WENDY aims at unravelling the factors triggering social acceptance of wind farms through an in-depth analysis at three dimensions: social sciences and humanities, environmental sciences, and technological engineering.

Behavioral Interventions Methodology

Deliverable 5.3: Behavioral Interventions Methodology
WP5, T5.2

Task 5.2 partners:

Leading partner: CBS

Participants: WR, EGP, NOWC, MEC

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Technical references

Project Acronym	WENDY
Project Title	Multicriteria analysis of the technical, environmental and social factors triggering the PIMBY principle for Wind technologies
Project Coordinator	CIRCE FOUNDACION CIRCE CENTRO DE INVESTIGACION DE RECURSOS Y CONSUMOS ENERGETICOS jperis@fcirce.es
Project Duration	October 2022 – September 2025 (36 months)

Deliverable No.	D5.3
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- PU – Public, fully open
- SEN – Sensitive, limited under the conditions of the Grant Agreement
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v	Date	Contributing Beneficiary
1.0	25th Feb 2025	Copenhagen Business School
2.0	6th Mar 2025	CBS, EGP

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Executive summary

The overall objective of the WENDY project is to increase social acceptability of wind energy at the community level, by triggering a change in societal perception towards onshore and offshore wind energy projects. To this end, Project WENDY aims to study the factors underlying social acceptance through an in-depth analysis at three dimensions: social sciences, environmental sciences, and technological engineering. The deliverable 5.3 has been developed under task 5.2, Work Package 5 (WP5) of the WENDY project and builds on the insights generated in WP2 and WP4. WP5 adopts a hands-on approach and through task 5.2 aims to test and validate selected behavioral solutions to enhance social acceptance attitude and behavior. This report relies on behavioral science methods and presents the research methodology and the outcomes of the implemented interventions.

In part 1, we assess the role of behavioral science in influencing energy related behaviors in general, and social acceptance of wind energy technology, in specific. We focus on the psychological and behavioral dimensions of social acceptance and develop theory- and evidence-driven interventions for WENDY use case areas.

In part 2, we describe the research design and methodology for the behavioral intervention experiments implemented under task 5.2 (figure 1). Task 5.2 started with preliminary desk research about the kind of behavioral interventions suitable to address the challenge of social opposition to wind energy technology and wind energy projects. Building on the work done in D2.3, D2.4, and D4.1, specific informational interventions were designed and tested through an online survey in the pilot phase in areas similar to WENDY use case areas. Based on the insights from the pilot phase, the interventions were further tweaked and implemented in the main phase, through another online survey in WENDY use case areas. Survey data was collected from 323 participants in the main phase across the four WENDY use case areas.

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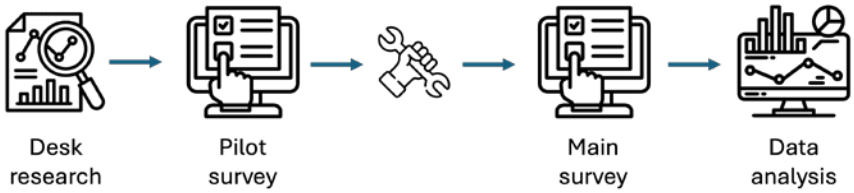

Figure 1: Methodology for task 5.2 - implementation of behavioral interventions to enhance social acceptance of wind energy.

In part 3, we present the analysis results of the behavioral experiments, discuss the implications and conclude with policy recommendations. As part of data analysis, we present results from a descriptive statistical analysis and non-parametric, Kruskal-Wallis statistical test to assess differences among the experimental conditions of the selected informational intervention. Further predictors of social acceptance attitude and behavior were tested through general linear model (GLM) regression analysis. Similar analyses have been conducted on data from both the pilot and main phase surveys, although the results from the pilot phase are described in the Appendix section, for ease of reading.

The main results indicate that there were no significant differences in social acceptance attitude and behavior across the intervention treatment conditions. This intervention, based on gain-goal framing, did not have an expected effect on social acceptance in the selected sample, and would need to be modified in further iterations. However, other predictors like people's **trust in authorities** (local government, wind energy project owners, developers) and **knowledge about wind energy** technology and wind farms emerge as significant factors enhancing social acceptance. Differences in social acceptance also emerge across the four use case areas, highlighting the need for **culture/country specific measures** to reduce social opposition to wind energy and wind farms.

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1. Introduction

This document presents the methodology for design and implementation of behavioral intervention, that aims to bring about sustainable, positive change in citizens' attitudes towards accepting and participating in wind farms. Building on D4.1, and inputs from task partners, it was decided to implement behavioral interventions based on information messages for T5.2.

Social acceptance (SA) of wind energy has been studied from many different perspectives, i.e., - socio-economic, technical, cultural and institutional and it is evident that it is a group level phenomenon but with consequences for both the individual and the society. Acceptance of wind energy (technology, policies, projects) can be considered a special case of **pro-environmental behavior** (PEB) that refers to actions, behaviors aimed at minimizing ecological harm and supporting natural resources, for instance, reducing pollution, conserving energy, recycling, using environmentally conscious transport, purchasing eco-friendly products or even environmental citizenship. And, to change any PEB, we consider four main points (Geller et al., 2002) - i) the specific behavior to be changed, ii) the factors that determine the specific behavior, iii) the interventions that can be applied, and iv) the effect of such interventions on the selected behavior. Likewise, for changing or enhancing acceptance of wind energy, we follow these four points, as elaborated in the subsections below.

1.1. Which behavior to change?

Under project WENDY, the focus is on changing (enhancing) social acceptance of wind energy and this necessitates defining and measuring social acceptance to design effective behavioral interventions. Existing research has operationalized social acceptance in different ways, with many studies using only direct measures of social acceptance (e.g., question on a 5-point or a 7-point scale - 'how much do you support wind farms/wind energy?'). We operationalize social acceptance using both direct and indirect self-report measures. Direct measures included individuals' support and acceptance for building wind farms at varying distances from their residence and attitude

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towards wind energy in general. Indirect measures included willingness to display more concrete wind energy related behaviors, like individuals' willingness to volunteer as a wind energy champion, to join a wind energy community or to invest in a wind energy project.

1.2. Which factors influence social acceptance?

As described in D4.1, social acceptance is influenced by a range of factors (socio-economic, environmental, landscape, institutional, technical and individual/psychological). In this deliverable, we select psychological factors and motivations as the basis for behavioral interventions, as solutions for other contextual factors might be beyond the scope of this document. Behavioral interventions are effective when they are aimed at specific antecedents or motivations of behavior and at removing barriers for behavior change.

Psychological motivations, like individuals' **beliefs and values**, could determine their environmental attitudes and behavior, including those towards energy (Dietz et al., 2005; Schwartz et al., 2012). Values affect how people perceive the physical features of a wind energy project and their acceptance levels (Bidwell, 2013) and projects that seem to support core values are more likely to get a positive public response (Perlaviciute et al., 2018). Citizens' beliefs about climate change (or climate change skepticism) and beliefs about renewable energy technology's costs, benefits, efficacy would certainly define acceptance of local projects (Sposato & Hampl, 2018). Further, it is also assumed that individuals make rational choices, weighing the **costs and benefits** of PEB. Since wind energy projects have global, collective environmental benefits and a high local, individual cost, support and acceptance is associated with higher altruistic values and lower egoistic levels (Steg et al., 2015). Next, **emotions and feelings (affect)**, specifically guilt and pride have been used to demonstrate a causal effect on PEB (Schneider et al., 2017), for instance, prompting feelings of pride for future positive pro-environmental actions had a more significant effect than feelings of guilt for inaction. Legacy motivations, or interest to pass along knowledge and skills to future generations, is a key motivator of pro-environmental action (Zaval et al., 2015) and can be used to encourage sustainable behaviors. Apart from these three motivations, behavior

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is also subject to **habits** and automatic cognitive processing instead of deliberate reasoning, and such habitual behavior might be driven by misperceptions and lack of attention (Aarts & Dijksterhuis, 2000). These factors are often not mutually exclusive, and eventual behavior (i.e., social acceptance) can be influenced by multiple motivations (Stern, 2000).

For the interventions in this task (task 5.2), we chose to work with the **costs and benefits** approach and steer away from manipulating community members' beliefs or emotions around wind energy. In developing the intervention, we rely on **goal-framing theory**, proposed by Lindenberg & Steg, (2007). This theory suggests that specific goals determine or frame, what people pay attention to, how they evaluate a situation and the various choice options. There might be multiple goals influencing behavior in a situation, but often one goal is dominant. For instance, people might focus on environmental benefits of wind energy in one situation, and on economic benefits in another situation depending on whether an environmental or economic goal is highlighted or activated in the situation. Three goals (or frames) have been highlighted by this theory - hedonic, gain, and normative goals, and we chose to work with **gain** goal frames for the interventions in WENDY use case areas.

Hedonic goal frame activates goals related to emotions, pleasure and improving how an individual feels in a situation (e.g., people emotionally attached to their cars, drive more frequently, and such people might not respond easily to financial incentives to use public transport, Nilsson & Küller, 2000). **Gain goal frame**, on the other hand, indicates that people are more sensitive to costs and benefits (in terms of money, time). For instance, people purchase energy-saving light bulbs or use solar panels if they believe it leads to personal cost savings (Bär et al., 2023). **Normative goal frame** implies behavior that happens without attention to feelings or associated costs, but with a focus on social norms, appropriateness and on setting a good example (e.g., an individual joining an energy community or recycling waste to set an example in the neighborhood, (Cialdini & Jacobson, 2021).

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1.3. Which interventions should be applied?

