4 Clean energy	Topic 5 Compa-nies must reduce emissions	Topic 6 Global efforts essential	Topic 7 Other countries must take action	Topic 8 Raise aware-ness	Topic 9 Regulate traffic and factories	Topic 10 Consume and pollute less	Topic 11 Carbon taxation	Topic 12 Promote sustainable technologies	Topic 13 Stop pollution
Intercept	0.224***	−0.00263	0.02199	0.155***	0.022	0.116***	0.106***	0.113***	0.052**	0.065***	0.092***	0.010	0.026**
Gender (female)	0.006	0.055***	0.020**	−0.062***	0.006	−0.001	0.006	0.002	−0.014**	0.011**	−0.013**	−0.027***	0.011**
Age	0.003	−0.005*	−0.009***	0.001	0.006***	0.001	0.005**	−0.006**	0.006***	−0.003*	0.001	−0.004	0.006***
Education	−0.002	−0.003	0.002	−0.003*	−0.001	0.001	−0.003**	−0.003**	0.005***	−0.001	−0.001	0.006***	0.001
Climate policy support	−0.025***	0.010***	0.013***	0.007***	0.004**	−0.007***	−0.009***	−0.007***	0.004.	−0.001	0.0013	0.014***	−0.004**
Perceived knowledge of climate policy	0.001	−0.003	−0.001	−0.001	0.005*	0.001	0.001	0.005**	−0.005**	−0.002	−0.007***	0.005*	0.002
Growth optimism	−0.018*	0.026**	0.001	0.027*	−0.011	−0.016	−0.014	0.011	−0.006	0.001	0.002	0.0114	−0.013*

Asterisks ***, ** and * denote 1%, 5% and 10% statistical significance, respectively.

Table A9
Survey questions used in the analysis.

Variable	Survey question/statement
Sociodemographics	
Gender	What is your gender?
Age	How old are you?
Education	What is the highest level of education that you have completed?
Political and climate views	
Perceived climate policy knowledge	Before today, how informed would you say you were about “Fit for 55” policies? (on a scale from 1 very uninformed to 7 very informed)
Personal support for climate policies	How much opposed, or in favour, are you of climate policies in general? (on a scale from 1 strongly opposed to 7 stronglly in favour)

Data availability

Data will be made available on request.

References

Andre, P., Pizzinelli, C., Roth, C., Wohlfart, J., 2022. Subjective models of the macroeconomy: evidence from experts and representative samples. Rev. Econ. Stud. 89 (6), 2958–2991.

Bell, C., Rhodes, E., Long, Z., Salemi, C., 2025. Do economic trade-offs matter in climate policy support? Survey evidence from the United Kingdom and Australia. Energy Policy 197, 114430.

Bergquist, M., Nilsson, A., Harring, N., et al., 2022. Meta-analyses of fifteen determinants of public opinion about climate change taxes and laws. Nat. Clim. Chang. 12, 235–240.

Bernauer, T., Gampfer, R., 2015. How robust is public support for unilateral climate policy? Environ. Sci. Pol. 54, 316–330.

Blauberger, M., Heindlmaier, A., Hofmarcher, P., Assmus, J., Mitter, B., 2023. The differentiated politicization of free movement of people in the EU. A topic model analysis of press coverage in Austria, Germany, Poland and the UK. J. Eur. Publ. Policy 30 (2), 291–314.

Blei, D.M., 2012. Probabilistic topic models. Commun. ACM 55, 77–84.

Bouma, G., 2009. Normalized (Pointwise) Mutual Information in Collocation Extraction. *Proceedings of the Biennial GSCL Conference* 2009.

Bretter, C., Schulz, F., 2025. Public support for climate policies and its ideological predictors across countries of the global north and global south. Ecol. Econ. 233, 108603.

Carson, R.T., Lu, J., Khossravi, E.A., Köhlin, G., Sterner, E., Sterner, T., Whittington, D., 2025. The public's views on climate policies in seven large global south countries. Nat. Clim. Chang. (9), 1.

Chaisty, P., Whitefield, S., 2015. Attitudes towards the environment: are post-communist societies (still) different? Environ. Polit. 24 (4), 598–616.

Creutzig, F., et al., 2021. Reviewing the scope and thematic focus of 100 000 publications on energy consumption, services and social aspects of climate change: a big data approach to demand-side mitigation. Environ. Res. Lett. 16, 033001.

Cullenward, D., Victor, D.G., 2020. Making Climate Policy Work. John Wiley & Sons.

De Oña, J., Estévez, E., De Oña, R., 2021. Public transport users versus private vehicle users: differences about quality of service, satisfaction and attitudes toward public transport in Madrid (Spain). Travel Behav. Soc. 23, 76–85.

