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Renewable energy acceptance and responsible actors: unravelling the influence of trust in governments and corporations

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Abstract

Background The global transition towards renewable energy (RE) is essential for mitigating climate change and reducing dependency on fossil fuels. However, this transformation faces significant challenges related to public acceptance, which is shaped by social, environmental, and economic concerns. Among the many factors influencing acceptance, trust in institutions plays a particularly critical role as energy transition policies involve high levels of uncertainty, long-term impacts, and an asymmetry of information, which requires citizens to rely on institutional actors when evaluating risks and benefits. Existing research often fails to differentiate trust in actors, particularly between government and corporations. This study addresses this gap by examining how different forms of institutional trust shape perceptions of RE technologies in Germany, including perceived benefits, perceived disadvantages, and affective responses.

Results Based on a mixed-methods approach combining qualitative thematic analysis and quantitative structural equation modelling using a representative telephone survey ($N = 1155$), the findings reveal a differentiated trust landscape. Trust in government is associated with stronger perceived benefits and lower perceived disadvantages of RE, but simultaneously with higher levels of negative emotional responses, potentially reflecting frustration with bureaucratic processes and unmet expectations. In contrast, trust in corporations is linked to more positive affective responses, while at the same time reducing perceived benefits and increasing perceived disadvantages, indicating skepticism toward corporate motives despite optimism about technological innovation.

Conclusions The results demonstrate that institutional trust does not function as a uniformly positive driver of RE acceptance, but rather as a complex and actor-specific mechanism involving both cognitive and affective evaluations. By differentiating between governmental and corporate trust, the study extends existing acceptance models and highlights important implications for policy and communication strategies. Strengthening trust in government requires transparency and participatory governance, whereas fostering trust in corporations depends on accountability, fairness, and the clear communication of public benefits.

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Background

Germany's energy system is undergoing a profound transformation to combat climate change and reduce dependence on fossil fuels, which are key drivers of global warming and environmental degradation [1]. This transition, known as the "*Energiewende*", centers on expanding renewable sources such as wind, solar, hydro, geothermal, and biomass, which offer low-carbon alternatives [2,–3]. To accelerate this shift, the German government has set ambitious goals, including a major reduction in fossil fuel use by 2035. Key measures include the "*Wind-an-Land-Gesetz*", requiring states to designate 2% of land for wind energy by 2032, and "*Solarpaket I*", which streamlines photovoltaic regulations and promotes rooftop and tenant solar installations, supporting the goal of 80% renewable electricity by 2030 [4].

Yet policies and technology are not enough. Public trust and acceptance of renewable energy (RE) are essential. Acceptance has become a decisive factor in determining whether projects proceed smoothly or encounter delays and resistance [5, 6], with numerous examples showing how opposition has led to significant setbacks or even the cancellation of entire projects [7–9]. Public resistance to RE projects stems from a variety of concerns, ranging from social issues like the rights of Indigenous communities [10, 11] to environmental impacts such as risks to bird populations [12], whale habitats [13], or groundwater contamination [14]. Economic factors also play a role, including high infrastructure costs [15] and fears of declining property values [16]. Reflecting this, academic interest in the topic has grown steadily since the mid-2000s, recognizing the vital role of social acceptance in driving the energy transition forward [17–19].

Underlying many of these acceptance issues is the question of trust—in the institutions responsible for making energy decisions, the fairness of procedures, and the motives behind projects.

Improving trust can help to reduce uncertainty [20] and supports cooperation in complex systems [21]. Although trust is a multidimensional concept that varies by context and discipline, at its core, trust reflects a willingness to accept vulnerability based on positive expectations of others' intentions and behavior [22]. Trust is shaped by past experiences, institutional frameworks, and personal dispositions [23]. In complex and uncertain areas such as RE policy, trust in institutions is especially important, since people rely on transparent and reliable decisions to feel confident in the transition process [24].

Scholars distinguish between different types of trust, depending on its target and formation process [25, 26]:

- Dispositional Trust: A general tendency to trust others, shaped by personality and early socialization [25].
- Institutional Trust: Confidence in organizations, governments, and corporations responsible for policies and infrastructure [25, 27, 28].
- Interpersonal Trust: Trust in individuals, such as policymakers, scientists, or local project leaders, which plays a key role in community acceptance [29].
- Procedural Trust: Trust in fair and transparent decision-making processes, including public participation in energy projects [30].
- Technological Trust: Confidence in the reliability, safety, and effectiveness of a specific technology, such as wind or solar power [29].

A key distinction in the trust literature is that trust and distrust are not simple opposites. Distrust is not merely the absence of trust but reflects active skepticism rooted in negative expectations [31]. These expectations are often shaped and reinforced by negative experiences with institutions or technologies, which can lead to long-lasting distrust that is difficult to reverse [32]. However, critical trust offers an alternative perspective, recognizing that skepticism does not necessarily equate to outright rejection but can instead foster a more reflexive and informed engagement with energy policies and technologies. By acknowledging uncertainty and allowing space for both confidence and cautious evaluation, critical trust can help to balance risk perception and facilitate public acceptance of energy transition initiatives [33].

In the context of the energy transition, trust is essential for public acceptance of RE projects [30]. Trust in government institutions affects the perceived legitimacy of policies [28], while trust in companies and project developers influences willingness to adopt new technologies [26]. Moreover, procedural trust–ensuring inclusivity, fairness, and transparency in decision-making, has been identified as a critical factor in fostering societal support [24].

Despite widespread recognition of the importance of public acceptance for the success of RE initiatives [34–36], the specific role of trust in shaping public perceptions remains underexplored. Existing research shows that trust is positively associated with technology acceptance [37], significantly influences perceptions of the energy transition [38], and affects consumers' willingness to financially support it [39]. However, few studies have differentiated between forms of trust, such as Terwel et al. [40], for example, who compared public trust in NGOs and industrial stakeholders in the context of carbon capture and storage (CCS). Similar analyses within the field of renewable energy remain scarce. This study addresses this gap by examining how institutional trust, specifically in governmental versus corporate actors, influences acceptance of the energy transition. In doing so, it provides a more differentiated understanding of public attitudes and delivers important insights for the effective implementation of RE policies.

In contrast to much of the existing literature, which focuses on individual technologies, such as wind or solar, this research takes a broader view and examines acceptance of the energy transition as a whole, thus offering deeper insights into the societal support needed to achieve the given climate goals.

To this end, the study applies the Huijts' comprehensive technology acceptance framework [29], in the following referred to as comprehensive framework, and employs a mixed-methods design. The qualitative component is based on thematic analysis of in-depth interviews and captures societal attitudes toward the transition. The quantitative analysis uses Structural Equation Modelling (SEM) to investigate how different dimensions of trust influence perceived benefits, disadvantages, emotional responses, and overall acceptance. By differentiating between trust in government institutions and trust in corporations, this research clarifies their distinct roles in shaping public acceptance. In doing so, it advances theoretical understanding and provides practical guidance for policymakers and communicators. Ultimately, the study seeks to illuminate how trust mediates public support for the energy transition and to offer actionable insights for its successful implementation.

Literature review

While traditional models such as the Technology Acceptance Model (TAM) by Davis [41] have primarily focused on factors such as perceived usefulness and ease of use, the acceptance of RE technologies involves additional social and institutional dimensions. More recent models, such as the Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. [42], and Huijts' comprehensive technology acceptance framework [29], integrate psychological factors such as trust and procedural fairness, as well as affectual aspects. These models highlight that transparent decision-making and fair benefit distribution are crucial for public acceptance [43]. The decision to employ the comprehensive framework by Huijts in this study is grounded in its explicit integration of trust as a core determinant of technology acceptance. It is particularly well-suited to analyze how institutional trust, especially in governments and corporations, interacts with perceived benefits, risks, and emotional responses. Moreover, the comprehensive framework integrates psychological constructs such as distributional and procedural fairness, as well as affective dimensions, which are crucial for understanding public reactions to large-scale infrastructure like the energy transition.