After selecting the target behavior and the underlying potential motivations, we consider the kind of interventions that can be used to influence such behavior. Referring to D4.1, we highlight the distinction between **informational** and **structural** interventions. Implementing informational interventions assumes that the target population lacks knowledge about the negative impact of its behavior (or lack thereof) on the environment, thus information via messages, prompts, feedback, reminders or product labelling, should be provided to this group to enhance environmentally supportive behavior. These interventions aim at influencing perceptions, attitudes and knowledge, without changing the actual decision context. Structural interventions, however, focus on changing the circumstances in which a decision needs to be made, by simplifying the decision-making. These interventions aim at influencing the external conditions, which in turn might influence perceptions and attitudes. For WENDY use case areas, we proceed with informational interventions. The selected informational intervention will be in the form of three textual messages with different framing (economic, environmental and control).

1.4. Expected effect of interventions

The informational interventions, designed using gain goal framing, are expected to enhance social acceptance in the selected population in WENDY use case areas. We intend to follow an experimental research design for both implementation phases, i.e., **pre-test** the intervention in smaller samples from populations similar to WENDY's use cases, and **main** implementation in WENDY use cases. Pre-testing (or piloting) the interventions will ensure experimental rigor and will help preempt any implementation errors. In both phases, the intervention will include one or more treatment groups and a comparable control group. Social acceptance attitude and the intention to act in ways supportive of wind energy are expected to be higher in the treatment groups vs. control groups, after the behavioral intervention experiment. Within the project and task timelines, it is possible to study only the short-term effects of the intervention, although it is

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advisable to study long term effects as well, to get a complete understanding of the impact and the change in behavior.

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2. Methodology and experiment design

2.1. Methodology

We tested our hypotheses through field experiments, conducted in two phases, in the WENDY use case areas. The first phase (**pilot**) involved pre-testing the designed intervention in smaller samples selected from populations similar to WENDY use case areas. This enabled us to test different versions of the intervention, different psychological variables and assess potential issues in implementation. The second phase (**main**) involved running the modified interventions, directly in WENDY use case areas.

2.1.1. Survey design

The behavioral intervention experiment consisted of an online survey with 26 questions (pilot phase) and 20 questions (main) phase. The survey was an **informational** intervention using message framing (see D4.1) and was implemented as a **randomized control trial** (RCT) with **between-subjects** design. In other words, the survey had **three experimental conditions** (economic, environmental, and control) and participants were randomly allocated to **one of these three conditions**. It is assumed that random allocation to the experimental conditions would allow causal estimates by comparison of behavior under one treatment condition with behavior under another treatment condition, with the behavior under the control condition serving as the baseline.

The survey started with a detailed consent form (see Appendix), after which participants answered questions related to social demographics (age, gender, education, employment), questions on knowledge about and experience with wind energy, trust in authorities, and question on environmental concern. Following these questions, the participants were presented with the experimental manipulation in form of one (out of three) textual message relating to wind energy/farms, after which they answered other questions on social acceptance attitude, social acceptance intention to act (hypothetical behavior), and other psychological constructs like

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general trust, social norms, community identity, and environmental identity. The entire survey was translated into the local language of the use case areas (i.e., Greek, Italian, Norwegian, Spanish) and validated by WENDY task partners.

These conditions were similar in both pilot and main phases, except the intervention messages. In the pilot phase, the experimental manipulation consisted of **balanced** information messages mentioning both **economic costs and benefits** (economic condition) or both **environmental costs and benefits** (environmental condition) or general information about wind energy (control). In the main phase, the experimental manipulation was changed and the messages mentioned only **economic benefits** (economic condition), or **environmental benefits** (environmental condition) or general information about wind energy (control). The survey responses were measured using Likert-scale items (combination of 5-point and 7-point).

The rationale for initially selecting balanced messages was that people often perceive environmental communication as manipulative and biased, an effect known as 'greenwashing', and this can have a backlash on the intended behavior (de Vries, 2020). However, this might also depend on the credibility perceptions about the communication source (independent news agency or wind project owner). With balanced messaging, we intended to present a fair, balanced picture of costs and benefits associated with wind energy. In the main phase, we modified the intervention to shorten the text and the survey completion time and resorted to gain framing messages using economic and environmental benefits of wind energy. In absence of sample size constraints, it would have been preferable to add two more treatment conditions (economic harms, environmental harms) for a more nuanced assessment of the people's attitudes towards wind energy.

2.1.2. Survey implementation

The surveys were created using the software Qualtrics, and the survey URLs/QR codes were distributed by the task partners (NOWC, EGP, MEC) in the selected sample areas. For the pilot phase, the surveys were run from 22nd May 2024 - 30th Jul 2024, and for the main phase, the surveys were active from 20th Sep 2024 - 20th Nov 2024. The surveys were entirely online, and the participants could respond using a mobile, laptop or a desktop. The estimated survey duration

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was about 15mins for pilot phase and about 10mins for main phase. For data analysis, we considered responses with provided consent, responses that were 100% complete and responses that cleared the manipulation check. Further, participants under 18 years of age were ineligible/excluded from the survey. We did not conduct a power analysis for sample size estimation, as the sample recruitment was dependent on the willingness of community members to take part in the survey. Participation was entirely voluntary and there was no remuneration.

2.1.3. Experimental manipulation

As mentioned earlier, the informational intervention was designed using the technique of message framing (see D4.1) with three between-subjects, experimental conditions. The manipulation involved varying the information that participants received, prior to answering questions measuring dependent variables (DV, see next sub section).

In the pilot phase, under the control condition, the participants viewed an image of wind turbines and read a short **neutral message** on wind energy in their country (see sample image in figure 2). In the first treatment condition (economic), participants viewed a message on **economic costs and benefits** of wind energy (see sample image in figure 3), and in the second treatment condition, a message with **environmental costs and benefits** of wind energy (see sample image in figure 4).

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The EU built 17 GW of new wind energy in 2023, slightly up on 2022 – and more than ever in a single year in fact. But it's not enough to reach the EU's 2030 targets. The EU should be building 30 GW of new wind every year between now and 2030. The actions set out in the EU Wind Power Package and European Wind Charter will help increase the annual build-out – national implementation is key. Wind was 19% of all electricity produced in Europe's last year.

According to WindEurope data, the EU built 17 GW of new wind farms in 2023: 14 GW onshore; 3 GW offshore. These numbers are slightly up on 2022 and are the most the EU has ever built in a single year. But it's well below the 30 GW a year that the EU needs to build to meet its new 2030 climate and energy security targets.

The IEA estimates that Europe will build 23 GW a year of new wind over 2024-28. The actions set out in the EU Wind Power Package should deliver a significant increase in the annual build-out – and strengthen Europe's wind energy supply chain. National implementation of the actions is key.

To that end the commitment to deliver the Wind Power Package that 26 EU Energy Ministers signed before Christmas in the European Wind Charter was key. Crucial actions include the further simplification of permitting, improvements in the design of the auctions to build new wind farms and public financial support for wind turbine manufacturing and key infrastructure.

Figure 2 - Sample image for control condition (pilot).

The EU built 17 GW of new wind energy in 2023, slightly up on 2022 – and more than ever in a single year in fact. But it's not enough to reach the EU's 2030 targets. The EU should be building 30 GW of new wind every year between now and 2030. The actions set out in the EU Wind Power Package and European Wind Charter will help increase the annual build-out – national implementation is key. Wind was 19% of all electricity produced in Europe's last year.

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These developments bring some **economic costs and benefits**.

On the one hand, the electricity generated by wind energy is sometimes more expensive than electricity generated by traditional fossil fuels due to different taxation rules. The initial costs for setting up a wind farm can also be higher. Eventually these costs get passed on to consumers.

But on the other hand, setting up wind farms often leads to benefits for the entire local community. The wind farms provide employment opportunities in the local areas directly and indirectly, they contribute to municipal taxes, and offer financial benefits to community members impacted by wind farms.

Figure 3 - Sample image for economic condition (pilot).

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These developments bring some **environmental costs and benefits**.

On the one hand, wind turbines might impact populations of birds, bats and other local wildlife in both onshore and offshore situations. Wind farms can also result in environmental pollution, soil erosion, marine toxicity through construction and decommissioning activities.

But on the other hand, energy generation from wind farms relies on a renewable and clean energy source and does not involve burning any fossil fuel, thus strongly reducing carbon emissions. Wind farms can be developed as nature reserves to support biodiversity on land and in sea.

Figure 4 - Sample image for environment condition (pilot).

In the main phase, under the control condition, the participants viewed a similar image of wind turbines but read a shorter **neutral message** about wind energy in their country (see sample image in figure 5). In the first treatment condition (economic), the participants read a short message highlighting only the **economic benefits** of wind farms, and an encouragement to '**save money by saying yes to wind energy**' (see figure 6). In the second treatment condition (environment), the participants read a short message highlighting only the **environmental benefits** of wind farms, and an encouragement to '**save the environment by saying yes to wind energy**' (see figure 7).

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DID YOU KNOW?

The Hellenic Wind Energy Association (HWEA or ELETAEN) revealed that 153 wind turbines were installed in 2023. Their combined capacity was 542.8 MW. Total wind power in Greece topped 5 GW for the first time, reaching 5.23 GW. Last year was second best only to 2019 in additions. At the end of December, more than 850 MW was under construction or ready to build. More than 300 MW is expected to come online by the end of this year.

Figure 5 - Sample image for control condition (main intervention).

DID YOU KNOW?

Wind farms lead to **economic benefits**. Wind farms can...

...provide employment opportunities in the local areas directly and indirectly,
...contribute to municipal taxes,
...offer financial benefits to community members impacted by wind farms,
...provide income for farmers and landowners,
...reduce electricity prices for consumers.

