Energy Visions Explored: the Acceptability of Future Energy Scenarios in Association with Trust in Policymakers via Perceived Costs and Benefits

Sabien B. Bootsma

S3902579

Department of Psychology, University of Groningen

PSB3E-BT15: Bachelor Thesis

Group 08

Supervisor: Robert Görsch

Second evaluator: dr. Miguel Garcia Pimenta

In collaboration with: Kimberley Bebendorf, Kristian Krikken, Alex Menke, and Kaitlyn Mistral-Bernard.

June 30, 2023

A thesis is an aptitude test for students. The approval of the thesis is proof that the student has sufficient research and reporting skills to graduate, but does not guarantee the quality of the research and the results of the research as such, and the thesis is therefore not necessarily suitable to be used as an academic source to refer to. If you would like to know more about the research discussed in this thesis and any publications based on it, to which you could refer, please contact the supervisor mentioned.

Abstract

Mitigating climate change requires transitioning to sustainable future energy scenarios. Public acceptance of such energy scenarios depends on trust, perceived costs and perceived benefits. Therefore, this paper explores the relationship between trust in policymakers and the acceptability of a realistic Dutch future energy scenario and investigates the mediating effects of the perceived costs and benefits. Data for the analysis was collected via snowball sampling and the university's first-year psychology student pool *(N = 163)*. In general, we did not find support for our hypothesis that higher trust was associated with higher acceptability, nor that perceived benefits or perceived costs acted as mediating factors in that relationship. However, higher perceived benefits were associated with higher acceptability, and lower perceived costs were associated with higher acceptability. These findings suggest that the lack of evidence for the trust-acceptability relationship in this study may be attributed to operationalisation and the distinctive characteristics of the energy scenario investigated. Furthermore, the importance of enhancing individuals' comprehension of perceived costs and benefits in energy scenarios is highlighted, as well as clear communication about future energy scenarios.

Keywords: climate change, public acceptability, future energy scenarios, trust, perceived costs & benefits

Energy Visions Explored: the Acceptability of Future Energy Scenarios in Association with Trust in Policymakers via Perceived Costs and Benefits

The IPCC (2018) reported that a 1.5-degree Celsius temperature increase to pre-industrial levels has severe consequences and the potential for catastrophic global disaster upon exceeding that limit. Therefore, researchers and national policymakers are determined to restrict global heating below the critical threshold (Huang et al., 2017; Nangombe et al., 2018; Seneviratne et al., 2018; Zhang et al., 2020). The concerning rise in global average temperatures can largely be attributed to the increase in greenhouse gas concentrations (IPCC, 2018), of which the primary emitters are the energy sector (Kern & Rogge, 2016). While there is a considerable amount of evidence on public perceptions of energy technology projects, policies, and behavioural changes, the separate components of energy scenarios (IPCC, 2018), there is a scarcity of studies that holistically engage individuals with the complexities of system-wide transformations (Demski et al., 2017). Consequently, it is crucial to investigate realistic future energy scenarios in aiming to successfully implement energy transitions.

Any sufficient effort to achieve energy transitions requires large-scale changes, and will thus need considerable public acceptance to succeed (Whitmarsh et al., 2012). Public acceptance is defined as an individual's attitude towards the energy transition, with both public acceptability and public support (Huijts et al., 2012; Liu et al., 2020). As proposed by the technology acceptance framework of Huijts et al. (2012), this evaluative attitude of acceptance is related to both cognitive and affective aspects, including factors such as trust in responsible actors, and perceived costs and benefits. Investigating the dynamics among these factors provides valuable information for formulating effective strategies and policies regarding energy scenarios,

ultimately contributing to a more sustainable energy sector. Therefore, the present study aims to investigate how these variables are related to a specific Dutch energy transition scenario.

To specify a Dutch energy scenario, the policymakers of the Netherlands have adopted national targets for a minimal CO2 emission reduction of 55% by 2030 and climate neutrality by 2050 (Coalitieakkoord, 2021). As a result, the need arose to investigate how policymakers can implement possible energy scenarios that facilitate these greenhouse gas reductions in the Netherlands. The TNO report by Scheepers (2022), for instance, puts forward two viable scenarios called ‘ADAPT’ and ‘TRANSFORM’. The TRANSFORM scenario requires a proactive attitude from citizens toward technological innovations, a strong environmental awareness, and a sense of urgency (see Figure A1, Appendix A) (Scheepers, 2022). Compared to the ADAPT scenario, TRANSFORM highlights the polarized opinions of citizens, of which additional insight can be valuable for policymakers to implement future energy scenarios. Altogether, considering the significance of public acceptance in achieving ambitious energy transitions, investigating TRANSFORM contributes to research on future energy scenario acceptance.

Moreover, exploring the level of trust in policymakers, and the perceived costs and benefits of TRANSFORM can provide an added understanding of the public’s acceptance of the scenario. Accordingly, understanding the level of public acceptability towards TRANSFORM is valuable for policymakers and other stakeholders to design and implement effective strategies that can enhance the sustainability of the transition to renewable energy scenarios.

Current Study

The main objective of this thesis is to examine the relationship between trust in policymakers and the acceptability of the energy scenario TRANSFORM. Furthermore, the role

of perceived costs and benefits of TRANSFORM in this relationship is investigated. Studying these mechanisms contributes to a better understanding of how individuals perceive and evaluate future energy scenarios.

Literature Review

Trust in Policymakers

Developing future energy scenarios, similar to research on energy projects and technologies, relies on multiple stakeholders, including researchers, energy companies, and governments (Piacentino et al., 2019; Wüstenhagen et al., 2007). Since policymakers play a critical role in deciding the political agenda for the energy transition, it is important to further investigate the citizens' trust in policymakers in relation to the acceptability of a proposed energy scenario. Trust has played an essential role in the acceptance of the proposed energy scenario by facilitating feelings of confidence and security (Büscher & Sumpf, 2015; Spadaro et al., 2020). Additionally, the initiation and management of energy transition projects typically fall outside the capacity of the general public, emphasizing the critical role of policymakers in the implementation of a future energy scenario.

To delve deeper into the function of trust, previous studies have demonstrated a positive correlation between trust in stakeholders or policymakers and the public acceptance of various components within energy scenarios, such as energy technology projects (Yang et al., 2016), environmental policies (Bronfman et al., 2008; Huijts et al., 2012) and behavioural change (van den Heuvel et al., 2015). These components collectively form energy scenarios, as indicated by IPCC (2018). Given the limited public knowledge regarding the technical aspects of energy projects (Molin, 2005), policies (Marshall et al., 2017), and behavioural change (Denton et al., 2020), individuals might base their evaluation on their trust in responsible agents when

evaluating energy scenarios. Thus, it is relevant to look into the trust in policymakers as one of the responsible agents. Nevertheless, it should be noted the above-mentioned prior studies have primarily focussed on the acceptability of separate components rather than the overall acceptability of energy scenarios, constituting a critical research gap. This research gap signifies the need to further investigate the comprehensive understanding and evaluation of entire energy scenarios.

In this thesis, trust is specifically conceptualised as integrity-based trust in policymakers, encompassing perceived honesty, concern for the public interest, and transparency about the activities of the responsible agents (Braun et al., 2018; Graham et al., 2009; Liu et al., 2020). According to Earle & Siegrist (2006), integrity-based trust was highly associated with project acceptability, offering valuable insight to explore the factor in relation to scenario acceptability. As the safeguarding of the public interest was a part of integrity-based trust (Liu et al. 2020), a link can be drawn between public acceptance and the perceived intentions and morality of the responsible agents (Earle & Siegrist, 2006, 2008; Fiske et al., 2002). Therefore, exploring integrity-based trust provides a relevant perspective for investigating the direct relationship between trust in policymakers and the public acceptability of a future energy scenario. Based on these prior discoveries, a relationship is proposed between trust in policymakers and the acceptability of the future energy scenario TRANSFORM. Accordingly, the first hypothesis posits that higher levels of integrity-based trust in policymakers are associated with increased acceptability of the TRANSFORM scenario (H1).