By contrast, other common models such as UTAUT and UTAUT2 prioritize factors such as performance expectancy, effort expectancy, and facilitating conditions, but do not account for trust or emotional variables in a substantial way. Similarly, the Innovation Diffusion Theory (IDT) focuses on the temporal spread of innovations and lacks the psychological mechanisms necessary to capture trust-based evaluation processes. These limitations make them less appropriate for studying public acceptance in the socio-political context of energy transitions.

Recent European case studies confirm that despite high general support (86% for renewables vs. 62% for wind projects), local resistance often stems from a lack of participation and an unequal distribution of costs and benefits [44, 45]. The concept of social acceptance underscores that public acceptance is shaped not only by individual attitudes but also by the legitimacy of decision-making processes. Studies in Ireland and Germany indicate that regions with low acceptance cause significantly higher implementation costs [46]. Three key drivers frequently cited in the literature help to explain this resistance:

- Perceived inequities in the distribution of project benefits [47].
- Lack of trust in planning authorities [48].
- Limited local participation in decision-making [49].

Economic factors also play a pivotal role in shaping public acceptance. Community ownership models, which allow local populations to directly benefit from RE projects, have been shown to increase support [50]. Offering tangible incentives and involving communities in decision-making processes can significantly enhance acceptance levels [51, 52]. Trust is particularly crucial regarding how these economic benefits are perceived and distributed. A recurring theme in the literature is that acceptance rises when benefits are seen as collective rather than individual [53, 54]. Ambrosio-Albala et al. [55], for example, found that decentralized energy storage systems received higher public approval when communities perceived the economic gains as shared. This highlights a broader insight: RE technologies are more likely to be accepted when they generate visible local benefits, such as job creation and economic development, alongside their environmental advantages.

This connection between fairness, benefit distribution, and trust reflects a deeper relationship. Research differentiates between integrity-based trust (perceived honesty and concern for public welfare) and competence-based trust (technical ability of responsible actors). Empirical studies show that integrity-based trust has a stronger impact on acceptance than competence-based trust [56, 57]. When economic benefits are perceived as fairly distributed, trust in institutions strengthens, reducing resistance to RE projects. Case studies on wind energy projects demonstrate that participatory planning and financial involvement can increase acceptance significantly [58]. For technologies such as hydrogen, knowledge gaps and prior experience additionally constitute a significant barrier to acceptance [59, 60]. Surveys indicate that only 23% of the population feels well-informed about hydrogen energy [61]. At the same time, technological familiarity significantly influences acceptance: communities with prior wind energy experience exhibit 30% lower opposition rates [62].

Research also highlights significant gaps between national and local acceptance of RE projects [63, 64]. While national support for renewables is relatively high, local support can vary, particularly when concerns about fairness and participation are not adequately addressed [46]. However, empirical studies indicate that spatial concerns of acceptance are not necessarily linked to the commonly-associated NIMBY phenomenon. A discrete-choice experiment found that the majority of wind energy supporters (79%) would accept a nearby wind farm even without compensation, suggesting that opposition is often rooted in concerns about placement and design rather than fundamental rejection. These concerns can be alleviated through participatory planning and fair compensation mechanisms [65]. However, the effectiveness of such measures largely depends on the level of trust between the institutions and stakeholders involved. In this context, trust emerges as a key driver of acceptance, whether this is trust in government institutions and corporations, or trust in local stakeholders such as community representatives and decision-makers [56]. A lack of local trust can be a decisive barrier to acceptance, leading to resistance even in regions with generally high support for RE policies [45, 66, 67]. Recognizing this, policy interventions have increasingly focused on trust-building strategies. For instance, the 2024 RE Directive [68] aims to mitigate these trust issues by prioritizing early citizen participation in project planning to reduce resistance and increase transparency.

In recent years, emotional responses (affect) have gained prominence as key drivers in technology acceptance. Emotions often influence perceptions of risk and benefit more strongly than rational assessments [69–71]. Positive feelings such as hope and optimism enhance acceptance by associating RE with progress and sustainability, while negative emotions such as fear or skepticism tend to heighten perceived risks and fuel opposition [43, 72]. Trust in government can play a dual role here, supporting optimism about long-term benefits while also triggering skepticism about bureaucratic inefficiency [73]. Affect mediates how risks and benefits are evaluated: optimism can reduce perceived risks, whereas fear can diminish the perceived value of RE projects [70, 71]. Affect also shapes long-term attitudes toward energy technologies [74]. For example, Cousse et al. [73] found that local opposition to wind energy often stems from emotional reactions to landscape changes and environmental concerns. Similarly, Wang and Xu [75] show how emotional language in public discourse can shape broader societal perceptions. These findings underline that trust and affect are closely intertwined in shaping public acceptance of RE.

From a methodological perspective, recent advancements have significantly enhanced how researchers assess public acceptance of RE initiatives. One key development is the integration of survey data with geospatial analysis to more precisely identify areas of high acceptance and potential resistance [65]. AI-driven predictive models further improve accuracy by analyzing opposition patterns using inputs such as social media sentiment, historical protest data, and satellite imagery [76]. Participatory geospatial platforms, including community GIS tools, have proven effective in reducing opposition by enabling real-time feedback on project siting decisions [77]. In parallel, behavioral techniques such as augmented reality (AR) visualizations can enhance public engagement by allowing stakeholders to virtually experience proposed projects before implementation [78].

In decision-making, advanced Multi-Criteria Decision Analysis (MCDA) methods are increasingly used to optimize trade-offs between technical feasibility and social equity. Adaptive RAO (Resource Allocation Optimization) models incorporate fuzzy logic to balance wind capacity factors with local concerns, while Monte Carlo simulations are employed to quantify uncertainty in expert judgments for offshore wind siting [79]. Together, these emerging methodologies offer innovative ways to foster trust, increase transparency, and strengthen public acceptance of RE projects.

The literature review identified trust as a central factor influencing public acceptance of RE technologies. Importantly, not all forms of trust have the same effect: trust in government and trust in corporations appear to operate through distinct mechanisms and produce divergent perceptions. While trust in government is often linked to long-term societal goals, such as climate protection, energy security, and fairness in policymaking [37, 43, 48], trust in corporations is more likely to trigger skepticism regarding motives, perceived fairness, and the distribution of benefits [47–49]. These differences suggest that institutional trust is not monolithic, but actor-specific, influencing how people cognitively assess both the benefits and the risks of RE technologies.

H1 *The direction and strength of the variables Perceived Benefits and Perceived Disadvantages differ between trust in government and trust in corporations.*

H2 in contrast is grounded in the assumption that trust not only shapes how people evaluate risks and benefits cognitively, but also how they feel about RE technologies. Affective responses, such as hope, fear, or skepticism, have been shown to play a critical role in acceptance, sometimes even outweighing rational assessments [69–71]. Trust can reduce feelings of uncertainty and threat, thereby fostering more positive emotional reactions [43]. Previous research suggests that institutional trust lowers affective resistance and increases acceptance through emotional reassurance [72, 73].

H2 *Higher levels of trust, whether in government or corporations, positively influence emotional reactions – greater trust leads to more favorable emotional responses.*

While H1 assumes that trust influences evaluations in a differentiated manner depending on the actor, H2 tests whether trust–regardless of source–tends to alleviate negative emotions and enhance emotional receptivity to RE. This reflects findings from Huijts et al. [29] and others, who argue that affect is a key mediator between trust and acceptance.

Methods

This study employs a mixed-methods approach, based on a representative survey which combined closed and open-ended questions. The data inform an explanatory model focusing on variables such as *Trust in Government*, *Trust in Corporations*, *Perceived Benefits*, and *Affect*. Analysis proceeds in two phases: first, a qualitative thematic analysis of open responses to uncover deeper public views, and second, a quantitative analysis using descriptive statistics and structural equation modeling (SEM) to explore relationships among variables. The integration of both approaches provides a comprehensive understanding of the drivers of public acceptance.