SAY YES TO WIND POWER! SAVE MONEY!

Figure 6 - Sample image for economic condition (main intervention).

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Figure 7 - Sample image for environment condition (main intervention).

It should be noted that all images shown above have the text in English for readability. In both phases of the interventions, the surveys and all text in the images were translated into the local language of the use case area, and the translation was validated by all task partners.

2.1.4. Information manipulation check

It is crucial to verify that the manipulation conditions influenced participants' perceptions in the intended way. For this, we included one question in the survey, much after the manipulation text was shown, to check whether the participants were attentive and whether the manipulation condition was noted by them. The multiple-choice question asked the participants which costs and benefits (in the pilot phase) or which benefits (in the main phase) of wind energy were shown to them earlier in the survey. The response options were - economic, environmental, health-related, no (costs and) benefits mentioned. In case the participants responded incorrectly, they were excluded from the analysis, and in case of correct response, it was assumed that the information manipulation was successful in conveying the desired information.

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2.1.5. Experiment variables

In the experiment, the principal dependent variables (DV) were **social acceptance attitude** and **social acceptance behavior** (intention to act). Social acceptance attitude measured experiment participants' support for wind energy technology in general and support for building wind farms in their country, region, municipality and neighborhood. Social acceptance intention to act measured realistic behavior possibility by asking participants, how likely were they to take part in wind energy volunteer activities or to take part in wind farm protest actions, in the future (see Appendix for all survey questions). The main independent variable (IV) was the manipulation framing condition (control, economic, environmental). Other variables of interest were trust in authorities/wind energy stakeholders, participants' experience and knowledge about wind energy, participants' concern for the environment, participants' environmental identity, participants' community identity and participants' alignment with social norms. For environmental concern, we selected relevant items from the construct developed by Rhead et al., (2018); for environmental identity, relevant items were selected from the construct developed by Clayton et al., (2021); similarly for social norms, community identity and general trust, we relied on the items validated by (Kalkbrenner & Roosen, 2016). All other survey questions were developed based on extensive literature search and feedback from WENDY use case leaders.

2.1.6. Participant sampling

For the pilot phase, data was collected from May to July 2024, and the sample consisted of participants contacted by the task partners (EGP, NOWC and MEC) through their network. Likewise, for the main intervention phase, the data was collected from September to November 2024, and the sample again consisted of participants contacted by the task partners (EGP, NOWC and MEC) through their network. The participants were above 18 years, and they were not remunerated for participating in the survey, as it was a voluntary contribution. The participants were residents of the WENDY use case areas and spoke the local language. All participants read and signed a detailed consent form (see Appendix) and proceeded with the survey. We chose to

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exclude those responses which were incomplete (participants left the survey mid-way), responses which were 'no consent', and responses that failed the manipulation check question.

2.2. Data analysis strategy

The raw data were downloaded from Qualtrics as .csv files. The data contained no personal identifiable information (e.g., participant name, address, social security number, IP address) and was anonymized. In both phases, the **inclusion criteria** at the participant level were i) age above 18 years, ii) resident of the WENDY use areas, and iii) ability to speak the local language. The **exclusion criteria** for data were i) no consent responses, ii) incomplete responses, and iii) responses that failed manipulation check. We did not exclude responses (outliers) for which completion time was more than three standard deviations from the mean completion time. Due to large variation in the sample size across the four countries/use cases, it was not feasible to do country-level analysis, hence we proceeded with a consolidated analysis, i.e., analysis on data pooled from all countries, for each phase. Thus, the analysis was done on 99 responses from the pilot phase and 166 responses from the main phase.

Data cleaning and analysis was done using open-source R programming language (R Core Team, 2024). Except for the participants' age, all collected data were either nominal (i.e., gender) or ordinal (i.e., responses to survey questions). Responses on Likert scale questions, have been grouped together to form a mean score for the question, which is then treated as interval data. Since data do not seem to be normally distributed, we chose non-parametric analysis to test the statistical significance of the effect of experimental condition. Results were considered to be statistically significant for p-values lower than 0.05. As a first step, descriptive analysis was conducted by determining mean and standard deviation values of all the variables. Then, we test our hypotheses using Kruskal-Wallis test (KW; Kruskal & Wallis, 1952), to calculate the probability of similarity between the distributions of the three samples. For further insights, we run regression models to uncover other drivers of social acceptance attitude and behavior. More specifically,

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generalized linear model (GLM) was applied as it is more appropriate when the dependent variable is not normally distributed.

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3. Results

This section presents participant sample details and the analysis results from the main intervention only, while the participant sample details and the analysis results from the pilot are given in the Appendix. Our primary focus is on studying how the selected informational interventions impact the dependent variables - participants' social acceptance attitude (towards wind energy) and behavior.

3.1. Sample size characteristics

The sample size details for the **main intervention** phase are presented in Table 2. Overall, 323 people responded to the survey across the four use case areas, but we excluded incomplete responses (41), no consent (3) responses in the first stage. The mean age of the sample participants (n = 279) was 49 years and 30% identified as female. The participant sample was highly educated with 70% of participants possessing a graduate degree or an advanced degree (PhD), and about 82% were working full-time. While only 24% of participants lived close to a wind farm, about 81% had seen or visited a wind farm, 5% had already invested in a wind farm and 33% expressed a desire to invest in a wind farm in the future. For further analysis, we excluded responses that failed manipulation check (113), giving us a final sample of 166 responses.

Table 1 - Sample characteristics for each WENDY use case area (main phase).

	Total responses	Complete responses	Males	Mean age (years; M)	Females	Mean age (years; F)
Greece	159	131	111	52.8	20	47.2
Italy	77	68	43	47.9	24	39.7
Spain	35	32	16	43.0	15	42.3

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	Total responses	Complete responses	Males	Mean age (years; M)	Females	Mean age (years; F)
Norway	52	48	23	51.7	24	44.6
Total	323	279	193	50.8	83	43.4

3.2. Survey results

The survey items used a mix of five and seven-point bidirectional Likert-type choice options, where the center point indicated a neutral position. Survey responses on questions comprising of multiple Likert items were combined into a single composite score, represented by the mean (e.g., environmental concern was measured by 5 Likert-type items, responses on which were combined into an average environmental concern score).

Based on the data from the main intervention, we first looked at the relative importance of different categories of issues and concerns that influenced opinions about wind energy, in general. Figure 8 indicates that the top three issues considered important in affecting participants' opinion are **climate issues** (e.g., global warming, CO2 emissions), **environmental issues** (e.g., impact on biodiversity, wildlife, eco-system), and **economic issues** (e.g., employment opportunities, community benefits, compensation, property values, electricity price).

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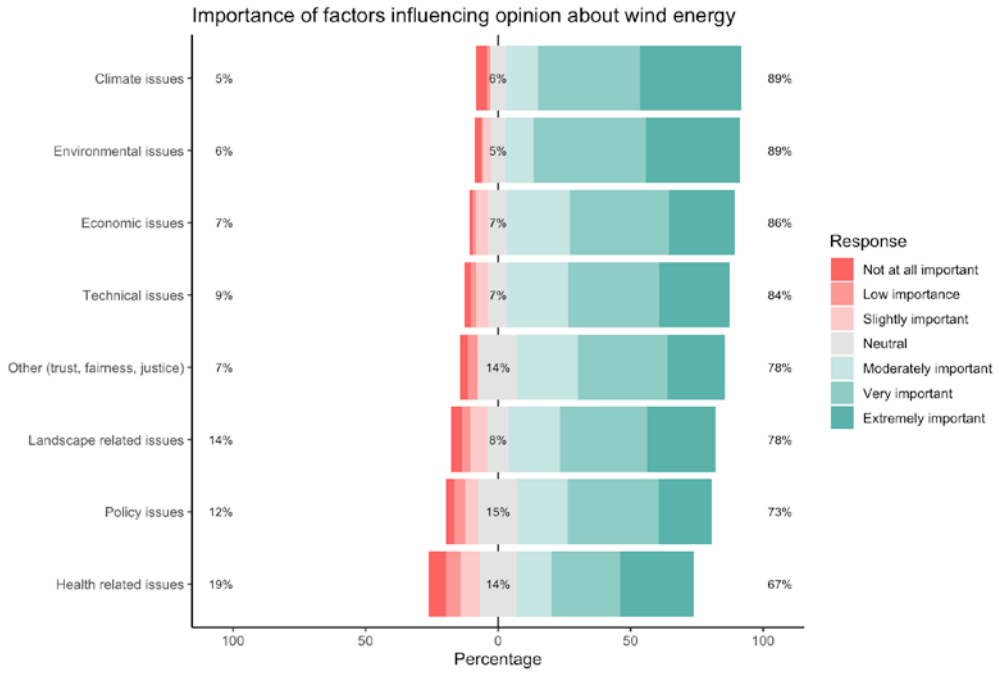

Figure 8: Survey responses for factors influencing opinion about wind energy (main intervention).

3.2.1. Social acceptance attitude

Social acceptance attitude was the first DV and was measured by five items - i) 'I am in favor of wind energy technology, in general.', ii) 'I am in favor of building wind farms in my country.', iii) 'I am in favor of building a wind farm in my region (10-15 kms from my residence).', iv) 'I am in favor of building a wind farm in my municipality (3-5 kms from my residence).', and v) 'I am in favor of building a wind farm in my community (1-2 kms from my residence).'. In figure 9, the response percentages are shown for all items on the social acceptance attitude scale.