Perceived Costs and Benefits

While some researchers have indicated a direct relationship between trust and the acceptance of an energy project (Siegrist et al., 2007; Terwel et al., 2009), others have proposed

an indirect relationship between trust and the acceptance of an energy project through other factors (Midden & Huijts, 2009; Montijn-Dorgelo & Midden, 2008; Siegrist, 2000; Terwel et al., 2009). Perceived costs and perceived benefits have been frequently investigated in the complex dynamics of acceptability (Bronfman et al., 2008; Huijts et al., 2012; Yang et al., 2016). For instance, higher perceived benefits and lower perceived costs can align with higher trust and acceptability. When applying these results to the current research, exploring the perceived costs and benefits of the TRANSFORM scenario can contribute to our understanding of energy scenario acceptability.

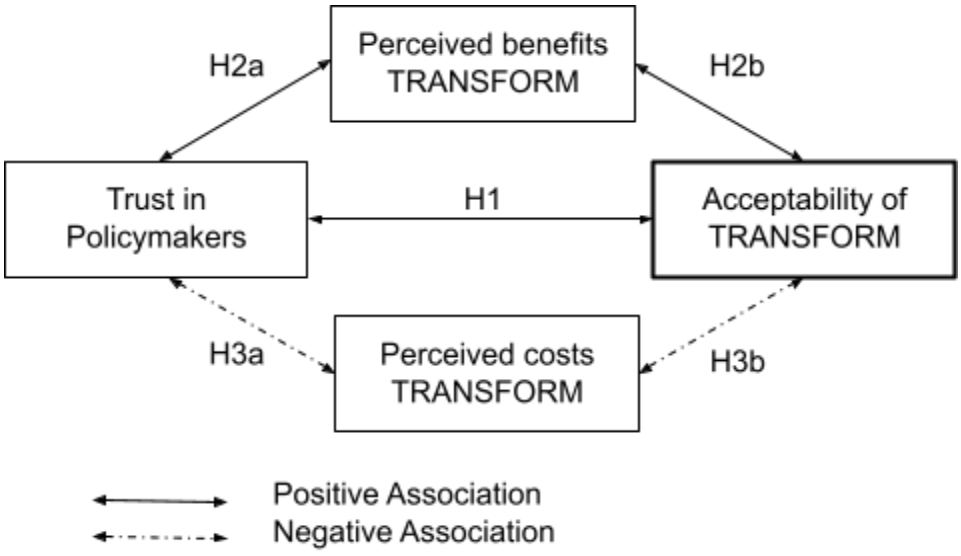
Multiple studies have found positive correlations between perceived benefits and acceptance of projects or scenarios (Siegrist, 2000; Yang et al. 2016), as well as a positive correlation between perceived benefits and trust in policymakers (Jones & Clark, 2014; Lim & Moon, 2022). To investigate diverse aspects of the scenario, Scheepers (2022) has highlighted several aspects of TRANSFORM, including strong environmental awareness, the collaboration of EU countries, governmental guidance for citizens on energy transition, and a reduction in international aviation and shipping greenhouse gas emissions, among other aspects (see Figure A1, Appendix A). These aspects can be interpreted as advantageous for fostering responsibility, sharing knowledge, renewable energy transition, and mitigating climate change (Burbidge, 2018; Ćetković & Buzogány, 2016; Potrč et al., 2021; Scheeper, 2022). Therefore, if an individual perceives such aspects as beneficial, it could be associated with a high acceptance of the TRANSFORM scenario. Moreover, perceiving high benefits could align with high levels of trust in policymakers responsible for implementing the scenario. Based on these findings, the following hypotheses are proposed: trust in policymakers has a positive association with the perceived benefits of TRANSFORM (H2a) and perceived benefits of TRANSFORM mediate the

relationship between trust in policymakers and the acceptability of TRANSFORM (H2b) (for a schematic overview, see Figure 1).

Furthermore, various researchers have shown a negative relationship between perceived costs and acceptance of projects (Siegrist, 2000; Yang et al. 2016), while additionally a negative association between perceived costs and trust in policymakers has been revealed (Jones & Clark, 2014). Although the aspects of TRANSFORM mentioned above have benefits, it should be considered that they can also be perceived as costs or disadvantages. These may include limited financial resources, time investments, challenges in driving behavioural changes, the complexity of EU collaboration, and strains on government budgets. Bringing these disadvantages together, perceiving the TRANSFORM scenario as costly could have associations with low trust in policymakers and a low acceptance of the scenario. Drawing from these preceding premises, the following hypothesis is put forth: trust in policymakers has a negative association with perceived costs of TRANSFORM (H3a) and perceived costs of TRANSFORM mediate the relationship between trust in policymakers and acceptability of TRANSFORM (H3b).

Figure 1

Overview of the Hypotheses



Method

Participants

The dataset comprised 323 respondents for the survey in total. The exclusion criteria were applied stepwise, removing the following amounts of participants: 111 (34%) through missing data on relevant variables, then 26 (8%) through attention check failure or exclusion request, and additionally 23 (7%) through non-Dutch residents in combination with non-Dutch nationality, resulting in 163 (50%) participants with suitable data for analysis (for an overview of the exclusion criteria, see Appendix B). The intended sample size of the study was 152 participants, as determined through an a priori G*power analysis (Linear Multiple Regression: power = .80, expected effect size 0.053[1], and $\alpha = 0.05$, see Calculation C1, Appendix C) (Faul et al., 2007).

Among the suitable participants, 66 (40%) were recruited through snowball sampling and 97 (60%) via SONA (a first-year Psychology course at the University of Groningen), which together formed a convenience sample. The snowball participants received no compensation and the SONA participants were compensated with 0.4 SONA credits upon completing the survey. The age distribution encompassed individuals from 16-20 years old up to 61-70 years old, of which 145 (89%) of the participants were below the age of 26. The study counted 97 (60%) female participants, 62 (38%) male, two (1%) non-binary/third gender, and two (1%) left their gender unspecified. Furthermore, 161 (99%) participants resided in the Netherlands, and 111 (68%) held Dutch citizenship.

Research Design

A cross-sectional design was employed to collect data via an online survey administered

[1] The effect size is based on Cohen's f^2 (Cohen, 1988) for a multiple regression model displaying a moderate effect, which is interpreted as meaningful for the current research.

in English using the Qualtrics platform (Qualtrics, Provo, UT). To maintain simplicity, only the pertinent variables for this thesis were considered. The independent variable (IV) assessed was 'trust in policymakers', the dependent variable (DV) was 'the public acceptability of TRANSFORM', and the mediator variables included 'perceived benefits of TRANSFORM' and 'perceived costs of TRANSFORM'.

Materials

A subset of the questions of the original questionnaire was assessed in this thesis, based on the relevant variables (see Figures A2, A3, A4, and A5, Appendix A). The Open Science Framework (OSF) was used to upload the survey materials and the current study's preregistration, which can both be accessed through the following link: https://osf.io/uskrp/?view_only=664b676ed28c4827a4a97c0aa38685a2. The data were analyzed using the statistical software IBM SPSS Statistics (Version 29.0.1.0), including the Process macro package (Hayes, 2022). Descriptive statistics of the relevant variables are depicted in Table C2 (see Appendix C).