Telephone interviews were selected to reduce selection bias, particularly the overrepresentation of literate, internet-connected individuals often found in online surveys [80, 81]. This approach ensured a more balanced sample across key demographic variables such as age, education, and gender [82]. The representative telephone survey was conducted in early 2023 by USUMA GmbH in cooperation with the Leibniz Institute for the Social Sciences.

It included 1155 respondents from the German-speaking population aged 16 and older, living in Germany. Sampling followed a dual-frame random approach using the Address-Based-Sampling system (ADM), combining landline and mobile telephone numbers to ensure adequate coverage, including “mobile-only” households. The Kish selection method was used within households to ensure random respondent selection. To achieve socio-demographic representativeness, a multi-stage weighting procedure was applied, calibrated to official microcensus data (age, gender, region, household structure). Item selection for each construct was guided by the theoretical dimensions of the comprehensive framework and by established measures used in previous acceptance and trust research [38, 55, 83]. Where necessary, items were adapted to the context of the German energy transition. The selected items were chosen to capture both integrity-related and performance-related aspects of institutional trust, as well as cognitive (benefits/disadvantages) and affective dimensions of acceptance. We thereby focused particularly on trust, differentiating between *Trust in Government* and *Trust in Corporations* in regard to the energy transition in Germany, without distinguishing between specific RE technologies. The survey questions included thematic blocks on knowledge, attitudes, risks, benefits, affective responses, trust, and acceptance intentions. All participants received a standardized introductory text developed in cooperation with the survey institute and reviewed for clarity and neutrality to ensure a common knowledge baseline before answering. The text was reviewed during the pretest phase to ensure comprehensibility for respondents with different educational backgrounds. Data were collected using computer-assisted telephone interviews (CATI), offering high standardization and interviewer control. While CATI is subject to potential social desirability bias, we employed neutral wording and careful question ordering to mitigate such effects. Compared to less controlled modes such as online opt-in panels, CATI offered a strong balance between quality assurance and representativeness.

Data collection and preparation

The initial dataset consisted of 1531 respondents, including 1501 from the main survey and 30 from a pretest. To ensure data quality, several validation steps were taken. A Dual-Frame weighting variable was applied to correct for sampling biases. Cases with excessive missing values, implausible response patterns, or unusually short response times were removed. After data cleaning, the final sample comprised 1155 valid cases. The survey combined Likert-scale items, ranking questions, and open-ended responses, enabling both quantitative analysis and qualitative insights into public perceptions of the energy transition. The dataset was thoroughly reviewed through plausibility checks, filter validations, and standardized coding of open-text responses.

Sample characteristics

The final sample included respondents aged 18–92 years (M = 54.32, SD = 17.80), with a median age of 56 – slightly older than the national median of 44.6 years [84]. The gender distribution was broadly comparable to national figures (53.94% male, 45.89% female), although men were slightly overrepresented relative to the general population [85]. Educational attainment was higher than average, with 51.17% holding a university degree compared to 21.44% nationally for those aged 25–64 [86]. Income levels varied: 22.60% reported a low net income (≤ €900), 40.44% fell into a middle-income bracket (€900–€1700), and 25.54% reported high income (> €1700).

Measurement model

The survey included both qualitative and quantitative items to assess public acceptance of RE technologies. Open-ended questions captured views on outcome efficacy, problem awareness, government responsibility, and acceptance intentions. Quantitative components measured latent constructs – *Trust in Government*, *Trust in Corporations*, *Perceived Benefits*, *Perceived Disadvantages*, *Affect*, *Attitudes*, and *Acceptability*–each assessed using two to four items (see Table 1). To evaluate the psychometric quality of multi-item constructs, we conducted Exploratory Factor Analysis (EFA). Data suitability was confirmed using Kaiser-Meyer-Olkin (KMO) measures and Bartlett's test for sphericity. EFA was performed using an oblique (Oblimin) rotation to allow for correlated factors. Factor extraction was conducted

Table 1 Latent variables and corresponding survey items

Variable	Item 1	Item 2	Item 3	Item 4
Trust in Government	When implementing the energy transition, the German Federal Government pays attention to the protection of people and the environment (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	The German Federal Government performs well in the implementation of the energy transition (1–5 scale; 1 = strongly disagree; 5 = strongly agree).		
Trust in Corporations	In addition to their economic interests, the large energy companies also take the concerns of the public into account (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	The large energy companies are doing a good job in implementing the energy transition (1–5 scale; 1 = strongly disagree; 5 = strongly agree).		
Perceived Benefits	If the energy transition is implemented, future generations will benefit from it (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	The energy transition will give citizens the opportunity to generate their own energy and thus become less dependent on the energy companies (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	I think the energy transition makes my life easier (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	I think the energy transition creates new jobs (1–5 scale; 1 = strongly disagree; 5 = strongly agree).
Perceived Disadvantages	I would be willing to pay more for electricity in order to contribute to the success of the energy transition (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	The energy transition will cause economic damage to Germany (1–5 scale; 1 = strongly disagree; 5 = strongly agree).		
Affect	How do you rate your sentiment when you think about the energy transition?	How do you rate your sentiment when you think about technological developments in the energy sector?		
Attitude toward RE	More renewable energy projects should be developed (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	The energy transition is the solution to our environmental and energy problems (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	We need a consistent switch to renewable energies (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	Energy costs must be affordable for everyone (1–5 scale; 1 = strongly disagree; 5 = strongly agree).
Intention to Accept	Overall, I am in favor of the energy transition (1–5 scale; 1 = strongly disagree; 5 = strongly agree).	Even if there are personal disadvantages for me, I have nothing against the implementation of the energy transition (1–5 scale; 1 = strongly disagree; 5 = strongly agree).		

Table 2 Descriptive statistics, item selectivity, and internal consistency

Construct	Item	M	SD	*r*	Cronbach's α
Trust in government					0.61 [0.56, 0.65]
	Q14	3.24	1.07	0.43	
	Q17	2.60	1.07	0.43	
Trust in corporations					0.63 [0.59, 0.67]
	Q18	2.30	1.04	0.46	
	Q19	2.29	1.01	0.46	
Perceived benefits					0.55 [0.50, 0.60]
	Q11	4.23	1.07	0.39	
	Q12	3.72	1.19	0.39	
Perceived disadvantages					0.51 [0.45, 0.56]
	Q10*	3.05	1.40	0.34	
	Q21	2.51	1.29	0.34	
Affect					0.65 [0.62, 0.69]
	Q22_1	2.85	1.04	0.47	
	Q22_2	2.54	0.93	0.50	
	Q22_3	2.57	0.96	0.44	
Attitude towards renewable energies					0.77 [0.75, 0.80]
	Q3	4.40	0.96	0.56	
	Q4	3.81	1.16	0.61	
	Q5	4.01	1.17	0.68	
Acceptability					0.71 [0.68, 0.74]
	Q35	4.27	1.02	0.56	
	Q38	3.75	1.19	0.56	

Cronbach's α is reported for each construct; values in brackets indicate 95% confidence intervals. r denotes corrected item–total correlations. An asterisk (*) indicates reverse-coded items

using an ordinary least squares-based method, and parallel analysis and scree plots guided the determination of the factor structure. In cases where the EFA suggested deviations from the expected structure, constructs were re-evaluated and refined accordingly. Finally, we assessed inter-correlations among the latent variables to identify potential multicollinearity risks relevant for further analysis [87, 88]. Items with factor loadings ≥ 0.40 were considered acceptable and retained, following commonly used thresholds in exploratory factor analysis [89]. The EFA largely supported the expected factor structure, with retained items loading primarily on their intended constructs and no substantial cross-loadings observed.

Reliability was assessed using Cronbach's alpha and corrected item–total correlations. Most scales demonstrated satisfactory internal consistency (Cronbach's $\alpha > 0.70$), except for the "Perceived Benefits" scale, which was retained despite lower reliability due to its theoretical relevance. One item (Q6) was removed to improve internal consistency and therefor is not included in Table 2.