There was **high support for wind energy technology** in general, in the pilot phase (mean score = 3.8 on a scale of 5, SD = 1.2) and in the main intervention (mean score = 4.3, SD = 0.9). However, the **support was lower for specific windfarms placed closer to residence** for the pilot (mean score = 3.1, SD = 1.3) and for the main intervention (mean score = 3.3, SD = 1.3). Further, participants were **more supportive of offshore wind farms than onshore wind farms** in both phases (figure 10 shows the main intervention survey responses for offshore vs. onshore wind farms).

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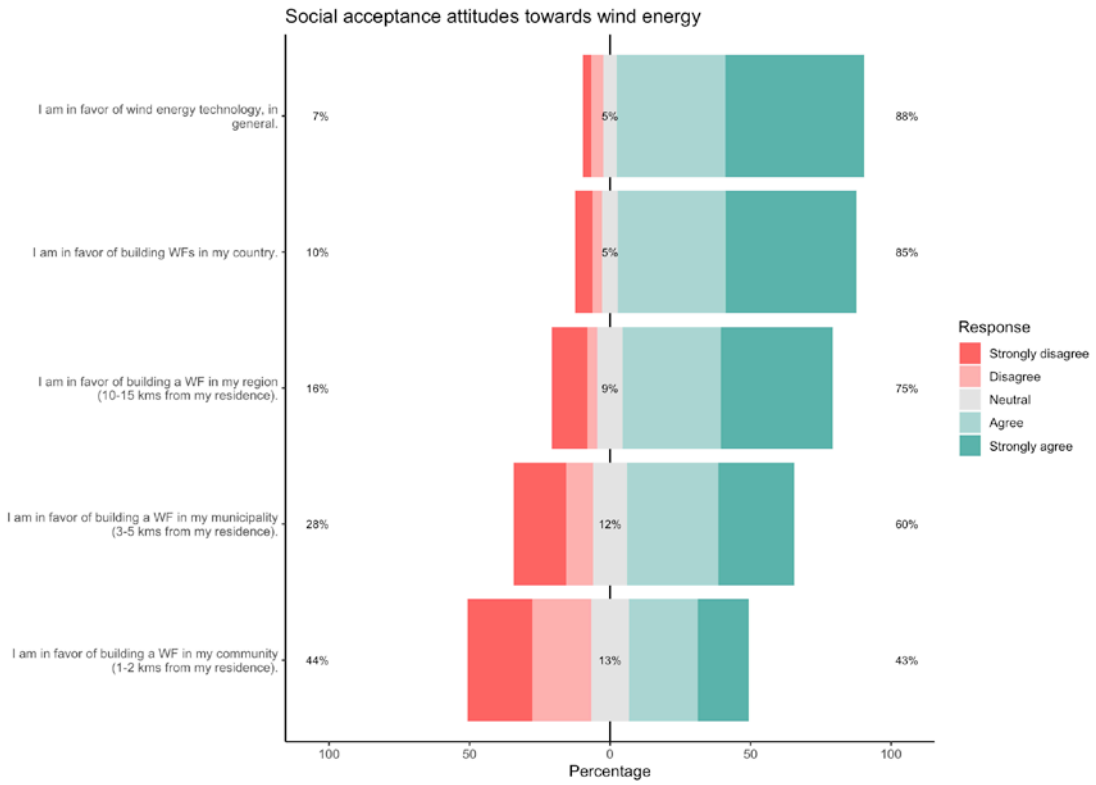

Figure 9: Survey responses for social acceptance attitude (main intervention).

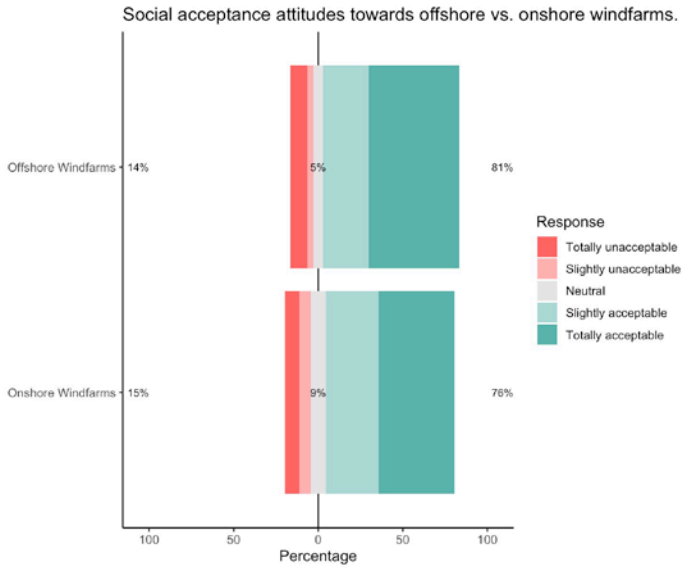

Figure 10: Survey responses for social acceptance of offshore vs. onshore windfarms (main intervention).

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We tested the **main effect of framing condition** (Control, Economic, Environment; figure 11) on social acceptance attitude and found no significant effects in the main phase ($\chi^2_{\text{Kruskal-Wallis}}$ (2) = 3.9, $p > 0.05$).

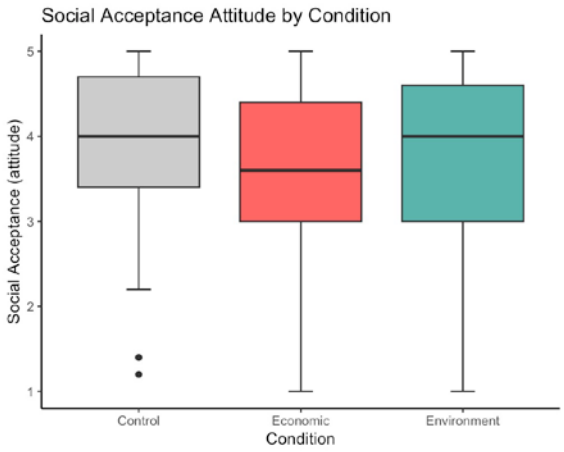

Figure 11: Boxplots of levels of social acceptance attitude for the three conditions in the main intervention. The graph shows the results of the Kruskal-Wallis nonparametric test.

Next, we conducted regression using GLM to check the influence of other variables on social acceptance attitude. Figure 12 presents the regression coefficients from the full model with major predictor variables (model 1) and the model selected based on lower Akaike Information Criterion (AIC; model 2). AIC is a metric for evaluating the accuracy of predictions and the validity of statistical models, and a model with a lower AIC score is preferred.

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	Dependent variable:			
	Social Acceptance Attitude		Social Acceptance Behavior	
	(1)	(2)	(3)	(4)
ConditionEconomic	-0.003	-0.016	-0.140	-0.145
	(0.158)	(0.156)	(0.137)	(0.134)
ConditionEnvironment	-0.056	-0.057	-0.031	-0.044
	(0.144)	(0.143)	(0.125)	(0.123)
CountryItaly	0.307	0.299*	-0.452**	-0.493***
	(0.164)	(0.150)	(0.144)	(0.131)
CountryNorway	0.121	0.154	-0.610***	-0.623***
	(0.200)	(0.180)	(0.173)	(0.155)
CountrySpain	0.552*	0.589**	-0.445*	-0.538**
	(0.217)	(0.196)	(0.192)	(0.173)
Age	0.005		0.002	
	(0.005)		(0.005)	
GenderFemale	0.062		-0.113	
	(0.134)		(0.116)	
GenderNotDisclosed	0.318		-0.227	
	(0.582)		(0.505)	
sa_att_avg			0.468***	0.474***
			(0.071)	(0.068)
trust_avg	0.396***	0.427***	-0.128	-0.112
	(0.091)	(0.085)	(0.084)	(0.079)
know_avg	0.679***	0.680***	0.181	0.189*
	(0.094)	(0.090)	(0.095)	(0.090)
env_conc_avg	0.070		0.049	
	(0.100)		(0.087)	
env_id_avg	-0.070		-0.028	
	(0.077)		(0.067)	
soc_norm_avg	0.160		0.018	
	(0.085)		(0.074)	
comm_id_avg	-0.040		0.048	
	(0.082)		(0.071)	
Constant	-0.630	-0.235	1.323*	1.543***
	(0.680)	(0.349)	(0.591)	(0.300)
Observations	166	166	166	166
Log Likelihood	-181.320	-184.269	-157.015	-158.488
Akaike Inf. Crit.	392.641	384.538	346.030	334.977
Note:			*p<0.05; **p<0.01; ***p<0.001	

Figure 12: Regressions predicting social acceptance attitude and behavior (main intervention). Standard errors shown in parenthesis.

In figure 12, the models 1 and 2 are for the DV - social acceptance attitude, with 'Constant' representing the intercept or baseline, i.e., the experimental condition = control, country = Greece, gender = male. We note the following results from the selected model, i.e., model 2 (*B represents unstandardized regression coefficients*):

1. Experimental condition did not have a significant effect in influencing social acceptance. That is to say, the information messages with economic and environmental framing

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mentioning economic and environmental benefits of wind energy did not have a significantly large or different effect than the information messages in the control condition, in influencing attitude.

2. Social acceptance attitude for Italy (B = 0.30, p = 0.04) and Spain (B = 0.59, p = 0.003) is found to be significantly higher than the baseline (Greece). The variable Country is significant in influencing social acceptance attitude.
3. **Trust in authorities** (local government, wind energy project owners, developers) is highly significant (B = 0.42, p < 0.001) in influencing social acceptance attitude. A positive and statistically significant regression coefficient indicates that higher the public trust in authorities, higher the acceptance attitude towards wind energy technology and projects.
4. Similarly, **knowledge about wind energy technology and wind farms** is highly significant (B = 0.68, p < 0.001) in enhancing social acceptance attitude. A positive and statistically significant regression coefficient indicates that higher the public knowledge and awareness about wind energy technology, higher the acceptance attitude towards wind energy technology and projects.
5. Age and gender have no significant effect on social acceptance attitude.
6. No interaction effects were found to be significant.