Trust in Policymakers

To measure trust in policymakers, a 7-point Likert scale was adapted from the research of Liu et al., (2020), with higher scores representing a higher level of trust in policymakers. Before presenting the scale, a clarification was provided regarding the definition of policymakers in the current context (see Figure A2, Appendix A). The three items pertained to perceived honesty, concern for the public interest, and transparency about the activities of the policymakers. The variable was presented before the scenarios, to avoid a social desirability bias. The trust inventory was found to be highly reliable ($\alpha = .88$)

Perceived costs and benefits of TRANSFORM

By using a 5-point Likert scale, the perceived costs of TRANSFORM and the perceived benefits of TRANSFORM were measured, as derived from Scheepers' (2022) scenario descriptions. To avoid the exclusive association of the terms 'costs and benefits' with financial implications, the survey used the term 'advantage' to describe perceived benefits, while 'disadvantage' was used to describe perceived costs. Higher scores on the advantage scale represented higher levels of perceived benefits of TRANSFORM, and higher scores on the disadvantages scale represented higher perceived costs of TRANSFORM. Cronbach's alphas for the four advantage and four disadvantage items were .79 and .80, respectively (for the items, see Figure A3 and Figure A4, Appendix A).

Acceptability of TRANSFORM

The acceptability of the energy scenario TRANSFORM was measured using a 7-point Likert scale. By the use of three items, participants could indicate their evaluation of the TRANSFORM scenario from "very unacceptable" (1) to "very acceptable" (7), "very negative" (1) to "very positive" (7), and "very bad" (1) to "very good" (7), as derived from Liu et al. (2020) (see Figure A5, Appendix A). The scale had a Cronbach's alpha of .88, indicating high internal consistency.

Procedure

Prior to commencing the data collection, a fast-track procedure without formal ethics approval was sought from the Ethics Committee of Psychology University Groningen, due to the low-risk nature of the study. The survey was accessible to snowball participants from May 3, 2023, to May 23, 2023, while SONA participants had access from May 8, 2023, to May 23, 2023. The questionnaire began by providing a link to information about the research, including the notion of voluntary participation, the option to withdraw, and the confidentiality measures

taken. Consecutively, the first questions pertained to informed consent and demographic information. To ensure attentiveness and quality of responses, an attention check was implemented at the beginning of the survey, while a seriousness check was enclosed at the survey's conclusion (for the checks, see Figure A6, Appendix A).

The subsequent part of the survey involved the randomized presentation of the items within each IV scale. Following, participants were provided with descriptions of the scenarios. They were prompted to share their perception of the scenario's advantages and disadvantages, as well as their overall acceptability of the presented scenario. The future energy scenario was presented with simplified descriptions included in the questionnaire through bullet points, accompanied by graphs illustrating energy supply sources and a table containing detailed information on the scenario (see Figure A1, Appendix A). To ensure that participants would not base their evaluation of the scenario on its name, the energy scenario TRANSFORM was referred to as 'Scenario B[2]'. The flexibility to revisit the information on the scenario was provided. In concluding the survey, participants got the opportunity to share any remarks they had on the study. The duration of participants completing the survey had a median of 14.1 minutes, including considerable variations (SD = 238.43 minutes).

Data Analysis

A regression analysis was used to examine the association, strength, and direction of correlation between trust in policymakers and the acceptability of TRANSFORM (H1). Furthermore, utilizing Hayes' (2022) simple mediation model, two separate mediation analyses were conducted. In these analyses, pathway 'a' represented the associations between the trust in policymakers with the perceived benefits of TRANSFORM (H2) and the perceived costs of

[2] Other researchers in this bachelor thesis additionally investigated Scheepers' (2022) energy scenario ADAPT, which was referred to as 'Scenario A'. Therefore, 'Scenario B' was chosen for TRANSFORM.

TRANSFORM (H3). Additionally, pathway 'b' showed the relationship between the perceived benefits of TRANSFORM (H2b) and the perceived costs of TRANSFORM (H3b) with the acceptability of TRANSFORM. Through these pathways, the direct (pathway c') and indirect effects (pathway ab) of trust in policymakers on acceptability were assessed, with the mediator variables being the perceived benefits of TRANSFORM (H2) and perceived costs of TRANSFORM (H3).

Assumption Checks

The assumptions were checked for each model. The online questionnaire was limited to one response per participant, assuring the independence of the study. In addition, the assumption checks for homoscedasticity and linearity portrayed no violations (see Figure D1, Appendix D). However, the Q-Q plot for the normality of residuals for the acceptability of TRANSFORM was slightly skewed to the right (see Figure D2, Appendix D). The violation was judged to be sufficiently small to proceed without data transformations. Nonetheless, it should be taken into account that the results could be moderately affected. Furthermore, there were 13 outliers detected in the data, although, given that they can be regarded as natural variations, the decision was made to retain them (see Figure D3, Appendix D).

Results

Descriptive Statistics

For an overview of the Descriptive Statistics see Table C2 (Appendix C). Additionally, a correlation table can be found in Table C3 (see Appendix C).

Trust in Policymakers and Acceptability of TRANSFORM (H1)

A regression analysis was utilized to test the hypothesis that trust in policymakers and the acceptability of TRANSFORM were correlated (H1). The results of the analysis did not

demonstrate a significant association between trust in policymakers and the acceptability of TRANSFORM (R^2 = .01, $F(1,161) = 1.39$, p = .24; for additional statistics see Table 1). This result suggests that people can have low trust in policymakers while having high acceptability of the future energy scenario, and vice versa. Therefore, the nonsignificant effect provides no credible evidence for H1 in this study.

Table 1

Regression Results with Acceptability of Scenario B as the Dependent Variable

Model	*b*	se	*β*	*t*	Sig.	*b 95% CI* [LL, UL]
(Constant)	5.32	0.27		19.62	<.001	[4.78; 5.85]
TRUSTtotal Score	0.08	0.06	.09	1.18	.24	[-0.05; 0.20]

Note. LL and UL refer respectively to Lower Level and Upper Level.

TRUSTtotal Score = Trust in Policymakers.

Perceived Benefits of TRANSFORM (H2)

The association between trust in policymakers and the acceptability of TRANSFORM via the perceived benefits of TRANSFORM was explored (H2). Trust in policymakers was expected to have a positive correlation with the perceived benefits of TRANSFORM (H2a), and perceived benefits of TRANSFORM would mediate the association of both variables (H2b).

Contrary to the hypothesis (H2a), the analysis displayed a nonsignificant relationship between trust in policymakers and the perceived benefits of TRANSFORM (pathway a) (b = .00, p = .95). This suggests that individuals who have higher levels of trust in national politicians may not necessarily evaluate the energy scenario more positively.

The hypothesis (H2b) was not supported by the results of the Hayes (2022) Process analysis. The direct effect between trust in policymakers and the acceptability of TRANSFORM

(pathway c') was found to be nonsignificant (b = .08, p = .15), which differs from pathway c because the perceived benefits of TRANSFORM are controlled for. Nonetheless, pathway b did display a significant positive association between the perceived benefits of TRANSFORM and the acceptability of TRANSFORM (b = .69, p < .001), in which 31% of the variability in acceptability can be accounted for by the influence of perceived benefits. The significant results can be interpreted as the more advantages that participants perceive, the higher the acceptability of the energy scenario. These findings suggest that trust in policymakers has no direct impact on the acceptability of TRANSFORM. Additionally, pathway ab was nonsignificant (index = .00, BootSE = .04), depicting the indirect effect with the perceived benefits of TRANSFORM as a mediator. This indicates that trust in policymakers is not associated with the acceptability of TRANSFORM through the perceived benefits of the energy scenario.

Furthermore, the total association between trust in policymakers and the acceptability of TRANSFORM (pathway c) was shown to be nonsignificant (b = .08, p = .24), consistent with the findings for H1 (for an overview of the pathways, see Table 2). Accordingly, the mediation analysis revealed no sufficient evidence for a relationship between trust in policymakers and the acceptability of TRANSFORM being mediated through the perceived benefits of TRANSFORM.