De Vries, E., Schoonvelde, M., Schumacher, G., 2018. No longer lost in translation: evidence that Google translate works for comparative bag-of-words text applications. Polit. Anal. 26 (4), 417–430.

Dechezleprêtre, A., Fabre, A., Kruse, T., Planterose, B., Sanchez Chico, A., Stantcheva, S., 2025. Fighting climate change: international attitudes toward climate policies. Am. Econ. Rev. 115 (4), 1258–1300.

Drews, S., Savin, I., van den Bergh, J., 2019. Opinion clusters in academic and public debates on growth-vs-environment. Ecol. Econ. 157, 141–155. https://doi.org/10.1016/j.ecolecon.2018.11.012.

Dugoua, E., Dumas, M., Noailly, J., 2022. Text as data in environmental economics and policy. Rev. Environ. Econ. Policy 16, 346–356.

Erbach, G., & Meinardi, C. (2025, May). Greece's climate action strategy(EPRS briefing no. PE 772.858). European Parliamentary Research Service. https://www.europarl.europa.eu/RegData/etudes/BRIE/2025/772858/EPRS_BRI(2025)772858_EN.pdf.

Fabre, A., Douenne, T., Mattauch, L., 2025. Majority support for global redistributive and climate policies. Nat. Hum. Behav. 1–12.

Gregersen, T., Doran, R., Böhm, G., Pfister, H.R., 2023. Expected climate change consequences and their role in explaining individual risk judgments. PLoS One 18 (2), e0281258.

Hobolt, S.B., Popa, S.A., van der Brug, W., 2025. European democracy in action? The 2024 European Parliament elections. J. Eur. Publ. Policy 1–16.

Kallbekken, S., 2023. Research on public support for climate policy instruments must broaden its scope. Nat. Clim. Chang. 13 (3), 206–208.

King, L.C., Savin, I., Drews, S., 2023. Shades of green growth scepticism among climate policy researchers. Nat. Sustainability 6, 1316–1320.

Kiss, T., Fórián, S., Szatmári, G., Sipos, G., 2021. Spatial distribution of microplastics in the fluvial sediments of a transboundary river–a case study of the Tisza River in Central Europe. Sci. Total Environ. 785, 147306.

Kyselá, E., Ščasný, M., Zvěřinová, I., 2019. Attitudes toward climate change mitigation policies: a review of measures and a construct of policy attitudes. Clim. Pol. 19, 878–892.

Ladini, R., Biancalana, C., 2025. The role of public issue salience in the relationship between political orientation and climate change concern: cross-sectional and longitudinal evidence from Europe. Acta Polit. 1–28.

Leiserowitz, A., 2006. Climate change risk perception and policy preferences: the role of affect, imagery, and values. Clim. Chang. 77 (1–2), 45–72.

Lorenzoni, I., Leiserowitz, A., De Franca, Doria M., Poortinga, W., Pidgeon, N.F., 2006. Cross-National Comparisons of image associations with "global warming" and "climate change" among laypeople in the United States of America and Great Britain. J. Risk Res. 9 (3), 265–281.

Lübke, C., 2022. Socioeconomic roots of climate change denial and uncertainty among the European population. Eur. Sociol. Rev. 38 (1), 153–168.

Magazzino, C., Mele, M., Schneider, N., Sarkodie, S.A., 2021. Waste generation, wealth and GHG emissions from the waste sector: is Denmark on the path towards circular economy? Sci. Total Environ. 755, 142510.

Maier, D., Baden, C., Stoltenberg, D., De Vries-Kedem, M., Waldherr, A., 2022. Machine translation vs. multilingual dictionaries assessing two strategies for the topic modeling of multilingual text collections. Commun. Methods Meas. 16 (1), 19–38.

Mildenberger, M., Tingley, D., 2019. Beliefs about climate beliefs: the importance of second-order opinions for climate politics. Br. J. Polit. Sci. 49 (4), 1279–1307.

Mildenberger, M., Lachapelle, E., Harrison, K., Stadelmann-Steffen, I., 2022. Limited impacts of carbon tax rebate programmes on public support for carbon pricing. Nat. Clim. Chang. 12 (2), 141–147.

Moragues, A., Seguí-Pons, J.M., Ruiz-Pérez, M., 2024. Equity in public transportation systems in tourist cities: a comparative study of Palma and Málaga (Spain). In: Emerging Cutting-Edge Applied Research and Development in Intelligent Traffic and Transportation Systems. IOS Press, pp. 149–164.

Müller-Hansen, F., Callaghan, M.W., Lee, Y.T., Leipprand, A., Flachsland, C., Minx, J.C., 2021. Who cares about coal? Analyzing 70 years of German parliamentary debates on coal with dynamic topic modeling. Energy Res. Soc. Sci. 72, 101869.

Osička, J., Černoch, F., 2017. Anatomy of a black sheep: the roots of the Czech Republic's pro-nuclear energy policy. Energy Res. Soc. Sci. 27, 9–13.