3.2.2. Social acceptance behavior

Social acceptance behavior was the second DV and was measured by five items in response to the statement 'In the next 12 months, would you be willing to:' - i) 'To volunteer as a wind energy promoter in your local community (e.g., 1 hour each week)?', ii) 'To join a wind energy community in your region?', iii) 'To invest in a community wind farm in your municipality?', iv) ' To participate in protest action or citizens' initiatives against planned wind energy project in your local community or neighborhood?', and v) 'To participate in citizen consultations for a wind farm in your local community or neighborhood?'. In figure 13, the response percentages are shown for all items on the social acceptance behavior scale. While people show a high willingness to participate in citizen consultations for a proposed wind farm, to join an energy community and to invest in a community wind farm, there is much lower willingness to volunteer as a wind energy promoter.

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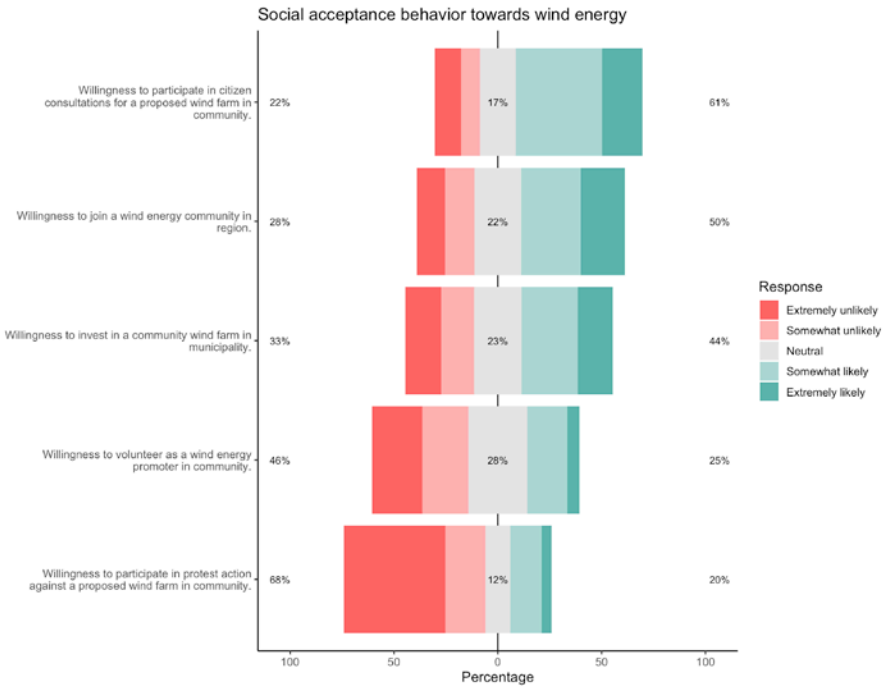

Figure 13: Survey responses for social acceptance behavior (main intervention).

We tested the **main effect of framing condition** (Control, Economic, Environment; figure 14) on social acceptance behavior and found no significant effects in the main phase ($\chi^2_{\text{Kruskal-Wallis}}$ (2) = 3.7, $p > 0.05$).

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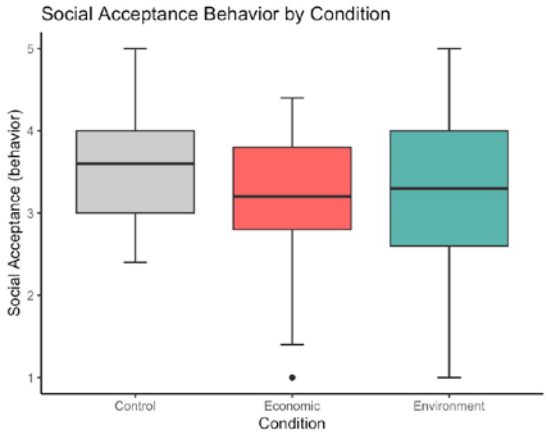

Figure 14: Boxplots of levels of social acceptance behavior for the three conditions in the main intervention. The graph shows the results of the Kruskal-Wallis nonparametric test.

Next, we conducted regression using GLM to check the influence of other predictors on social acceptance behavior. We again refer to figure 12 for regression coefficients from the full model with major predictor variables (model 3) and the model selected based on lower Akaike Information Criterion (AIC; model 4). In these models for social acceptance behavior, we included **social acceptance attitude** as an additional predictor. We note the following results from the selected model, i.e., model 4 (*B represents unstandardized regression coefficients*):

1. Experimental condition did not have a significant effect in influencing social acceptance behavior. That is to say, the information messages with economic and environmental framing mentioning economic and environmental benefits of wind energy, did not have a significantly large or different effect than the information messages in the control condition in influencing behavior. The 'constant' coefficient is shown as significant, as it is significantly different from zero.
2. The variable **Country** is significant in influencing social acceptance behavior, with Spain (B = -0.53, $p < 0.01$), Italy (B = -0.49, $p < 0.001$) and Norway (B = -0.62, $p < 0.001$) showing lower social acceptance behavior propensity than the baseline country Greece. This highlights country level differences in people's intention to act in ways to support wind energy, thus indicating a need for country specific measures to influence social acceptance behavior.

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3. Trust in authorities (local government, wind energy project owners, developers) is not significant in influencing social acceptance behavior.
4. **Knowledge about wind energy technology and wind farms** continues to be a significant factor in enhancing social acceptance behavior. A positive and statistically significant regression coefficient ($B = 0.18$, $p < 0.05$), indicates that higher the public knowledge and awareness about wind energy technology, higher the acceptance attitude towards wind energy technology and projects.
5. **Social acceptance attitude** is also highly significant in enhancing relevant behavior. With a positive and statistically significant regression coefficient ($B = 0.47$, $p < 0.001$), people's social acceptance attitude, or their feelings and thoughts, is crucial in influencing how they eventually behave with respect to wind energy technology or wind farms. In this case, higher the levels of acceptance attitude, higher the probability of acceptance behavior, hence it is important to change attitudes as a first step.
6. No interaction effects were found to be significant.

3.3. Limitations

In this subsection, we discuss some limitations to this work:

1. Due to ease of implementation, the choice of interventions was restricted to information-based messages through on online survey, as compared to other field-based structural interventions or policy interventions. Informational interventions focus on persuasion, raising awareness and addressing information deficit, as means to influencing people's attitudes and their commitment to act pro-environmentally. These interventions are more effective when pro-environmental behavior (PEB) is comparatively easier and does not require much time, money or effort. People accepting and actively supporting wind energy and specific projects, is a special case of PEB, which has barriers greater than a negative attitude. Thus, it might be appropriate to use informational strategies as supplements to other structural, more concrete solutions.

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2. At the sample level, first challenge was the sample size, which meant that limited number of treatment conditions could be tested and evaluated. The surveys relied on voluntary participation of community members, and this often presents a challenge in attaining a sample size sufficient for statistically significant findings. In the current work, we were able to test two treatment conditions (e.g., environmental benefits vs economic benefits of wind energy), but with a larger sample it would be possible to test more treatment conditions (for instance, environmental benefits, economic benefits, environmental harms, economic harms) to assess whether people are more influenced by negative information or positive information. Second, the sample was not nationally representative and there were only 24% of participants in the main intervention that lived close to a wind farm. This would restrict the generalizability of the findings to other regions close to a wind farm. Third, there were large variations in the sample size from each use case area (e.g., Greece - 69 responses; Spain - 20 responses), due to which country-level analysis had to be excluded from the study, although country (use case area) emerged as a significant predictor of social acceptance behavior, meaning there are differences in how people across cultures respond to the same information about wind energy, necessitating culture specific measures to reduce social opposition.
3. Finally, at the level of study design, the interventions were developed using only economic and environmental framing. Other factors related to wind energy like climate issues, health concerns could also be included in potential interventions. Our interventions were further based on general information about wind energy and did not pertain to any specific wind energy project in the vicinity of the participants, and this could have adversely impacted their effectiveness.

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4. Conclusion

In this study, we set out to get a better understanding of behavioral and psychological determinants of social acceptance of wind energy technology and wind energy projects by designing and testing behavioral interventions. This was done with the aim of generating insights and developing recommendations for policy makers and other wind energy stakeholders. This study proceeded through two phases of interventions designed to enhance social acceptance attitude and willingness to behave in a way supportive of wind energy.

The results from the first phase (pilot) indicated that a public communication strategy with an economic and environmental framing, using a balanced approach about both *costs and benefits* of wind energy, is not successful in enhancing social acceptance. However, other predictors like people's knowledge about wind energy, community identity, social norms and even age and gender are significantly associated with social acceptance. Interestingly, environmental identity and environmental concern do not seem to play a role in the current sample, although country-level differences in social acceptance were observed.

The intervention in the second phase (main) was modified to a communication strategy with an economic and environmental framing but talking only about *benefits* of wind energy. This approach was also not successful in enhancing social acceptance, although other predictors emerged significant, namely, trust in authorities and wind energy stakeholders and people's knowledge about wind energy, with country-level differences. Further, people indicated a high willingness to participate in citizen consultations for a proposed wind farm, to join an energy community and to invest in a community wind farm. Consistent with other research, participants in this study showed a high level of support for wind energy overall.