For the quantitative analysis Structural Equation Modelling (SEM), a widely used statistical technique in the social and behavioral sciences, was used, since it enables the simultaneous analysis of complex relationships among multiple variables. Integrating principles from factor analysis and multiple regression, SEM is especially useful for testing theoretical models that involve interdependencies among constructs. In this study, we applied covariance-based SEM (CB-SEM) using Maximum Likelihood Estimation with robust (Huber-White) standard errors (MLR) to evaluate the relationships specified in our conceptual framework. SEM consists of two main components: the measurement model, which defines the relationships between observed variables and their associated latent constructs, and the structural model, which specifies the hypothesized relationships among those constructs. This dual structure allows for the simultaneous evaluation of measurement reliability and theoretical validity, enhancing the overall robustness of the results.

To ensure methodological rigor, we carefully considered model specification, sample size adequacy, estimation method, and model evaluation. Following established guidelines [90, 91], we assessed model fit using multiple indices (e.g., CFI, RMSEA, SRMR) and tested construct reliability and validity. These steps ensured that the analytical framework adhered to best practices in SEM research, thereby strengthening the interpretability of the findings. We also estimated indirect effects using Satorra-Bentler corrections to compute robust standard errors [92–95], thereby improving the reliability of mediation estimates under non-normal data conditions. Additionally, we examined model-implied correlations between latent factors in the measurement

Table 3 Model-implied correlations between latent factors

	1	2	3	4	5	6	7
Trust in government (1)	0.466						
Trust in corporations (2)	0.595*	0.329					
Perceived benefits (3)	0.579*	0.077*	0.651				
Perceived disadvantages (4)	−0.665*	−0.103*	−0.924*	0.642			
Affect (5)	−0.723	−0.288	−0.714*	0.795*	0.592		
Attitude towards RE (6)	0.574*	0.052*	0.988	−0.949*	−0.681*	0.397	
Acceptability (7)	0.558*	0.050*	0.961*	−0.923*	−0.663*	0.973*	0.726

N = 1155. The diagonal row represents the standard deviation of the respective latent factor, providing information on the variability of the latent constructs underlying the reported correlations. The significance (*) is based on bootstrapped 95% confidence intervals from 5000 repetitions model to assess potential multicollinearity risks (see Table 3).

We examined the model-implied correlations between latent model factors within our measurement model (see Table 3).

To assess the significance of the correlations, we computed two-tailed 95% confidence intervals using bootstrapping with 5000 samples, providing robust estimates of the relationships between acceptability and its predictors.

Model fit was evaluated using multiple indices: the χ^2/df ratio, root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), and incremental fit measures including the comparative fit index (CFI), Tucker-Lewis index (TLI), and gamma hat index (γ). Thresholds for acceptable fit were based on recommendations by West et al. [96]. These indicators assess how well the structural model represents the observed data. The results indicated a satisfactory overall model fit, supporting the validity of the hypothesized relationships (see Table 4).

Results

The results section is structured into two main components: a qualitative and a quantitative analysis. The qualitative analysis employs a thematic approach to examine open-ended survey responses. These responses were inductively coded to identify recurring patterns, which were subsequently grouped into broader thematic categories. This provides deeper insight into participants' underlying attitudes and concerns regarding the energy transition. The quantitative analysis is presented in two stages. First, descriptive statistics offer an overview of participants' responses to selected survey items, illustrating trends and preferences through percentage distributions. This step highlights general patterns in public opinion. Second, the Structural Equation Model (SEM) is used to explore the relationships between key latent variables, such as trust in government and corporations, perceived benefits and disadvantages, and emotional responses. This model allows for a deeper understanding of how different types of trust influence public acceptance of RE technologies.

Qualitative analysis

The qualitative analysis followed a structured thematic approach, ensuring a systematic evaluation of open-ended survey responses. The open-ended responses were analyzed using a thematic, inductive approach. Initially, the responses were reviewed independently by both first authors to identify recurring thematic patterns. In a subsequent step, similar responses were grouped into broader thematic categories (e.g., political responsibility, technological concerns, citizen participation) through discussion and consensus. These categories were developed in a data-driven manner, without relying on a predefined coding scheme. Although no specialized software was used, consistency and transparency were ensured through an iterative discussion process. This collaborative procedure allowed for a high degree of interpretive alignment and intersubjective plausibility in the resulting categorization. The approach is consistent with established practices in reflexive thematic analysis and applied qualitative coding, as outlined by Braun and Clarke [97] and Guest, MacQueen, and Namey [98].

Government and policy

Some of the respondents emphasized the crucial role of government in financing and coordinating the energy transition, while also expressing frustration over bureaucratic inefficiencies that slow down implementation. Calls for state-led financial support were common, with statements such as *"The federal government must handle the financing,"* and *"Government must help"*. Others highlighted the need for better policy coordination, particularly at the European level, stating, *"Europe-wide coordinated control of measures,"* and *"The European Union must work better with its members"*.

At the same time, dissatisfaction with excessive bureaucracy was voiced, regarded as a major obstacle to progress. Several respondents called for *"reducing bureaucracy," "eliminating bureaucratic overhead,"* and moving *"towards a faster approval process"*. Some also argued that the government should take a more proactive regulatory role, with one respondent stating, *"The government should put pressure on the large corporations"*.

These responses reveal a tension between expectations for government leadership and frustration over inefficiencies. While many see the state as a key driver of the energy transition, there is also a clear demand for more streamlined, transparent, and decisive governance to accelerate implementation.

Technological advancements

Many respondents emphasized the need for technological advancements to drive the energy transition, expressing skepticism about current renewable solutions and calling for more diverse energy options. Some advocated

Table 4 Model fit indices

	χ2/df	RMSEA	SMRM	CFI	TLI	Gamma
Target value	< 3.00	< 0.080	≤ 0.080	≥ 0.950	≥ 0.950	≥ 0.950
Our model	4.05	0.051	0.038	0.957	0.942	0.971

for new and more reliable technologies, stating, *"Through new technologies, not the current ones,"* and *"Exploration of other technologies besides wind and bio, for example, nuclear fusion"*.

A notable number of participants supported nuclear energy, with suggestions to *"re-enter nuclear energy,"* and *"focus more on nuclear power"*. Others highlighted the potential of hydrogen energy, while several stressed the importance of increasing research efforts, calling for *"establishing a fund for science,"* and expanding *"research funding"*.

Additionally, some voiced concerns about the impact of existing energy projects on the landscape, with one respondent stating, *"It's important to integrate energy plants into the landscape and not to treat them as a disturbance such as now"*. These perspectives reflect a demand for both technological progress and better integration of energy solutions into the environment, suggesting that public support for the energy transition may depend on continued innovation and more carefully planned infrastructure development.

Collaboration and community involvement

The importance of collaboration and shared responsibility in advancing the energy transition was also highlighted. Several emphasized the need for broad cooperation, stating, *"Collaboration of all forces,"* while others called for stronger public-private partnerships, suggesting an *"expansion in the private sector"*.

Local engagement was also seen as crucial, with some advocating for closer cooperation with local authorities, stating, *"Work together with municipalities"*. Additionally, there was a broader call for collective participation, with one respondent emphasizing, *"Everyone should participate"*.

These responses reflect a widespread belief that the energy transition cannot be achieved by governments or corporations alone. Instead, a coordinated effort among policymakers, businesses, local governments, and citizens is necessary to ensure a successful and socially accepted shift toward RE.

Quantitative analysis

Perceived benefits

Among the provided set of objectives regarding perceived benefits, which, in line with [29], refers to the evaluation of positive outcomes associated with the energy transition, respondents were asked to indicate objectives they considered particularly important or unimportant. As these items were implemented as multiple-response questions rather than a complete ranking, the results are reported descriptively. Overall, objectives related to climate-neutral energy production (35.9%) and reducing dependence on foreign energy sources (32.7%) were mentioned most frequently as particularly important, followed by air pollution reduction (14.0%) and security of supply (6.9%). In contrast, goals such as oil depletion (2.3%) and other categories were mentioned far less frequently (see Fig. 1).