Ou, Y., Iyer, G., Clarke, L., Edmonds, J., Fawcett, A.A., Hultman, N., McJeon, H., 2021. Can updated climate pledges limit warming well below 2°C? Science 374 (6568), 693–695.

Patino-Artaza, H., King, L.C., Savin, I., 2024. Did COVID-19 really change our lifestyles? Evidence from transport energy consumption in Europe. Energy Policy 191, 114204.

Peñasco, C., Anadón, L.D., Verdolini, E., 2021. Systematic review of the outcomes and trade-offs of ten types of decarbonization policy instruments. Nat. Clim. Chang. 11 (3), 257–265.

Poortinga, W., Whitmarsh, L., Steg, L., Böhm, G., Fisher, S., 2019. Climate change perceptions and their individual-level determinants: a cross-European analysis. Glob. Environ. Chang. 55, 25–35.

Rhodes, E., Axsen, J., Jaccard, M., 2017. Exploring citizen support for different types of climate policy. Ecol. Econ. 137, 56–69.

Roberts, M.E., Stewart, B.M., Tingley, D., Lucas, C., Leder-Luis, J., Gadarian, S.K., Albertson, B., Rand, D.G., 2014. Structural topic models for open-ended survey responses. Am. J. Polit. Sci. 58 (4), 1064–1082.

Roberts, M.E., Stewart, B.M., Tingley, D., 2019. STM: an R package for structural topic models. J. Stat. Softw. 91 (1), 1–40.

Savin, I., Drews, S., Maestre-Andrés, S., van den Bergh, J., 2020. Public views on carbon taxation and its fairness: A computational-linguistics analysis. Clim. Chang. 162 (4), 2107–2138.

Savin, I., Drews, S., van den Bergh, J., 2021. GEM: a short "growth-vs-environment" module for survey research. Ecol. Econ. 187, 107092.

Savin, I., Drews, S., van den Bergh, J., Villamayor, S., 2022. Public expectations about the impact of COVID-19 on climate action by citizens and government. PLoS One 17 (6), e0266979.

Savin, I., Drews, S., van den Bergh, J., 2024. Carbon pricing – strengths, weaknesses and knowledge gaps according to a global survey. Environ. Res. Lett. 19, 024014.

Savin, I., King, L.C., van den Bergh, J., 2025a. Analysing content of Paris climate pledges with computational linguistics. Nat. Sustainability 8, 297–306.

Savin, I., King, L.C., van den Bergh, J., 2025b. Views of EU Citizens on Economic Growth and Implications for Climate Policy. ICTA_UAB Working paper.

Sebo, P., de Lucia, S., 2024. Performance of machine translators in translating French medical research abstracts to English: a comparative study of DeepL, Google translate, and CUBBITT. PLoS One 19 (2), e0297183.

Smith, E.K., Mlakar, Ž., Levis, A., Sanford, M., Stapper, L., Bouman, T., Emmerling, J., Perlaviciute, G., Tavoni, M., Berger, L., van den Bergh, J., Bernauer, T., Casamassima, A., Epper, T., Eddai, N., Savin, I., Ščasný, M., Turmunkh, U., Zvěřinová, I., Pianta, S., 2026. Nature Climate Change, Forthcoming.

Stechemesser, A., Koch, N., Mark, E., Dilger, E., Klösel, P., Menicacci, L., Wenzel, A., 2024. Climate policies that achieved major emission reductions: global evidence from two decades. Science 385 (6711), 884–892.

Tvinnereim, E., Fløttum, K., 2015. Explaining topic prevalence in answers to open-ended survey questions about climate change. Nat. Clim. Chang. 5 (8), 744–747.

Tvinnereim, E., Liu, X., Jamelske, E.M., 2017a. Public perceptions of air pollution and climate change: different manifestations, similar causes, and concerns. Clim. Chang. 140 (3–4), 399–412.

Tvinnereim, E., Fløttum, K., Gjerstad, Ø., Johannesson, M.P., Nordø, Å.D., 2017b. Citizens' preferences for tackling climate change. Quantitative and qualitative analyses of their freely formulated solutions. Glob. Environ. Chang. 46, 34–41.

Umit, R., Schaffer, L.M., 2020. Attitudes towards carbon taxes across Europe: the role of perceived uncertainty and self-interest. Energy Policy 140, 111385.

van den Bergh, J.C.J.M., 2011. Environment versus growth—a criticism of "degrowth" and a plea for "a-growth". Ecol. Econ. 70 (5), 881–890.

van den Bergh, J.C.J.M., Castro, J., Drews, S., Exadaktylos, F., Foramitti, J., Klein, F., Savin, I., 2021. Designing an effective climate-policy mix: accounting for instrument synergy. Clim. Pol. 21 (6), 745–764.