Table 2

Mediation Results with Perceived Benefits as the Mediator Factor

Effect	*b*	se	R^2	*t*	Sig.	*95% CI* [LL, UL]
a: Trust → Benefits	0.00	0.05	.00	-0.06	.95	[3.35; 4.20]
b: Benefits → Accept	0.69	0.08	.31	8.32	<.001	[0.52, 0.85]
c (total): Trust → Accept	0.08	0.06	.00	1.18	.24	[-0.05, 0.20]

c' (direct): Trust → Accept	0.08	0.05	–	1.44	.15	[-0.03, 0.18]
ab (indirect) Trust → Benefits → Accept [a]	0.00	0.04	–	–	–	[-0.07, 0.08]

Note. LL and UL refer respectively to Lower Level and Upper Level. [a] = Bootstrap (5000).

Trust = Trust in Policymakers. Benefits = Perceived Benefits of TRANSFORM. Accept = Acceptability of TRANSFORM.

The arrows are one-headed in the Table, and two-headed in Figure 3, due to APA guidelines.

Perceived Costs of TRANSFORM (H3)

The final hypothesis proposed that trust in policymakers would be negatively correlated with the perceived costs of TRANSFORM (H3a) and the perceived costs of TRANSFORM would function as a mediator in the association between trust in policymakers and the acceptability of TRANSFORM (H3b).

The levels of trust in policymakers did not have a statistically significant correlation with the perceived costs of TRANSFORM (pathway a) ($b = 0.02$, $p = .68$), countering the expectations of H3a. These results imply that individuals' levels of trust are not related to their perception of the energy scenario.

The mediation analysis's collective results did not support the hypothesis (H3b). Regardless, a significant negative association was displayed between the perceived costs of TRANSFORM and the acceptability of TRANSFORM (pathway b) ($b = -.50$, $p < .001$), with 20% of the variance in acceptability explained by the perceived costs. This means that when people had a low perception of TRANSFORM's disadvantages, they showed a higher acceptability of the energy scenario. There was no significant direct effect between trust in policymakers and the acceptability of TRANSFORM while controlling for the perceived costs of

TRANSFORM (pathway c') (b = .09, p = .13). This suggests that people's trust in policymakers was not related to the acceptability of TRANSFORM after perceived costs were taken into account. In addition, the indirect effect (as pathway ab) with the perceived costs of TRANSFORM as mediator displayed no significant results (index = -.01, BootSE = .03), which contributes to the notion that trust in policymakers has no association with the acceptability of TRANSFORM via the perceived costs of TRANSFORM.

Moreover, the mediation analysis calculated the total effect of trust on acceptability to be b = .08, p = .24 (pathway c), which corresponded to the results of the linear regression reported for H1 (for an overview of the results, see Table 3 and Figure 2). Consequently, H3 is not substantiated by the mediation analysis results with the perceived costs of TRANSFORM.

Table 3

Mediation Results with Perceived Costs as the mediator factor

Effect	*b*	se	R^2	*t*	Sig.	*95% CI* [LL, UL]
a: Trust → Costs	0.02	0.06	.00	0.42	.68	[-0.09; 0.14]
b: Costs → Accept	-0.50	0.08	.20	-6.18	<.001	[-0.65, -0.34]
c (total): Trust → Accept	0.08	0.06	.00	1.18	.24	[-.051, .203]
c' (direct): Trust → Accept	0.09	0.06	–	1.51	.13	[-0.03, 0.20]
ab (indirect) Trust → Costs → Accept[a]	-0.01	0.03	–	–	–	[-0.07, 0.05]

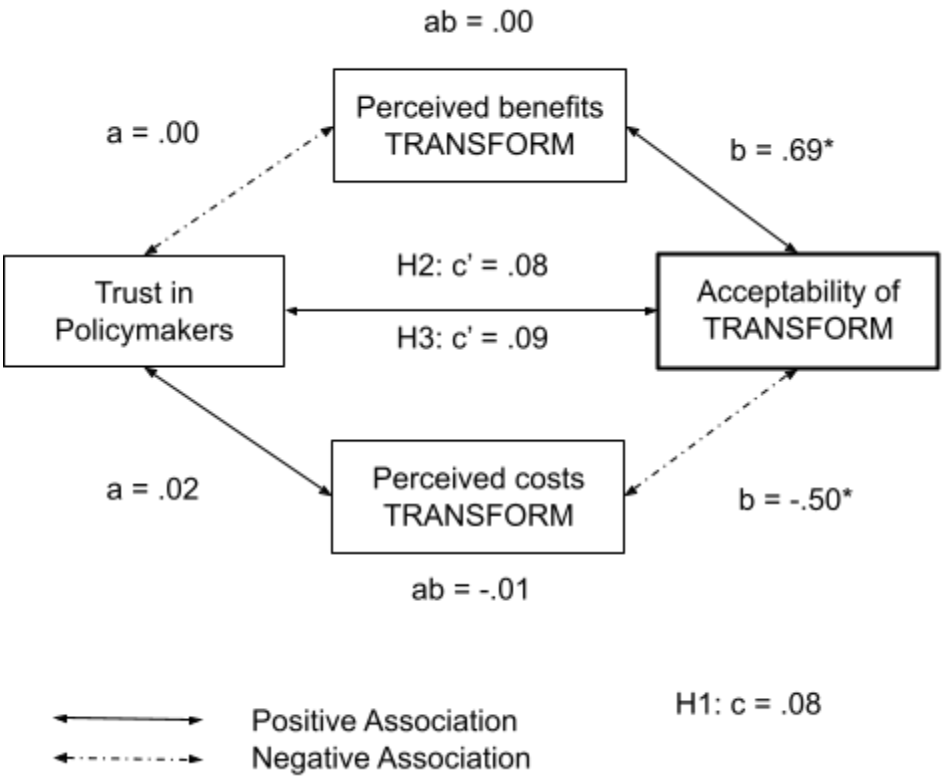
Note. LL and UL refer respectively to Lower Level and Upper Level. [a] = Bootstrap (5000).

Trust = Trust in Policymakers. Costs = Perceived Costs of TRANSFORM. Accept = Acceptability of TRANSFORM.

The arrows are one-headed in the Table, and two-headed in Figure 3, due to APA guidelines.

Figure 3

Overview of Results



Note. * $p < .05$; the coefficients are unstandardised.

Different letters (a, b, ab, c, c') refer to paths in the mediation analysis; a = xxx, b = xxx, c = xxx, and c' = xx; the formula to calculate the total effect (a*b+c' = c) is derived from Hayes Process Macro (2022).

Discussion

The present study investigated the acceptability of the TRANSFORM scenario aiming to increase knowledge on implementing future energy scenarios. Considering the crucial role of policymakers as stakeholders in the implementation of future energy scenarios, the level of trust in policymakers in association with the acceptability of TRANSFORM was explored. Additionally, the study examined the perceived benefits and perceived costs of TRANSFORM as

potential factors influencing the relationship between trust and acceptability. No sufficient support for the suggested hypotheses was found, regardless of a found link between perceived benefits and acceptability. Therefore, the findings are discussed through interpretations, theoretical and practical implications, and limitations.

Interpretations

Our results of the hypothesized association between trust in policymakers and the acceptability of TRANSFORM (H1) contradicted the expected outcome as based on previous research (Bronfman et al., 2008; Yang et al., 2016). This discrepancy can be attributed to the narrowed operationalization of trust in policymakers to integrity-based trust, focusing on honesty, concern for the public interest, and transparency (see Figure A2, Appendix A) (Braun et al., 2018; Graham et al., 2009; Liu et al., 2020). An alternative operationalization could be competence-based trust, which reflects perceptions of the abilities, skills, and expertise of responsible agents (Gordon et al., 2014; Terwel et al., 2009). Given the significance of policymakers' competence in making informed decisions for the public and effectively implementing scenarios, further research could explore the connection between competence-based trust in policymakers and energy scenario acceptability.

Another explanation for the lack of support for the trust-acceptability relationship is that energy scenarios differ from energy projects in terms of scale, duration, and complexity. Accepting a scenario that extends to 2050 may be more challenging to put into perspective for individuals compared to accepting a project focussing on the upcoming five years. In addition, policies and behaviour changes are equally part of energy scenarios, and while trust is typically related to policy support (Hetherington., 1998; Lee et al., 2016; Rudolph., 2009), it may not necessarily extend to the aspect of behaviour changes inherent in TRANSFORM scenario.