With these results, we highlight the relevance of socio-psychological determinants of social acceptance, like trust, social norms, community identity, and especially, the level of public knowledge and awareness about wind energy technology and wind farms, which shows as the

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strongest predictor. While the two versions of information interventions in this study were not successful, a more refined intervention can be designed using a different positioning regarding wind farm development. Informational interventions have been shown to change public attitudes on wind energy, especially when the focus of the communication messages has been about more specific projects, communicated in live, face to face information sessions, and communicated multiple times over a time duration. This would enable the public to gain a more nuanced understanding of the costs and benefits of specific wind energy developments, leading to a potential change in social acceptance attitudes. Importantly, country- and culture-specific communication strategies should be developed around proposed wind energy projects, avoiding a one-size-fits-all approach.

These findings alert policy makers and wind energy stakeholders to the importance of often overlooked social and behavioral determinants of social acceptance. Behavioral interventions have been deployed for influencing and guiding energy use and conservation behavior, and with great success, but much depends on the intervention context and design. In this respect, wind energy projects in Europe could serve as a learning ground for social acceptance of renewable energy technology.

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5. Appendix

5.1. Consent form

Dear participant,

Welcome to our survey!

Study Title: Public attitudes towards wind energy.

Project: WENDY - Multicriteria analysis of the technical, environmental, and social factors triggering the acceptance of wind technologies.

Purpose of the research: This research study is part of a European project called WENDY, funded by European Commission's Horizon Europe programme under grant agreement no. 101084137. **The objective of the survey is to collect information on social, psychological factors that influence people's acceptance, support, or opposition of wind energy and wind farms.** In this objective, nine European partners (Foundacion Circe, White Research, Stiftelsen Norsk Institutt for Naturforskning NINA, Enel Green Power, Norwegian Offshore Wind, Minoan Energy Community, Copenhagen Business School, APPA Renovables, and Q-Plan International) are collaborating on this project.

In this study, we present you with some information about wind energy and wind farms and request you to answer some simple questions. You would also be requested to provide some personal information during the survey.

Your participation: We invite you to take this survey to help us understand factors influencing social acceptance of wind energy. The survey will take about **10-15 mins**. Your participation is entirely voluntary, and you may stop participating any time you wish. If you do not wish to provide the requested information, the only consequence is that you will not be able to participate in the research project.

Risks and benefits: To the best of our knowledge, answering this survey has no more risk than everyday life. However, if you wish not to answer any specific question, you can leave it blank. You do not have to give us any reason for not responding to any question or for refusing to take part in the online survey. There are no direct benefits to you, but your participation would help us understand the different reasons behind social opposition to wind farms in EU and help us design better solutions to this challenge. There are no financial incentives in participating in this survey.

Confidentiality: All your personal data will be kept confidential. No answers in the survey can be traced back to any person. In case the results of this survey are being published, all individual names and other personally identifiable information will be anonymised (no names and personal details will be used). To minimize the risks, we collect only the personal information that is absolutely needed for achieving the aims of the study.
All partner institutions involved in the WENDY project adhere to the European Union's General Data Protection Regulation (GDPR) and other relevant European and national legislation.

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The legal basis for processing personal data: The personal data concerning education, income, age, gender etc. are processed in accordance with Article 6 (1), litra e. The data shall not be transferred to third countries.

Recipients of Personal Data: Your personal data will not be shared with or given to anyone outside of the project. The information will however be shared with the other European partners as part of this research project. We may also share the data we collect from you for use in future research studies or with other researchers or journal editors. If we share the data that we collect about you, we will remove any personal information before we share it, i.e., only anonymised data will be shared.

Data Retention Period: Since the anonymised data do not have any personal identifiers, it will be stored and kept for research purposes.

Contact: If you have any questions, you can ask the person conducting the survey OR you may contact the researcher -

- Roopali Bhatnagar (rbh.msc@cbs.dk), Copenhagen Business School, Denmark.
- [One contact person from the task partners]

Copenhagen Business School will be responsible for accessing and processing the data.

If you have any questions regarding data security that you do not wish to ask members of the research team, you may also contact Copenhagen Business School's Data Protection Officer (DPO) - Mr. Jesper Smedegaard Madsen (dpo@cbs.dk).

If you have read and understood the information above, please indicate your choice below -

I consent to taking part in this survey. ☐

I DO NOT consent to taking part in this survey. ☐

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5.2. Online survey

The survey questions shown here are in English, but all text was translated to the local languages in the online surveys, which were validated by WENDY use case partners. Both surveys started with the same consent form (shown above). All questions (Q1 - Q27) were included in the pilot survey, while six questions (Q4, Q8, Q12, Q14, Q20, Q27) were excluded in the main survey. The images in the main survey corresponded to figures 5 - 7 in the methodology section (section 2).

Q1 What is your age (in years)? _____

Q2 What is your gender?

- o Male
- o Female
- o Non-binary / third gender
- o Prefer not to say

Q3 What is the highest level of education that you have completed?

- o Less than High school
- o High school graduate
- o Some college but no degree
- o Bachelor's degree (for example: BA, BS)
- o Master's degree (for example: MA, MS)
- o Professional degree (for example: MD, LLB, MBA etc.)
- o Advanced graduate or doctorate (PhD)
- o Vocational degree
- o Other

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Q4 Here is a 7-point scale showing possible political ideology ranging from extremely liberal (left) to extremely conservative (right). Where would you place yourself on this scale?

	Liberal	----	----	----	----	----	Conservative
Political ideology	o	o	o	o	o	o	o

Q5 What best describes your current employment status?

- o Working full-time
- o Working part-time
- o Unemployed, looking for work
- o Retired, pensionist
- o Student
- o Homemaker, stay-at-home parent
- o Other

Q6 How trustworthy do you find:

	Extremely untrustworthy	Somewhat untrustworthy	Neutral	Somewhat trustworthy	Extremely trustworthy
Your national government?	o	o	o	o	o
Your local government (e.g., municipal level)?	o	o	o	o	o
Wind energy project developers?	o	o	o	o	o
Energy suppliers?	o	o	o	o	o

Q7 Do you live near a wind farm?

- o No
- o Yes

Q8 At what distance approximately are the wind turbines to your place of residence (in kms) ? _____

Q9 Have you ever seen a wind turbine from close or visited a wind farm?

- o No
- o Yes

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Q10 Is your employment in any way connected to the wind industry (e.g., developer, investor, consultant, project manager, policy maker)?

- o No
- o Maybe
- o Yes

Q11 Have you invested in a wind farm in your community, region or country?

- o Yes
- o No, but I would like to do so in the future
- o No

Q12 Do you use electricity generated by wind energy at home or at work?

- o Definitely not
- o Probably not
- o Don't know
- o Probably yes
- o Definitely yes

Q13 Please indicate your opinion on the following statements:

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
Wind turbines kill birds.	o	o	o	o	o
Wind energy is expensive and cannot compete with traditional sources of energy (e.g., coal, oil)	o	o	o	o	o
Wind energy will increase your monthly energy bill.	o	o	o	o	o
Wind turbines are noisy and can affect your health.	o	o	o	o	o
Around 95% of a wind turbine can be recycled.	o	o	o	o	o
Generating power from wind turbines does not emit any greenhouse gases.	o	o	o	o	o

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Q14 Which is the main source of electricity generation in your country (2024)?

- o Wind energy
- o Solar energy
- o Natural gas
- o Coal
- o Hydropower
- o I don't know

Q15 Please indicate your opinion on the following statements:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Climate change is beyond control, it is too late to do anything about it.	o	o	o	o	o
The effects of climate change are too far in the future to really worry me.	o	o	o	o	o
The environment is a low priority compared to other things in my life.	o	o	o	o	o
If things continue on their current course, we will soon experience a major environmental disaster.	o	o	o	o	o
The so-called 'environmental crisis' facing humanity has been greatly exaggerated.	o	o	o	o	o

Q16 Please read the following text carefully:

Control image OR Economic condition OR Environment condition

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Q17 Please indicate your opinion on the following statements:

	Strongly disagree	Somewhat disagree	Neutral	Somewhat agree	Strongly agree
I am in favor of wind energy technology, in general.	0	0		0	0
I am in favor of building wind farms in my country.	0	0		0	0
I am in favor of building a wind farm in my region (10-15 kms from my residence).	0	0		0	0
I am in favor of building a wind farm in my municipality (3-5 kms from my residence).	0	0		0	0
I am in favor of building a wind farm in my community (1-2 kms from my residence).	0	0		0	0

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Q18 In forming your opinion about wind energy, please indicate how important are the following factors:

	Not at all important	Low importance	Slightly important	Neutral	Moderately important	Very important	Extremely important
Environmental issues (e.g., impact on biodiversity, wildlife, eco-system)	o	o	o	o	o	o	o
Climate issues (e.g., global warming, CO2 emissions)	o	o	o	o	o	o	o
Landscape related issues (e.g., visual impact, noise, location of wind farms)	o	o	o	o	o	o	o
Economic issues (e.g., employment opportunities, community benefits, compensation, property values, electricity price)	o	o	o	o	o	o	o
Health issues (e.g., annoyance, stress)	o	o	o	o	o	o	o
Policy issues (e.g., taxes, political decision-making, energy policy)	o	o	o	o	o	o	o
Other issues (e.g., trust in local authorities, wind energy developers, wind industry, fairness of decisions)	o	o	o	o	o	o	o
Technical issues (e.g., size of turbines, number of turbines in a wind farm, turbine design, recycling capability of turbines)	o	o	o	o	o	o	o

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Q19 In the next 12 months, would you be willing to:

	Extremely unlikely	Somewhat unlikely	Neutral	Somewhat likely	Extremely likely
To volunteer as a wind energy promoter in your local community (e.g., 1 hour each week)?	o	o	o	o	o
To join a wind energy community in your region?	o	o	o	o	o
To invest in a community wind farm in your municipality?	o	o	o	o	o
To participate in protest action or citizens' initiatives against planned wind energy project in your local community or neighborhood?	o	o	o	o	o
To participate in citizen consultations for a wind farm in your local community or neighborhood?	o	o	o	o	o

Q20 On a scale of 0 - 20 Euros, please indicate how much you would be willing to pay **each month,** to support wind energy projects in your region or community: _____

Q21 To you, how acceptable are:

	Totally unacceptable	Slightly unacceptable	Neutral	Slightly acceptable	Totally acceptable
Onshore (on land) wind farms?	o	o	o	o	o
Offshore (in sea) wind farms?	o	o	o	o	o

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Q22 How expensive do you think, it is to produce electricity from these energy sources?