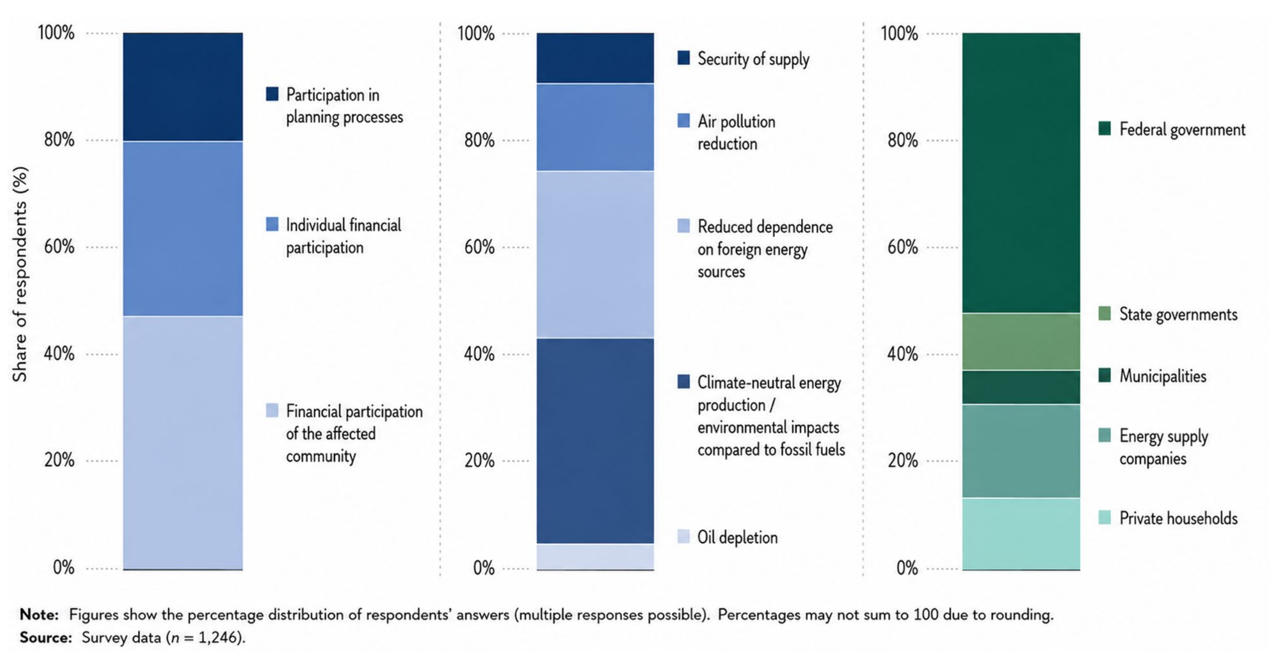

Fig. 1 Public perceptions of the energy transition. First column: perceived benefits; second column: problems addressed by the energy transition; third column: perceived responsibility for implementation (left to right)

Preferred measures to advance the energy transition

A relative majority of respondents stated that financial participation of the affected community would be the most effective way to advance the energy transition (46.7%), followed by individual financial participation (29.0%). In contrast, participation in planning processes was mentioned by a markedly smaller share of respondents (17.8%).

Problem perception

A substantial share of respondents prioritized reducing dependence on foreign energy sources (32.7%) and mitigating environmental impacts (35.9%), whereas only a small proportion highlighted oil depletion as a major concern (2.3%). High energy prices were mentioned less frequently, while environmental impacts compared to fossil fuels were perceived as the most crucial problem area overall. A small number of respondents did not align with any of the provided problem categories (see Fig. 1).

Role of government

In terms of responsibility for the implementation of the energy transition, most respondents considered the federal government to be primarily responsible (62.8%). State governments were mentioned by a smaller share (8%), followed by municipalities (4%). Energy supply companies were viewed as holding a significant level of responsibility (13.9%), though still far behind the federal government. A relatively small number of respondents considered private households to be responsible (8%) (see Fig. 1).

The findings from this section highlight public priorities, such as energy security and the role of government and corporations in the energy transition. While these results offer a valuable overview of public concerns, they do not fully explain the deeper factors shaping these preferences–particularly the role of trust in influencing how benefits, risks, and responsibilities are perceived. To answer these underlying questions, the following section explores the relationships which drive these attitudes.

Relationships in the energy transition

To better understand the mechanisms driving public acceptance of RE technologies, this study applied an explanatory model based on the TAF, with a specific emphasis on trust. The model investigates how trust in government and corporations affect public perceptions, specifically, perceived benefits, disadvantages, and emotional reactions, which in turn influence acceptance.

The model incorporates two complementary psychological theories (see Fig. 2):

1. The TPB (see Fig. 2: orange marking) asserts that individuals' intentions to act are shaped by attitudes,

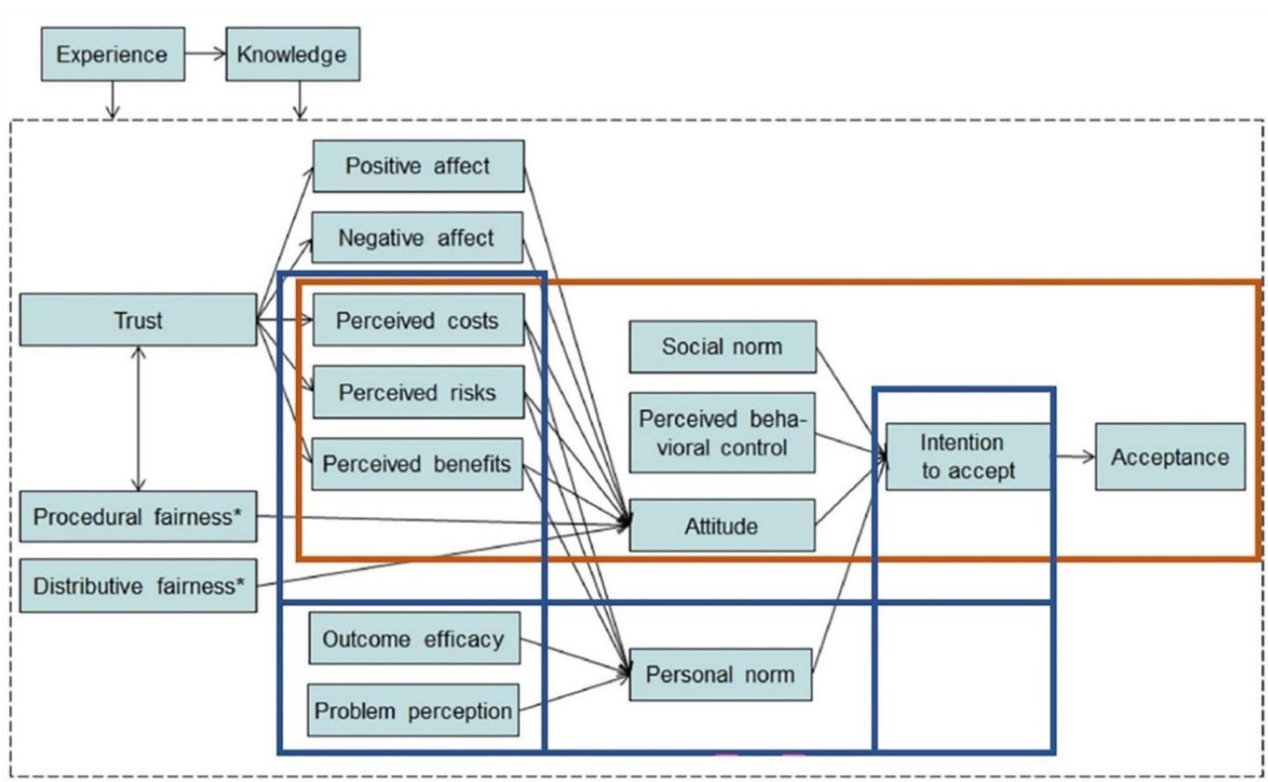

Fig. 2 Comprehensive framework [29] with markings for TPB (orange) and NAM (blue)

subjective norms, and perceived behavioral control (PBC). Positive attitudes, social pressure, and belief in having the necessary resources increase the likelihood of action. Behavioral intention**s**, shaped by these factors, directly impact behavior [99–101]. In assessing the acceptance of the energy transition, trust plays a key role, as it influences how people perceive benefits and risks [43], especially in the context of technology adoption where social acceptance is critical [37]. Also, moral considerations, such as the perceived impact on the environment or society [102], together with emotions such as fear, hope, and satisfaction, are key factors in shaping acceptance [69, 71], with the role of affect gaining increasing attention in recent research [72, 73, 103]. This growing body of research has led to increased attention to affective and trust-related determinants of technology acceptance, as well as to their explicit inclusion in frameworks such as the UTAUT [42] and the comprehensive framework [29]. Variables such as general social norms or PBC are excluded, as they are less directly relevant to the trust-focused analysis. These selected constructs were consolidated into three central latent variables in our model: *Affect*, *Perceived Disadvantages*, and *Perceived Benefits*.