The lack of association between trust and acceptability also suggests that trust in policymakers does not involve a direct type of responsible agent in the energy scenario. To elaborate, previous research proposed that public acceptance of renewable energy projects is influenced by trust in the responsible agents (Liu et al., 2019). However, it can be argued that policymakers may not directly serve as the primary responsible agents of energy projects but rather act as implementers of these projects. Particularly in the context of the current national government of the Netherlands, which can be seen as predominantly characterized by market-oriented policymakers (Oteman et al., 2014). Consequently, the public may not perceive the distinct market positioning of the stakeholders involved, limiting the effectiveness of measuring trust in policymakers combined with acceptability (Wallquist, 2012). Hence, future research should consider these interpretations and explore related hypotheses to additionally investigate the dynamics between trust and acceptability.

Although there was no evidence for the mediating role of perceived benefits on the trust-acceptability relationship (H2a & H2b), higher perceived benefits of TRANSFORM were associated with increased acceptability. These results imply that increased levels of trust in policymakers may not lead to higher acceptability through the perceived benefits of TRANSFORM. This finding could be elucidated by the notion that individuals with limited knowledge or interest in a subject do not directly evaluate the risks or benefits associated with different technologies (Cvetkovich & Earle, 1992; Siegrist, 2000). In such cases, trust in institutions can serve as a coping mechanism to navigate the complexities of risk decision-making (Siegrist, 2000; Siegrist & Cvetkovich, 2000). However, if individuals lack trust in those institutions, relying on trust as a coping strategy becomes challenging, suggesting that

enhancing individuals' understanding of perceived costs and benefits could provide a more informed path to the level of scenario acceptance.

Nevertheless, there was a link found between higher perceived benefits of TRANSFORM and increased levels of acceptability of TRANSFORM. These outcomes align with previous research demonstrating relatedness between perceived benefits and project acceptability[3] (Bronfman et al., 2009; Huijts et al., 2012; Siegrist, 2000). To clarify the overall findings of this hypothesis, the role of trust in policymakers is brought into consideration again. The lack of evidence for the link between trust in policymakers and the perceived benefits of TRANSFORM could be attributed similarly to the operationalisation of trust and the role of policymakers in combination with the energy scenario. Therefore, the suggestion for future studies is to look further into the role of perceived benefits of a scenario in combination with the acceptability of the scenario, because increased advantages could contribute to implementing a scenario.

Regarding the final hypothesis, there was no evidence that higher levels of trust in policymakers would be associated with higher levels of acceptability of TRANSFORM through lower levels of perceived costs of TRANSFORM (H3a & H3b). Interestingly, participants who perceived higher costs of the TRANSFORM scenario did express lower acceptability of the scenario. This is in line with previous studies showing that public support of policies tends to be greater when they are anticipated to have less negative and more positive results, and when the costs and benefits are fairly distributed (Drews & Van den Bergh, 2016; Perlaviciute et al., 2021).

Theoretical Implications

The research and its findings are relevant to various theoretical perspectives regarding the acceptability of future energy scenarios. Firstly, the lack of support for the link between trust in

[3] Considering the limited research on the acceptability of future energy scenarios, the current study builds upon existing literature to explore factors that lay the groundwork for assessing acceptability. The components entail technology projects, policies, and behavioural changes (IPCC, 2018).

policymakers and the acceptability of TRANSFORM contributes to the understanding of acceptability. The idea of the connection between the variables was based on previous research indicating a relationship between trust in responsible agents and the acceptability of future energy projects (Liu et al., 2019). However, the current study suggests that scenario acceptability is not necessarily perceived the same as projects. The complexity of accepting future scenarios is thereby highlighted.

Secondly, trust in policymakers did not play the expected role in the acceptability of energy scenarios. Nonetheless, these findings provide insight into the role of trust in policymakers in the acceptability process of future energy scenarios. Citizens might be willing to accept future energy scenarios regardless of the citizens' trust in the policymakers implementing the scenario. Even the absence of trust can serve as a valuable factor in advancing sustainability efforts, as it has previously brought attention to flaws and challenges associated with the early stages of for instance developing a smart grid (an interconnected network for electricity distribution) (Büscher & Sumpf, 2015). Moreover, different factors such as the perceived benefits, costs, or other personal values linking to the energy scenario could outweigh the role of policymakers when investigating the acceptability of the scenario (Huijts et al., 2012). Therefore, the idea that trust in policymakers is directly linked to the public acceptance of a future energy scenario is undermined, suggesting other important factors to take into account.

Moreover, the results add to the nascent nature of the acceptance of future energy scenarios research field by providing valuable insight into the association between perceived benefits, perceived costs, and scenario acceptability. By taking both the advantages and disadvantages of the energy scenario into account, the study enhances the understanding of the factors that influence the acceptability of the future energy scenario. Thus, we find support for

the idea that individuals' evaluation of the energy scenario TRANSFORM is associated with the balance between the scenario's potential perceived benefits and costs.

Finally, when assessing the acceptability of an energy scenario, the need to evaluate the positive and negative factors involved should not be underestimated. The findings have shown that when people evaluate their acceptability of an energy scenario, they take into account both the good and bad things associated with the scenario. This aligns with decision-making theories and the idea of comparing the costs and benefits of a certain aspect before accepting it (Bronfman et al., 2009; Bronfman & Vazquez, 2011; De Groot et al, 2013; Visschers & Siegrist, 2014). Based on these findings, further research is suggested on the relationship between perceived costs and perceived benefits for individuals, as that information can contribute to the understanding of the complex dynamics of the system.

Practical Implications

The research findings have practical implications for the acceptability of energy scenarios in real-world settings. Policymakers and other stakeholders of energy scenarios should consider the importance of understanding the cost-benefits relationship to increase scenario acceptability. Even if trust in policymakers is not associated with the acceptability of the energy scenario, it remains essential to ensure clear and accurate communication about the complex aspects of energy scenarios (Schenk & Lensink, 2007). Such an approach enables the public to make informed decisions and better understand the complexities of energy scenarios (Rose et al., 2017).

Additionally, engaging the public in the development of carbon reduction policies presents an opportunity for more effective decision-making in those policies (Castell, 2010). Thus, the successful implementation of energy scenarios is contingent on the contribution of a

whole society, and how stakeholders consider consultations of the public and collaborative approaches. Previous research on implementing renewable energy projects has similarly taught about the relevance of involving communities during the stages of their development (Colmenares-Quintero et al., 2020). Although, challenges associated with addressing climate change through fostering a greater democratic engagement in the political system should not be underestimated (Lidskog & Elander, 2010). The objective is to create a discourse where social and psychological factors are taken into account in order to enhance the public acceptability of energy scenarios.

Limitations

Looking at the future, this study emphasizes multiple limitations to ponder regarding operationalisation, generalizability, and statistics. First, the operationalization of perceived costs and benefits in this study differed from other policy support research. While various studies focused on the overall perception of benefits and risks (Arbuckle et al., 2013; Moon et al., 2020; Yang et al., 2014), or classified costs and benefits into specific categories (Perlaviciute & Steg, 2014), this study examined the costs and benefits of TRANSFORM based on specific characteristics. Accordingly, participants could have formed an influenced view of the scenarios, evaluating rather the several parts of TRANSFORM than the scenario as a whole. Therefore, future research could consider a more holistic approach when investigating the perceived costs and benefits of an energy scenario.

Second, the generalizability of the findings from the energy scenario TRANSFORM to other future energy scenarios may be constrained for three different reasons. One reason for this is that different energy scenarios can have unique characteristics that influence public perceptions and acceptance, which might vary from those observed in TRANSFORM. To

address this, investigating Scheepers' (2022) ADAPT scenario, which shares similar goals but presents alternative features and implications, could provide insight into the acceptability of the findings across scenarios.