	Very cheap	Slightly cheap	Moderately priced	Slightly expensive	Very expensive	Not sure
Offshore wind	0	0	0	0	0	0
Onshore wind	0	0	0	0	0	0
Solar	0	0	0	0	0	0
Natural gas	0	0	0	0	0	0
Coal	0	0	0	0	0	0
Hydropower	0	0	0	0	0	0
Nuclear	0	0	0	0	0	0

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Q23 Please indicate the extent to which each of the following statements describes you:

	Not at all true about me			Neither true nor untrue			Completely true about me
I like to spend time outdoors in natural settings (e.g., forests, mountains, rivers, fields, local parks, lake or beach, or a leafy garden)	o			o	o		o
I think of myself as a part of nature, not separate from it.	o			o	o		o
If I had enough resources such as time or money, I would spend some of them to protect the natural environment.	o			o	o		o
When I am upset or stressed, I can feel better by spending some time outdoors surrounded by nature.	o			o	o		o
Behaving responsibly toward nature—living a sustainable lifestyle—is important to who I am.	o			o	o		o
Learning about the natural world should be part of everyone's upbringing.	o			o	o		o
If I could choose, I would prefer to live where I can have a view of the natural environment, such as trees or fields.	o			o	o		o
An important part of my life would be missing if I was not able to get outside and enjoy nature from time to time.	o			o	o		o
I feel refreshed when I spend time in nature.	o			o	o		o
I feel comfortable out in nature.	o			o	o		o
I enjoy encountering elements of nature, like trees or grass, even when I am in a city.	o			o	o		o

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Q24 In the image and text about wind energy shown to you earlier in the survey, which costs and benefits were mentioned?

- o Environmental
- o Economic
- o Health
- o No mention of costs and benefits

Q25 Please indicate your opinion on the following statements:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Many of my neighbors and friends use electricity generated from renewable energy sources.	o	o	o	o	o
Saving energy is expected by my neighbors, friends and family.	o	o	o	o	o
People I care about would approve of my participation in local wind energy projects.	o	o	o	o	o

Q26 Please indicate your opinion on the following statements:

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
I feel strongly attached to the community I live in.	o	o	o	o	o
There are many people in my community whom I think of as good friends.	o	o	o	o	o
I often talk about my community as being a great place to live.	o	o	o	o	o

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Q27 Please indicate your opinion on the following statements:

	You can't be too careful.	-	-	Don't know	.	.	Most people can be trusted.
Would you say that most people can be trusted, or that you can't be too careful in dealing with people?	0	0	0	0	0	0	0
Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair?	0	0	0	0	0	0	0
Would you say that most of the time people try to be helpful or that they are mostly looking out for themselves?	0	0	0	0	0	0	0

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5.3. Data analysis for pilot survey

5.3.1. Sample size characteristics (pilot)

The **pilot** sample size details, as per use case area, are presented in Table 1. Overall, 288 people responded to the survey across the four use case areas, but we excluded incomplete responses (31) and no consent (8) responses in the first stage. The mean age of the sample participants (n = 249) was 45 years and 35% identified as female. It was a highly educated participant sample with 65% participants possessing a graduate degree or an advanced degree (PhD). About 70% participants were employed full time, and on political ideology, 47% identified as Liberals, 30% as neutral, and 20% as Conservatives. Although only 18% participants lived close to a wind farm, almost 74% had seen or visited a wind farm, 14% had invested in a wind farm and 25% expressed a desire to invest in a wind farm in the future. For further analysis, we excluded responses that failed manipulation check (150), giving us a final sample of 99 responses.

Table 1 - Sample characteristics for each WENDY use case area (pilot phase).

	Total responses	Complete responses	Males	Mean age (years; M)	Females	Mean age (years; F)
Greece	127	108	80	50.4	25	43.8
Italy	19	18	9	54.1	7	40.4
Spain	17	13	7	40.7	6	31.7
Norway	125	110	60	42.1	50	41.8
Total	288	249	156	47.0	88	41.6

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5.3.2. Social acceptance attitude (pilot)

Social acceptance attitude was the first DV and was measured by five items - i) 'I am in favor of wind energy technology, in general.', ii) 'I am in favor of building wind farms in my country.', iii) 'I am in favor of building a wind farm in my region (10-15 kms from my residence).', iv) 'I am in favor of building a wind farm in my municipality (3-5 kms from my residence).', and v) 'I am in favor of building a wind farm in my community (1-2 kms from my residence).'. In figure 15, the response percentages are shown for all items on the social acceptance attitude scale. The survey responses show a familiar pattern, i.e., high social acceptance for wind energy in general, and declining acceptance attitudes for specific wind farms closer to residence.

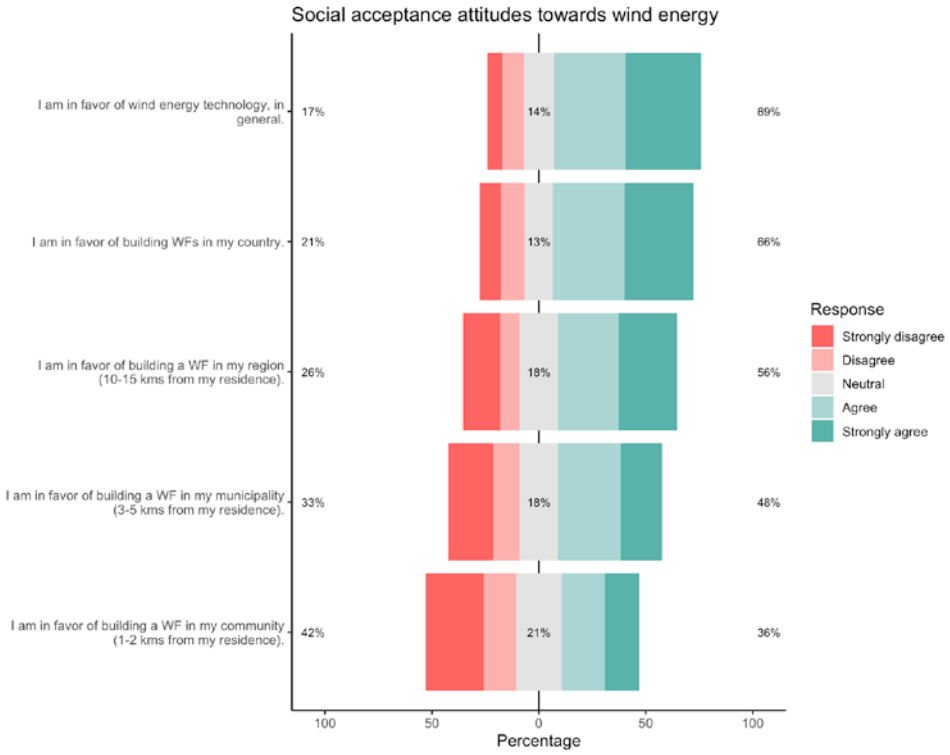

Figure 15: Survey responses for social acceptance attitude (pilot).

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There was **high support for wind energy technology** in general, in the pilot phase (mean score = 3.8 on a scale of 5, SD = 1.2), however, the **support was lower for specific windfarms placed closer to residence** (mean score = 3.1, SD = 1.3). Further, participants were **more supportive of offshore wind farms than onshore wind farms** (figure 16 shows the pilot survey responses for offshore vs. onshore wind farms).

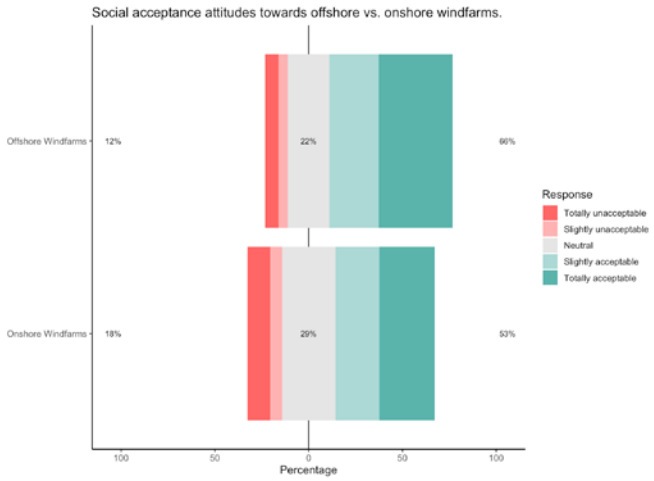

Figure 16: Survey responses for social acceptance of offshore vs. onshore windfarms (pilot).

We tested the **main effect of framing condition** (Control, Economic, Environment; figure 17) on social acceptance attitude and found no significant effects in the pilot ($\chi^2_{\text{Kruskal-Wallis}}$ (2) = 1.7, p > 0.05).