2. The second psychological theory in the comprehensive framework is the Norm Activation Model (NAM) (see Fig. 2 – blue marking). It explains how personal norms influence altruistic and pro-environmental behaviors. According to the NAM, behavioral intentions are shaped by personal norms, driven by an individual's awareness of consequences and sense of responsibility [98]. Schwartz highlights that pro-social behavior stems from a moral duty, activated when people realize the negative impact of inaction and believe they can make a difference [104]. In the context of energy transitions, the NAM predicts that people are more likely to reduce energy consumption when motivated by strong personal norms. However, this motivation is affected by financial and personal hurdles [105]. While normative variables are not included in our SEM, we incorporated factors such as outcome efficacy, the conviction that one's actions contribute to solving a problem, and problem perception into our qualitative analysis to capture their influence on acceptance of the energy transition.

This combined model provides a robust framework for assessing how different forms of trust–notably trust in institutional actors and corporations–interact with cognitive evaluations (e.g., perceived benefits or risks) and emotional responses (e.g., hope or fear) to shape overall acceptance of the energy transition. In doing so, the model integrates insights from previous research on technology acceptance, trust and affect, while tailoring the analysis specifically to the socio-political context of renewable energy in Germany.

Results in reference to H1

- **Trust in Government**: The SEM results showed a significant positive relationship between "Trust in Government" and "Perceived benefits" ($\beta = 0.826$, $p < 0.001$), indicating that higher trust in government leads to stronger perceptions of the benefits associated with the energy transition. Additionally, "Trust in Government" had a significant negative relationship with perceived disadvantages ($\beta = -0.936$, $p < 0.001$), suggesting that greater trust reduces the perception of potential risks or costs (see Fig. 3).
- **Trust in Corporations**: In contrast, "Trust in Corporations" demonstrated an inverse relationship with these two variables. There was a significant negative relationship between "Trust in Corporations" and perceived benefits ($\beta = -0.415$, $p < 0.01$), meaning that higher trust in corporations was associated with weaker perceptions of the benefits. Similarly, "Trust in Corporations" had a significant positive relationship with perceived disadvantages ($\beta = 0.454$, $p < 0.01$), implying that more trust in corporations heightened concerns about potential disadvantages (see Fig. 3).

Results in reference to H2

- **Trust in Government and Affect**: Contrary to expectations, higher trust in government was associated with a significant increase in negative emotional reactions toward RE technologies ($\beta = -0.855$, $p < 0.001$). This result suggests that despite trust in the government enhancing perceptions of benefits and reducing perceived disadvantages, it does not necessarily lead to more positive emotional responses (see Fig. 4).
- **Trust in Corporations and Affect**: On the other hand, higher trust in corporations did lead to positive emotional reactions ($\beta = 0.222$, $p < 0.01$). This indicates that trust in corporations can foster positive emotional responses, despite the association with higher perceived disadvantages (See Ibid.)

Interpretation of Findings.

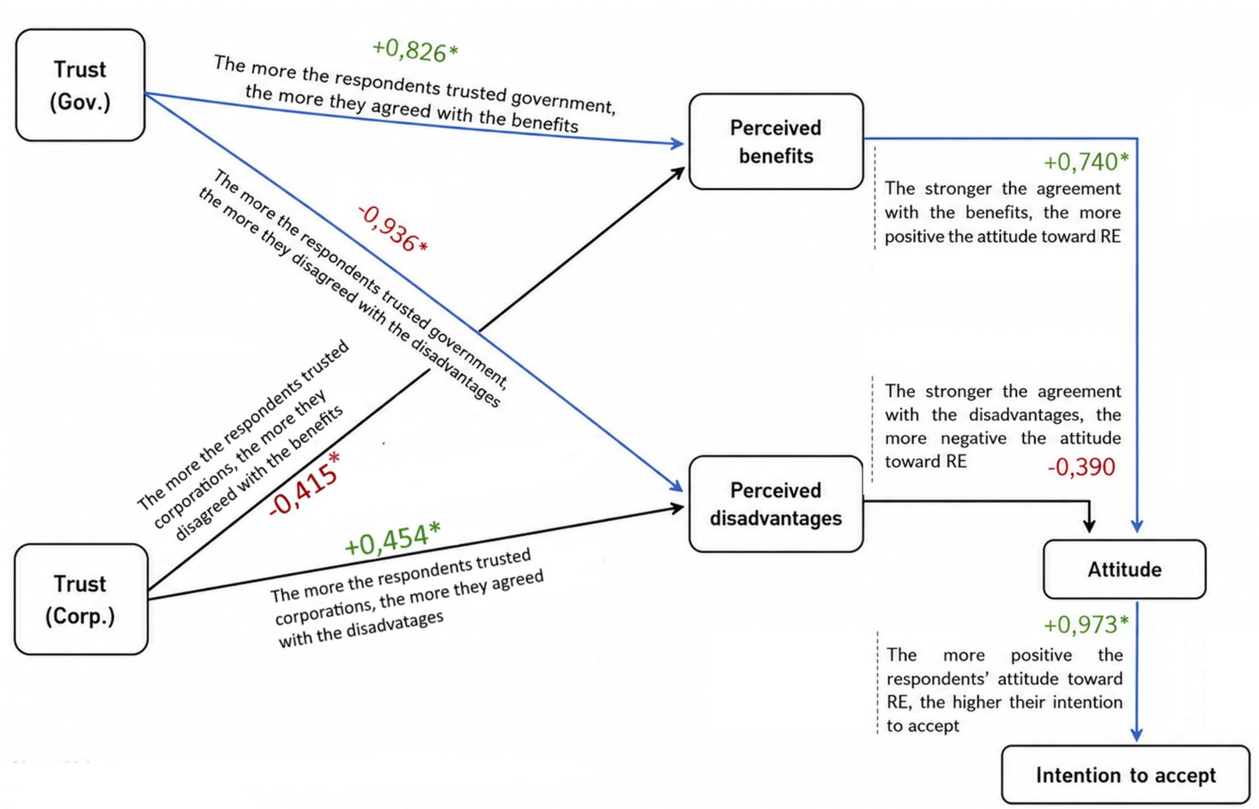

Fig. 3 Structural equation model results for H1 with standardized path coefficients (*$p < 0.01$)