Another reason could be that personal differences in the participant's understanding of energy scenarios impact their perceptions and responses. Varying levels of English language comprehension and specific terminology related to the TRANSFORM scenario may introduce bias and limitations when generalizing the findings to other energy scenarios. The effect of limited comprehension can be longer duration or attrition, as observed in our study. Therefore, it is relevant to assess participants' perspectives during survey administration to minimize misconceptions.

A final explanation for the lack of generalizability could be that contextual aspects, including data collection, geographic location, and sociocultural elements can influence participant perceptions. For instance, the data collection process involved snowball and SONA sampling in 20 and 15 days, respectively. As a result, predominantly first-year psychology students of the University of Groningen and friends and families of the researchers participated in the study. Thereby, a potential bias towards young, educated individuals with a specific interest in energy scenarios is introduced. As young educated individuals may exhibit lower trust in policymakers (Hudson, 2006), it could explain the lack of correspondence between the trust variable and the other variables in this study. Consequently, future research could investigate the generalizability of the findings to a broader population to address these potential biases.

Third, the mediational analysis utilized in this study was limited because it was designed for causal relationships, whereas the current research focussed on associations between variables rather than establishing causality. This limitation is apparent in the two-headed arrows

representing correlation in the hypotheses and results (Figure 1 and Figure 2), while the statistical analysis illustrates one-headed arrows indicating causality (Table 2 and Table 3). Consequently, the understanding of the directions and underlying dynamics among the variables is reduced. To explore causality between the variables, an experiment could be conducted, manipulating trust through diverse statements about policymakers, and manipulating perceived costs and benefits by presenting different information about financial, environmental, or social aspects. This alternative approach would enrich the analysis and contribute to the understanding of future energy scenario acceptability.

Conclusion

To conclude, this research explored the association between trust in policymakers and the acceptability of the future energy scenario TRANSFORM, with the additional investigation of the mediation effect of the perceived benefits of TRANSFORM and the perceived costs of TRANSFORM. The study yields three important findings. First, trust in policymakers shows no significant correlation with the other variables, indicating a lack of connection and highlighting the need for further exploration of alternative operationalizations.

Second, the complexity of future energy scenario acceptability is apparent, revealing that the acceptability of the overall scenario may differ from the sum of its individual components (energy technology projects, policies, and behavioural change). This encourages more research on the specific contributions of each energy component to the holistic nature of future energy scenarios.

Third, the research emphasizes the significance of perceived benefits and perceived costs, prompting the enhancement of individuals' comprehension of costs and benefits to facilitate informed and deliberate acceptability of scenarios. These findings have both theoretical

implications for understanding acceptability and practical implications for policymakers, underscoring the importance of transparent communication and considering the perceived costs and benefits to optimize the implementation of future energy scenarios.

References

Arbuckle, J.G., Morton, L.W., Hobbs, J., 2013. Understanding farmer perspectives on climate change adaptation and mitigation: the roles of trust in sources of climate information, climate change beliefs, and perceived risk. Environ. Behav. 47 (2), 205–234. https://doi.org/10.1177/0013916513503832

Braun, C., Merk, C., Pönitzsch, G., Rehdanz, K., & Schmidt, U. (2018). Public perception of climate engineering and carbon capture and storage in Germany: survey evidence. Climate Policy, 18(4), 471-484. https://doi.org/10.1080/14693062.2017.1304888

Bronfman, N. C., & Vázquez, E. L. (2011). A cross‐cultural study of perceived benefit versus risk as mediators in the trust‐acceptance relationship. Risk Analysis, 31(12), 1919-1934. https://doi.org/10.1111/j.1539-6924.2011.01637.x

Bronfman, N., Vázquez, E., Gutiérrez, V., & Cifuentes, L. (2008). Trust, acceptance and knowledge of technological and environmental hazards in Chile. Journal of Risk Research. https://doi.org/10.1080/13669870801967184

Bronfman, N., Vázquez, E., & Dorantes, G. (2009). An empirical study for the direct and indirect links between trust in regulatory institutions and acceptability of hazards. Safety Science.

Burbidge, R. (2018). Adapting aviation to a changing climate: Key priorities for action. Journal of Air Transport Management. https://doi.org/10.1016/J.JAIRTRAMAN.2018.04.004.

Büscher, C., & Sumpf, P. (2015). “Trust” and “confidence” as socio-technical problems in the transformation of energy systems. Energy, Sustainability and Society, 5(1), 1-13. https://doi.org/10.1186/s13705-015-0063-7

Coalitieakkoord 2021 – 2025 : Omzien naar elkaar, vooruitkijken naar de toekomst : VVD, D66, CDA en ChristenUnie. (2021). https://library.wur.nl/WebQuery/groenekennis/2309281

Castell, S. (2010) What the Public Say about Designing Climate Change and Low Carbon Interventions [online]. London: Sciencewise Expert Resource Centre, Department for Business Innovation and Skills. Available from: 〈 http://www.sciencewise-erc.org.uk/cms/assets/Uploads/Publications/What-the-public-say-about-climate-change.pdf〉.

Ćetković, S., & Buzogány, A. (2016). Varieties of capitalism and clean energy transitions in the European Union: When renewable energy hits different economic logics. Climate Policy. https://doi.org/10.1080/14693062.2015.1135778.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (Second edition ed.). Psychology Press.

Colmenares-Quintero, R., Benavides-Castillo, J., Rojas, N., & Stansfield, K. E. (2020). Community perceptions, beliefs and acceptability of renewable energies projects: A systematic mapping study. *Cogent Psychology, 7*(1) https://doi.org/10.1080/23311908.2020.1715534

Cvetkovich, G., & Earle, T. C. (1992). Environmental Hazards and the Public. Journal of Social Issues, 48(4), 1-20. https://doi.org/10.1111/j.1540-4560.1992.tb01942.x

De Groot, J. I. M., Steg, L., & Poortinga, W. (2013). Values, perceived risks and benefits, and acceptability of nuclear energy. Risk Analysis, 33(2), 307–317. https://doi-org.proxy-ub.rug.nl/10.1111/j.1539-6924.2012.01845.x

Demski, C., Evensen, D., Pidgeon, N., & Spence, A. (2017). Public prioritisation of energy affordability in the UK. Energy Policy, 110, 404-409. https://doi.org/10.1016/j.enpol.2017.08.044

Denton, G., Chi, O. H., & Gursoy, D. (2020). An examination of the gap between carbon

offsetting attitudes and behaviors: Role of knowledge, credibility and trust. International Journal of Hospitality Management, 90, 102608. https://doi.org/10.1016/j.ijhm.2020.102608

Drews, S., and Van den Bergh, J. C. J. M. (2016). What explains public support for climate policies? A review of empirical and experimental studies. Clim. Policy 16, 855–876. https://doi.org/10.1080/14693062.2015.1058240

Earle, T., & Siegrist, M. (2008). Trust, Confidence and Cooperation model: a framework for understanding the relation between trust and Risk Perception. International Journal of Global Environmental Issues, 8(1-2), 17-29. https://doi.org/10.1504/IJGENVI.2008.017257

Earle, T. C., & Siegrist, M. (2006). Morality Information, Performance Information, and the Distinction Between Trust and Confidence. Journal of Applied Social Psychology, 36(2), 383-416. https://doi.org/10.1111/j.0021-9029.2006.00012.x

Faul, F., Erdfelder, E., Lang, A., & Buchner, A. (2007). GPower 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behavior Research Methods, 39(2), 175-191. https://doi.org/10.3758/BF03193146

Fiske, S. T., Cuddy, A. J. C., Glick, P., & Xu, J. (2002). A Model of (Often Mixed) Stereotype Content. Journal of Personality and Social Psychology, 82(6), 878-902. https://doi.org/10.1037/0022-3514.82.6.878

Gordon, R., Brunson, M. W., & Shindler, B. (2014). Acceptance, Acceptability, and Trust for Sagebrush Restoration Options in the Great Basin: A Longitudinal Perspective. Hosted by Utah State University Libraries. https://doi.org/10.2111/REM-D-13-00016.1

Graham, J. B., Stephenson, J. R., & Smith, I. J. (2009). Public perceptions of wind energy

developments: Case studies from New Zealand. Energy Policy, 37(9), 3348-3357. https://doi.org/10.1016/j.enpol.2008.12.035

Hayes, A. F. (2022). Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach. Guilford Publications. http://afhayes.com/introduction-to-mediation-moderation-and-conditional-process-analysis.html

Hetherington, M. (1998). The Political Relevance of Political Trust. American Political Science Review. https://doi.org/10.2307/2586304.