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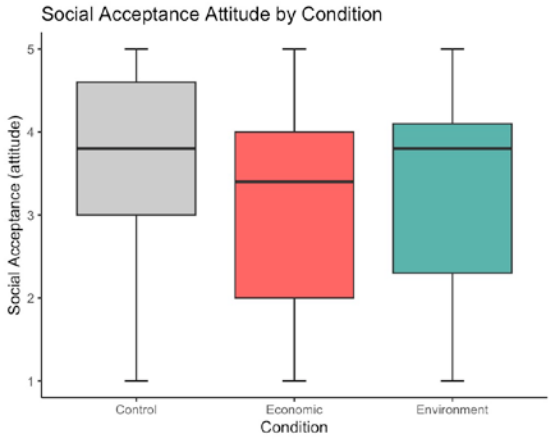

Figure 17: Boxplots of levels of social acceptance attitude for the three conditions in the pilot. The graph shows the results of the Kruskal-Wallis nonparametric test.

5.3.3. Social acceptance behavior (pilot)

Social acceptance behavior was the second DV and was measured by five items in response to the statement 'In the next 12 months, would you be willing to:' - i) 'To volunteer as a wind energy promoter in your local community (e.g., 1 hour each week)?', ii) 'To join a wind energy community in your region?', iii) 'To invest in a community wind farm in your municipality?', iv) ' To participate in protest action or citizens' initiatives against planned wind energy project in your local community or neighborhood?', and v) 'To participate in citizen consultations for a wind farm in your local community or neighborhood?'. In figure 18, the response percentages are shown for all items on the social acceptance behavior scale.

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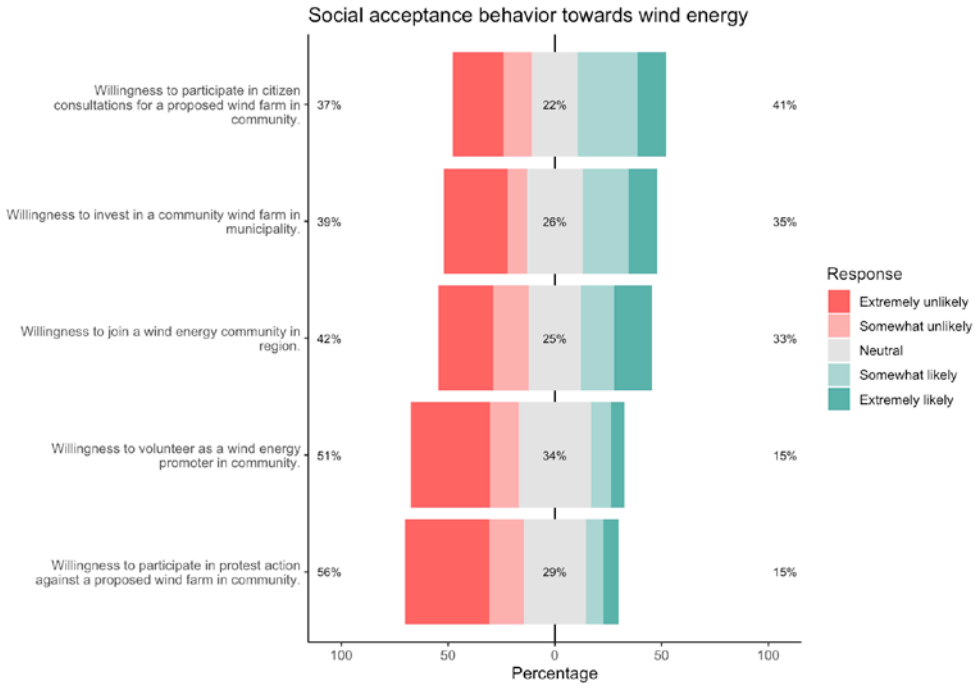

Figure 18: Survey responses for social acceptance behavior (pilot).

We tested the **main effect of framing condition** (Control, Economic, Environment; figure 19) on social acceptance behavior and found no significant effects in the pilot ($\chi^2_{\text{Kruskal-Wallis}}$ (2) = 4.8, p > 0.05).

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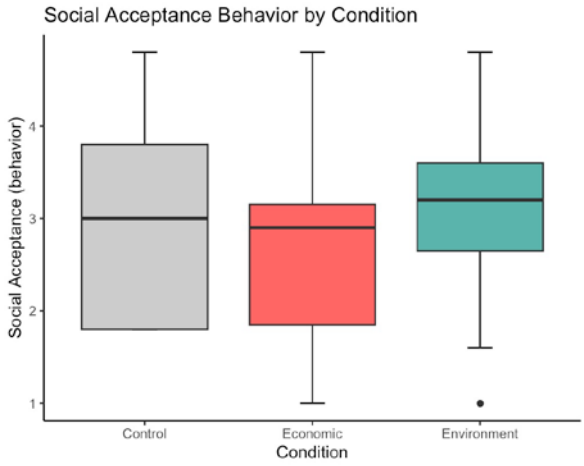

Figure 19: Boxplots of levels of social acceptance behavior for the three conditions in the pilot. The graph shows the results of the Kruskal-Wallis nonparametric test.

Next, we conducted regression on the pilot data to check the influence of other variables on social acceptance attitude and behavior. Figure 20 presents the regression coefficients from the full model with major predictor variables (model 1, model 3) and the model selected based on lower Akaike Information Criterion (AIC; model 2, model 4). For the DV social acceptance behavior, we included social acceptance attitude as an additional predictor. We note the following results from the selected models, i.e., model 2 (attitude) and model 4 (behavior):

1. Experimental condition did not have a significant effect in influencing either social acceptance attitude or behavior. That is to say, the information messages with economic and environmental framing mentioning BOTH economic and environmental **costs and benefits** of wind energy did not have a significantly large or different effect than the information messages in the control condition, in influencing people's attitude or willingness to act in a supportive way.
2. In the pilot data, variable **country** is significant in influencing social acceptance behavior, but not attitude. Social acceptance behavior coefficients are significantly lower for Norway ($B = -0.58$, $p < 0.01$) and Spain ($B = -0.82$, $p < 0.01$).

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3. **Trust in authorities and stakeholders** (local government, wind energy project owners, developers) did not play a significant role in influencing either social acceptance attitude or behavior.
4. On the other hand, **knowledge about wind energy technology and wind farms** is highly significant ($B = 0.79$, $p < 0.001$) in enhancing social acceptance attitude but not behavior. A positive and statistically significant regression coefficient of 0.79, indicates that higher the public knowledge and awareness about wind energy technology, higher the acceptance attitude towards wind energy technology and projects.
5. **Social norms around use of renewable energy** were also significantly associated with social acceptance attitude ($B = 0.26$, $p < 0.05$) but not behavior.
6. Similarly, the variable **community identity** showed a significant negative association with social acceptance attitude ($B = -0.34$, $p < 0.01$) but a significant positive association with behavior ($B = 0.21$, $p < 0.05$)
7. **Age and gender** are significant predictors of social acceptance behavior, but not attitude. Age had a slightly negative effect ($B = -0.01$, $p < 0.05$), and so did gender, with females showing lower behavior coefficient ($B = -0.32$, $p < 0.05$).
8. No interaction effects were found to be significant.

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	Dependent variable:			
	Social Acceptance Attitude		Social Acceptance Behavior	
	(1)	(2)	(3)	(4)
ConditionEconomic	-0.291	-0.286	-0.035	-0.023
	(0.229)	(0.221)	(0.189)	(0.182)
ConditionEnvironment	-0.213	-0.217	0.024	0.055
	(0.218)	(0.210)	(0.178)	(0.169)
CountryItaly	0.531	0.510	0.002	-0.072
	(0.330)	(0.298)	(0.274)	(0.264)
CountryNorway	0.019	0.059	-0.533*	-0.587**
	(0.275)	(0.256)	(0.224)	(0.187)
CountrySpain	0.564	0.571	-0.733*	-0.825**
	(0.379)	(0.371)	(0.312)	(0.298)
Age	0.001		-0.013*	-0.014*
	(0.007)		(0.006)	(0.006)
GenderFemale	-0.071		-0.283	-0.323*
	(0.198)		(0.161)	(0.148)
GenderNonBinary	0.687		-0.719	-0.679
	(0.868)		(0.708)	(0.698)
GenderNotDisclosed	-0.812		-0.641	-0.575
	(0.623)		(0.511)	(0.501)
sa_att_avg			0.287**	0.290**
			(0.094)	(0.089)
trust_avg	0.136	0.134	-0.105	
	(0.128)	(0.119)	(0.106)	
know_avg	0.736***	0.793***	0.196	0.200
	(0.132)	(0.117)	(0.127)	(0.121)
env_conc_avg	0.065		0.087	
	(0.130)		(0.111)	
env_id_avg	-0.053	-0.032	-0.003	
	(0.120)	(0.103)	(0.100)	
soc_norm_avg	0.280*	0.269*	0.091	0.085
	(0.134)	(0.131)	(0.114)	(0.111)
comm_id_avg	-0.379**	-0.343**	0.225*	0.213*
	(0.121)	(0.116)	(0.105)	(0.102)
Constant	1.243	1.045	1.079	1.222
	(1.105)	(1.024)	(0.914)	(0.700)
Observations	91	91	90	91
Log Likelihood	-99.644	-101.343	-79.112	-81.071
Akaike Inf. Crit.	231.288	224.686	192.223	190.141
Note:				*p<0.05; **p<0.01; ***p<0.001

Figure 20: Regressions predicting social acceptance attitude and behavior (pilot). Standard errors shown in parenthesis.

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