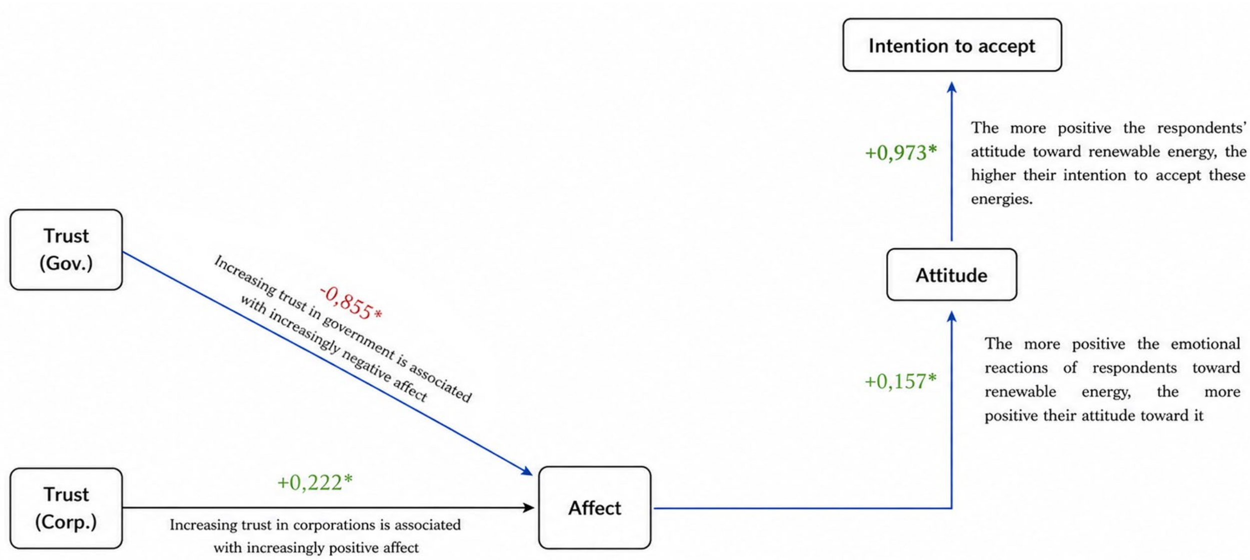

Fig. 4 Structural equation model results for **H2** with standardized path coefficients (*$p < 0.01$)

- **Trust in Government**: The data confirm H1, showing a strong positive relationship between trust in government and perceived benefits ($\beta = 0.826$), and a significant negative .relationship with perceived disadvantages ($\beta = -0.936$). Respondents with higher trust in government tend to view RE more favorably and worry less about associated costs or risks. This supports the idea that governments are perceived as public-interest actors–expected to ensure transparency, sustainability, and equitable energy policies, thereby strengthening acceptance.

- **Trust in Corporations**: In contrast, higher trust in corporations correlates negatively with perceived benefits ($\beta = -0.415$) and positively with perceived disadvantages ($\beta = 0.454$), contradicting the assumption that corporate trust would enhance support for RE. These results suggest that corporate actors are viewed with more skepticism, likely due to perceptions of profit-driven motives, limited transparency, and unequal distribution of benefits. While trust in corporations may imply confidence in technological competence, it does not translate into higher public acceptance, highlighting a key distinction from governmental trust.
- **Trust in Government and Affect**: Contrary to H2, higher trust in government was linked to more negative emotional responses toward RE technologies ($\beta = -0.855$). This suggests that while institutional trust boosts perceptions of benefits and reduces perceived disadvantages, it may also generate frustration, likely due to bureaucratic inefficiencies, slow implementation, or unmet expectations. Trust in government may carry a higher burden of accountability, leading to negative affect when public expectations around fairness, responsiveness, or transparency are not fulfilled.
- **Trust in Corporations and Affect**: In contrast, trust in corporations was positively associated with affect ($\beta = 0.222$). This could be explained by perceptions of corporate innovation, efficiency, and economic opportunity, which tend to elicit more optimism–even if profit motives remain a concern. Unlike government trust, which is often entangled in political complexity, corporate trust may inspire more straightforward emotional responses tied to progress and performance.
- **Indirect Effects on Acceptance**: The results show that trust influences acceptance primarily through perceived benefits. Trust in government indirectly increases acceptance by enhancing perceived benefits ($\beta = 0.742$, $p = 0.026$), while trust in corporations has the opposite effect, reducing perceived benefits ($\beta = -0.444$, $p = 0.033$). No significant indirect effects were found via affect or perceived disadvantages, indicating that emotional responses and risk perception play a secondary role. Ultimately, the perception of concrete benefits, such as energy security or environmental protection, remains the most decisive factor in shaping acceptance.

Discussion

At first glance, the findings may appear to contradict conventional assumptions in the trust literature. Specifically, in this study, higher trust in government was associated with increased perceived benefits of RE, yet simultaneously correlated with more intense negative emotional responses such as frustration and anger. We interpret this not as a paradox, but rather as a reflection of expectation-based disappointment: individuals who place trust in the government may feel emotionally let down when RE policies are perceived as inadequate, unfair, or poorly communicated. Their trust may increase cognitive acceptance (e.g., recognizing benefits), but this does not shield them from emotional discontent when implementation falls short of expectations. This finding aligns with research on "betrayal-based anger" and the emotional cost of trust violations in institutional contexts [106, 107]. Hence, this pattern resonates with the relevant literature [108, 109], suggesting that trust violations by institutions, particularly when perceived as moral or procedural failures – trigger intense emotional responses. Even when individuals acknowledge the long-term goals or cognitive merits of a policy, their emotional evaluation may be shaped by perceived misalignment with expected fairness or transparency [110].

The observed negative association between trust in corporations and perceived public benefits of RE likewise contrasts with findings by Liu et al. [37], who report that both competence- and integrity-based trust in project operators positively predict public acceptability. Our results suggest that generalized trust in corporate sectors may function differently. While corporations may be perceived as competent or innovative, they are also often viewed as profit-driven and insufficiently aligned with the public good. As a result, higher abstract trust in corporate actors may coexist with skepticism about their underlying motives, thus reducing perceptions of public benefit and increasing the salience of trade-offs. This interpretation is consistent with Liu et al.'s focus on project-specific trust, such as trust in a named operator (e.g., NAM), whereas our study examines broader sectoral trust across the corporate landscape. An alternative interpretation relates the observed patterns to broader ideological orientations toward state intervention and market-based solutions. Prior research suggests that some individuals are skeptical of climate change mitigation and renewable energy expansion, while simultaneously opposing government-led interventions and expressing affective alignment with market-oriented energy actors. From this perspective, lower perceived benefits of renewable energy and negative affect toward governmental actors may reflect ideological dispositions rather than trust dynamics alone. While our data do not allow us to disentangle these mechanisms empirically, future research could address this by including measures of political ideology or attitudes toward state intervention.

One of the most significant findings is that environmental impact reduction, rather than economic or social factors, is the primary motivator for public support. Respondents consistently prioritized climate neutrality and energy security, linking the legitimacy of RE projects to the perceived environmental benefits. The majority of respondents perceived financial participation of the affected community in the generated profit as the most effective approach, a finding that aligns with other publications [55, 111, 112]. "Trust in Government" was a key factor in shaping perceptions, emphasizing the importance of strong governmental involvement for the success of the energy transition. In contrast, "Trust in Corporations" was associated with negative perceptions of both the benefits and fairness of the process, underscoring the need for companies to prioritize transparency and fairness in order to gain broader acceptance.

Our findings align with and extend existing research on trust and RE acceptance. Liu et al. [61] emphasized the importance of trust in energy companies, while our study highlights trust in government as equally critical. Additionally, our results support the identified emotional responses as significant in shaping public attitudes [37]. Similar to the findings of Liu et al., our results demonstrate that affect plays a pivotal mediating role between trust and acceptance. However, we extend this understanding by revealing that trust in corporations can evoke positive emotional reactions, even when perceptions of benefits are negative. Segreto et al. [45] similarly emphasized the role of transparent communication and financial participation in promoting acceptance, reinforcing the importance of fair benefit distribution in securing public support for energy transitions.

Theoretical and practical implications

This study reinforces and extends the comprehensive framework, highlighting the central role of trust in shaping both cognitive and affective responses to RE technologies. Trust in government emerged as a key driver, enhancing perceptions of environmental benefits and reducing perceived risks, consistent with the comprehensive framework's emphasis on trust as a determinant of acceptance.