Huang, J., Yu, H., Dai, A., Wei, Y., & Kang, L. (2017). Drylands face potential threat under 2 °C global warming target. Nature Climate Change, 7(6), 417-422. https://doi.org/10.1038/NCLIMATE3275

Hudson, J. (2006). Institutional Trust and Subjective Well-Being Across the EU. Wiley-Blackwell: Kyklos. https://doi.org/10.1111/j.1467-6435.2006.00319.x.

Huijts, N. M. A., Molin, E. J. E., & Steg, L. (2012). Psychological factors influencing sustainable energy technology acceptance: A review-based comprehensive framework. *Renewable & Sustainable Energy Reviews, 16*(1), 525-531. https://doi.org/10.1016/j.rser.2011.08.018

IBM Corp. Released 2022. IBM SPSS Statistics for Windows, Version 29.0. Armonk, NY: IBM Corp. https://www.ibm.com/products/spss-statistics

IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani,

W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press.

Jones, N., & Clark, J. (2014). Social capital and the public acceptability of climate change adaptation policies: a case study in Romney Marsh, UK. Climatic Change. https://doi.org/10.1007/s10584-013-1049-0.

Kern, F., & Rogge, K. S. (2016). The pace of governed energy transitions: Agency, international dynamics and the global Paris agreement accelerating decarbonisation processes? Energy Research & Social Science, 22, 13-17. https://doi.org/10.1016/j.erss.2016.08.016

Lee, J., Boynton, M., Richardson, A., Jarman, K., Ranney, L., & Goldstein, A. (2016). Raising the Legal Age of Tobacco Sales: Policy Support and Trust in Government, 2014-2015, U.S.. American journal of preventive medicine. https://doi.org/10.1016/j.amepre.2016.04.009.

Lidskog, R., Elander, I., 2010. Addressing climate change democratically. Multi-level governance, transitional networks and governmental structures. Sustainable Development 18 (1), 32–41. https://doi.org/10.1002/sd.395

Lim, J., & Moon, K. (2022). Political Trust and Support for a Tax Increase for Social Welfare: The Role of Perceived Tax Burden. Sustainability (Basel, Switzerland), 14(12), 7171. https://doi.org/10.3390/su14127171

Liu, L., Bouman, T., Perlaviciute, G., & Steg, L. (2020). Effects of competence- and integrity-based trust on public acceptability of renewable energy projects in China and the Netherlands. Journal of Environmental Psychology, 67, 101390. https://doi.org/10.1016/j.jenvp.2020.101390

Liu, Y., Ge, Y., Xia, B., Cui, C., Jiang, X., & Skitmore, M. (2019). Enhancing public acceptance

towards waste-to-energy incineration projects: Lessons learned from a case study in China. Sustainable Cities and Society. https://doi.org/10.1016/J.SCS.2019.101582.

Marshall, N., Adger, N., Attwood, S., Brown, K., Crissman, C., Cvitanovic, C., De Young, C., Gooch, M., James, C., Jessen, S., Johnson, D., Marshall, P., Park, S., Wachenfeld, D., & Wrigley, D. (2017). Empirically derived guidance for social scientists to influence environmental policy. PLoS ONE, 12(3), e0171950. https://doi.org/10.1371/journal.pone.0171950

Midden, C. J. H., & Huijts, N. M. A. (2009). Role of Trust in the Affective Evaluation of Novel Risks: The Case of CO_2 Storage. Risk Analysis, 29(5), 743-751. https://doi.org/10.1111/j.1539-6924.2009.01201.x

Molin, E. (2005). Causal Analysis of Hydrogen Acceptance. Transportation Research Record, 1941(1941), 115-121. https://doi.org/10.3141/1941-14

Montijn-Dorgelo, F. N. H., & Midden, C. J. H. (2008). The role of negative associations and trust in risk perception of new hydrogen systems. Journal of Risk Research, 11(5), 659-671. https://doi.org/10.1080/13669870801967218

Moon, W., Kahlor, L., & Olson, H. (2020). Understanding public support for carbon capture and storage policy: The roles of social capital, stakeholder perceptions, and perceived risk/benefit of technology. Energy Policy. https://doi.org/10.1016/j.enpol.2020.111312.

Nangombe, S., Zhou, T., Zhang, W., Wu, B., Hu, S., Zou, L., & Li, D. (2018). Record-breaking climate extremes in Africa under stabilized 1.5 °C and 2 °C global warming scenarios. Nature Climate Change. http://doi.org/10.1038/s41558-018-0145-6

Oteman, M., Wiering, M., & Helderman, J. (2014). The institutional space of community

initiatives for renewable energy: a comparative case study of the Netherlands, Germany and Denmark. Energy, Sustainability and Society, 4, 1-17. http://doi.org/10.1186/2192-0567-4-11

Perlaviciute, G., & Steg, L. (2014). Contextual and psychological factors shaping evaluations and acceptability of energy alternatives: Integrated review and research agenda. Renewable and Sustainable Energy Reviews, 35, 361-381. https://doi.org/10.1016/j.rser.2014.04.003

Perlaviciute, G., Steg, L., & Sovacool, B. K. (2021). A perspective on the human dimensions of a transition to net-zero energy systems. *Energy and Climate Change, 2*, 100042. https://doi.org/10.1016/j.egycc.2021.100042

Piacentino, A., Duic, N., Markovska, N., Mathiesen, B. V., Guzović, Z., Eveloy, V., & Lund, H. (2019). Sustainable and cost-efficient energy supply and utilisation through innovative concepts and technologies at regional, urban and single-user scales. Energy (Oxford), 182, 254-268. https://doi.org/10.1016/j.energy.2019.06.015

Potrč, S., Čuček, L., Martin, M., & Kravanja, Z. (2021). Sustainable renewable energy supply networks optimization – The gradual transition to a renewable energy system within the European Union by 2050. Renewable & Sustainable Energy Reviews. https://doi.org/10.1016/J.RSER.2021.111186.

Qualtrics. (2005). Qualtrics International Inc. (March, 2023). Qualtrics. https://www.qualtrics.com

Rose, S., Diaz, D., & Blanford, G. (2017). UNDERSTANDING THE SOCIAL COST OF CARBON: A MODEL DIAGNOSTIC AND INTER-COMPARISON STUDY. Climate Change Economics. https://doi.org/10.1142/S2010007817500099.

Rudolph, T. (2009). Political Trust, Ideology, and Public Support for Tax Cuts. Public Opinion Quarterly. https://doi.org/10.1093/POQ/NFP012.

Scheepers, M. (2022). Een Klimaatneutraal Energiesysteem Voor Nederland: Nieuwe Verkenning Toont Grenzen Mogelijkheden. TNO. http://resolver.tudelft.nl/uuid:2b4cfe43-7483-462d-8f0e-98e4c85f36b2

Schenk, N., & Lensink, S. (2007). Communicating uncertainty in the IPCC's greenhouse gas emissions scenarios. Climatic Change. https://doi.org/10.1007/S10584-006-9194-3.