Importantly, our findings add nuance by showing that affective responses can sometimes override cognitive judgments. While trust in corporations was generally low, it still correlated with positive emotional reactions, suggesting that emotional engagement may mediate skepticism about perceived fairness or motives. This points to a potential extension of the comprehensive framework: affective and cognitive responses may interact differently depending on whether trust is placed in a public or corporate context.

By illustrating that trust operates on both rational and emotional levels, our results support Huijts et al. [29], but also suggest that the relative weight of these dimensions varies by actor. This has direct policy implications, emphasizing the need to build trust not only through transparent governance but also through emotionally resonant communication and community engagement.

Practical implications

Strengthening government trust

Despite high trust in government increasing the perceived benefits of RE, it does not necessarily evoke positive emotions. Bureaucratic complexity and slow implementation often fuel frustration. The success of the energy transition depends not only on technological innovation but also on securing public trust and support. While government trust shapes how benefits and risks are cognitively assessed, corporate trust influences emotional responses. Both actors must therefore move beyond technical delivery to focus on inclusive governance, transparent communication, and equitable outcomes.

Governments should:

- **Communicate transparently and accessibly**: Establish local information points and digital platforms for regular updates on RE policies and projects. Use visual tools (e.g., infographics, explainer videos) to make content more accessible.
- **Institutionalize citizen participation**: Enable early and meaningful engagement through town halls, advisory boards, and participatory planning processes to prevent tokenism and improve project design.
- **Ensure fair distribution of costs and benefits**: Introduce compensation schemes such as discounted energy tariffs for affected communities or shared revenue models to promote perceived fairness and equity.
- **Reduce bureaucratic barriers**: Simplify permitting processes and introduce ombudsman services for transparent dispute resolution to minimize frustration and delays.
- **Enhance accountability**: Independent monitoring bodies should track policy outcomes, supported by open-access reporting to build public confidence.

Addressing corporate trust challenges

While corporate trust was associated with more positive emotional responses, public skepticism remains regarding corporate motives, particularly concerning profit-driven decision-making. To build stronger corporate-public relationships, energy companies could:

- **Engage early with local communities**: Conduct co-creation workshops and dialogue sessions before project rollout to align initiatives with local needs and reduce resistance.
- **Demonstrate transparency**: Publish annual sustainability and social responsibility reports, ideally verified by third-party auditors, to enhance credibility and accountability.
- **Implement community benefit schemes**: Offer ownership models, local investment opportunities, and infrastructure improvements to ensure communities benefit directly from RE projects.

Limitations and future research

While this study provides valuable insights into the role of trust in shaping public acceptance of RE technologies, several limitations must be acknowledged. These limitations offer important directions for future research, particularly in refining our understanding of the relationship between different facets of trust and RE acceptance.

Scope of trust

This study focuses on institutional trust—specifically, trust in government and corporations, highlighting how these actor-specific forms influence perceived benefits, disadvantages, and emotional responses. However, trust is a multidimensional construct. Other facets, such as procedural trust (confidence in fair, transparent decision-making) and technological trust (belief in the reliability and safety of RE technologies), are also important. While these dimensions were excluded from the structural equation model (SEM) to maintain analytical clarity and emphasize the actor-based distinction, they did emerge in the qualitative data. Respondents frequently referenced dissatisfaction with bureaucratic procedures and concerns about technology performance, hallmarks of procedural and technological trust. Future research should build on this by integrating a multilevel trust framework that combines institutional, procedural, and technological dimensions. This would allow for a more comprehensive understanding of how different aspects of trust interact and shape public acceptance.

Contextual and cultural specificity

This study was conducted in Germany, an industrialized democracy with moderate levels of institutional trust and an ambitious yet contested energy transition policy. As such, the findings reflect a specific socio-political context, which may limit their generalizability. Prior research shows that baseline levels of institutional trust vary substantially between countries. For example, Scandinavian nations such as Denmark and Sweden tend to exhibit higher levels of trust in government institutions, which may lead to different dynamics in how trust shapes acceptance of renewable energy. In Germany, moderate institutional trust often coexists with skepticism, particularly toward bureaucratic processes and corporate motives. This ambivalence shaped the dual findings in our study, high trust in government was associated with perceived benefits, yet also triggered negative emotional reactions. These insights underscore the need to contextualize trust within national cultures and political institutions. Cross-national comparative studies, especially in low-trust or non-European settings, are essential to explore how institutional trust functions differently and what this means for energy policy engagement and public support.

Cross-sectional design and excluded variables

The survey-based cross-sectional design captures public opinion at a single point in time. However, trust is not static—it evolves in response to policy changes, stakeholder behavior, and broader social developments. Longitudinal research is needed to track how shifts in trust affect RE acceptance over time. For example, major energy events (e.g., price spikes, blackouts, or successful projects) may significantly alter public trust and, consequently, acceptance levels. Moreover, while this study focused on cognitive and emotional pathways, it excluded variables such as political ideology, media exposure, and regional identity in order to ensure model interpretability and statistical robustness. These factors are known to influence public opinion and trust, and future studies should explore how they interact with institutional trust and affect acceptance dynamics.

Affective–cognitive interaction

Our findings reveal a complex interplay between emotional and rational pathways of trust. Trust in government increased perceptions of benefit and reduced perceived risks, but also correlated with heightened negative emotions, likely stemming from unmet expectations. This pattern aligns with research on "betrayal-based anger" and moral outrage, which suggests that institutional trust violations, particularly regarding fairness or transparency, can provoke strong emotional backlash even when rational support remains intact. Conversely, trust in corporations was associated with positive emotional responses, but not with increased perceptions of public benefit. This suggests that corporate trust may be driven more by associations with innovation, efficiency, or economic opportunity, rather than by perceived fairness or shared goals. These findings emphasize that emotional and cognitive evaluations may not always align, and that different sources of trust carry different expectations and affective consequences. Future research should use experimental designs or mixed-methods approaches to examine what role the feeling of being "betrayed" takes and how it influences acceptance behavior.

Conclusions

This study contributes to the growing literature on public acceptance of renewable energy by showing that trust in government and corporations plays a central but complex role. While trust in government enhances perceptions of RE benefits, it also evokes negative emotions, likely due to frustration with bureaucratic inefficiencies. In contrast, trust in corporations generates more positive emotional responses but raises concerns over fairness and profit motives. These findings highlight that trust is not a uniform driver of acceptance, but a nuanced and sometimes contradictory force. Beyond institutional trust, procedural trust (in fair decision-making) and technological trust (in the reliability of RE systems) likely interact with acceptance and merit further attention. For policymakers, this means prioritizing transparent and inclusive governance to build procedural trust, while corporations must demonstrate ethical conduct and technological credibility in order to strengthen public confidence in their role. Future research should explore these dynamics through longitudinal and cross-national studies, as well as experimental methods to clarify the causal pathways between trust, perception, and behavior. Ultimately, fostering trust through accountability, fairness, and engagement is critical for ensuring public support and a successful energy transition.

Abbreviations

χ^2	Chi-Square
CFI	Comparative Fit Index
CO2	Carbon Dioxide
KMO	Kaiser-Meyer-Olkin
MLR	Maximum Likelihood with Robust Errors
NAM	Norm Activation Model
PBC	Perceived Behavioral Control
RE	Renewable Energy
RMSEA	Root Mean Square Error of Approximation
SEM	Structural Equation Modelling
SRMR	Standardized Root Mean Square Residual
TAF	Technology Acceptance Framework
TAM	Technology Acceptance Model
TPB	Theory of Planned Behavior
UTAUT	Unified Theory of Acceptance and Use of Technology

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Author contributions

Patrick Stuhm has developed the concept and written the textManuel Baumann has reviewed the text with regard to logical coherence, craftsmanship, and content quality.Marcel Weil has reviewed the text with regard to logical coherence, craftsmanship, and content quality.

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Data availability

The data analyzed in this study originate from a representative telephone survey conducted in Germany in early 2023. The data are available from the corresponding author upon reasonable request, subject to applicable data protection and access restrictions.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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