Seneviratne, S., Rogelj, J., Séférian, R., Wartenburger, R., Allen, M., Cain, M., Millar, R., Ebi, K., Ellis, N., Hoegh‐Guldberg, O., Payne, A., Schleussner, C., Tschakert, P., & Warren, R. (2018). The many possible climates from the Paris Agreement's aim of 1.5 °C warming. Nature. https://doi.org/10.1038/s41586-018-0181-4

Siegrist, M. (2000). The Influence of Trust and Perceptions of Risks and Benefits on the Acceptance of Gene Technology. Risk Analysis, 20(2), 195-203. https://doi.org/10.1111/0272-4332.202020

Siegrist, M., Cousin, M., Kastenholz, H., & Wiek, A. (2007). Public acceptance of nanotechnology foods and food packaging: The influence of affect and trust. Appetite, 49(2), 459-466. https://doi.org/10.1016/j.appet.2007.03.002

Siegrist, M., & Cvetkovich, G. (2000). Perception of Hazards: The Role of Social Trust and Knowledge. Risk Analysis. https://doi.org/10.1111/0272-4332.205064.

Spadaro, G., Gangl, K., Prooijen, J., Lange, P., & Mosso, C. (2020). Enhancing feelings of security: How institutional trust promotes interpersonal trust. PLoS ONE. https://doi.org/10.1371/journal.pone.0237934.

Terwel, B. W., Harinck, F., Ellemers, N., & Daamen, D. D. L. (2009). Competence-Based and

Integrity-Based Trust as Predictors of Acceptance of Carbon Dioxide Capture and Storage (CCS). Risk Analysis, 29(8), 1129-1140. https://doi.org/10.1111/j.1539-6924.2009.01256.x

Van den Heuvel, S., Schalk, R., & Assen, M. A. L. M. (2015). Does a Well-Informed Employee Have a More Positive Attitude Toward Change? The Mediating Role of Psychological Contract Fulfillment, Trust, and Perceived Need for Change. The Journal of Applied Behavioral Science, 51(3), 401-422. https://doi.org/10.1177/0021886315569507

Visschers, V., & Siegrist, M. (2014). Find the differences and the similarities: Relating perceived benefits, perceived costs and protected values to acceptance of five energy technologies. Journal of Environmental Psychology. https://doi.org/10.1016/J.JENVP.2014.05.007.

Wallquist, L., Visschers, V., Dohle, S., & Siegrist, M. (2012). The Role of Convictions and Trust for Public Protest Potential in the Case of Carbon Dioxide Capture and Storage (CCS). Human and Ecological Risk Assessment: An International Journal. https://doi.org/10.1080/10807039.2012.688719.

Whitmarsh, L., O′Neill, S., Lorenzoni, I., 2012. Engaging the Public with Climate Change: Behaviour Change and Communication. Earthscan, London. https://doi.org/10.4324/9781849775243

Wüstenhagen, R., Wolsink, M., & Bürer, M. J. (2007). Social acceptance of renewable energy innovation: An introduction to the concept. Energy Policy, 35(5), 2683-2691. https://doi.org/10.1016/j.enpol.2006.12.00

Yang, Z.J., Kahlor, L.A., Griffin, D.J., 2014. I share, therefore I am: a US China comparison of college students' motivations to share information about climate change. Hum. Commun. Res. 40 (1), 112–135. https://doi.org/10.1111/hcre.12018.

Yang, L., Zhang, X., & McAlinden, K. (2016). The effect of trust on people's acceptance of CCS (carbon capture and storage) technologies: Evidence from a survey in the People's Republic of China. Energy. https://doi.org/10.1016/J.ENERGY.2015.12.044.

Zhang, M., Yu, H., King, A. D., Wei, Y., Huang, J., & Ren, Y. (2020). Greater probability of extreme precipitation under 1.5 °C and 2 °C warming limits over East-Central Asia. Climatic Change, 162(2), 603-619. https://doi.org/10.1007/s10584-020-02725-2

Appendix A

Survey Questions

Figure A1

Scenario B Description

The energy sector is the largest contributor to greenhouse gas emissions which are driving climate change. To address this, the Netherlands pledged to reach **net zero emissions by 2050**, for which future energy scenarios have been developed. Future energy scenarios are calculations of how energy consumption, demand and production must change while considering factors such as changing environmental effects, growing population, sustainability goals and international cooperation. All while the Dutch economy continues to grow at the same rate. Here, we present **two realistic future energy scenarios** for the Netherlands: the scenario A and B.

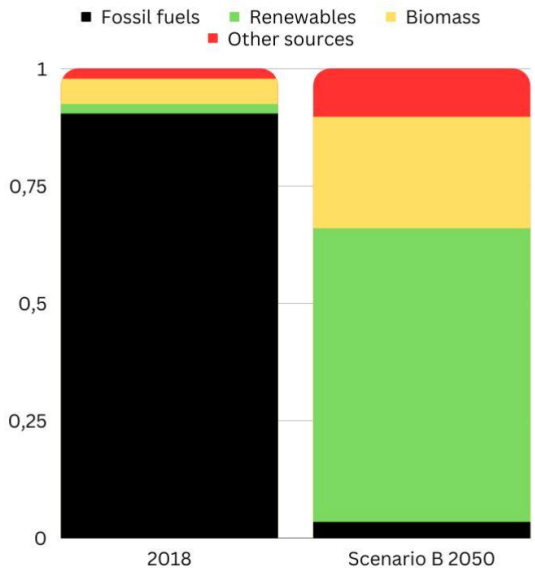
Below are several graphs and information on Scenario B. **Please read the descriptions carefully to understand the scenarios.** You will be asked a series of questions about the details of the scenario and its advantages, disadvantages and acceptability. Note: hover over underlined words for more information about the concept.

In scenario B:

- The Netherlands relies on its strong knowledge and innovative business community to transition to cleaner energy sources.
- The country focuses on using renewable technologies while also developing a more circular economy, which helps reduce energy usage.
- The government plays an important role in facilitating and promoting the adoption of sustainable technologies.

- People become more aware of their energy usage and make changes to reduce their carbon footprint. This includes behaviour like eating less meat and choosing seasonal foods.
- New technologies, such as electric and hydrogen-powered transportation, are welcomed and encouraged.
- The demand for energy decreases as people's mobility behaviour changes and industries shift towards less energy-intensive processes.
- Companies are making big changes to become more sustainable.
- The service sector grows as the economy shifts towards more sustainable, circular practices.
- The agricultural sector switches to more sustainable energy sources, such as solar panels, wind turbines and geothermal energy for farm operations.
- To meet international climate goals, international aviation and shipping are required to reduce their greenhouse gas emissions by 95%.
- Carbon Capture and Storage is only used to a limited extent, and biomass is only used if no other options are available.

The below graph indicates the percentages of Dutch energy supply sources in 2018 compared with those projected by scenario B in 2050.



The table below provides you with more detailed information on the scenario.

	Scenario B
National greenhouse gas reduction target	2030: 55% 2050: 100%
Greenhouse gas reduction target international flying and shipping	2050: 95%
Fossil fuel prices	Constant after 2030
Energy demand	
• Industry	↓
• Service sector	↑↑
• Agriculture sector	↓
Industry production	↓
Mobility demand*	
• Domestic	↓
• International	↓
Biomass availability**	
• Domestic	++
• Imports	++
Use CO2 capture and storage (CCS)***	+
Use coal-fired power plants	No

↑ means growth, ↓ shrinkage and ↑↑ extra growth, +++ means large, ++ moderate and + limited availability

Explanation of terms

* **Mobility demand:** transportation (e.g. cars, buses, trains, bicycles)

** **Biomass availability:** availability of organic matter for energy production (e.g. wood, vegetable and garden waste, sewage)

*** **CO2 capture and storage:** technology capturing and storing CO2 underground or in long-term storage facilities (e.g. gas reservoirs, deep ocean sediments)

Figure A2

Trust in Policymakers Scale

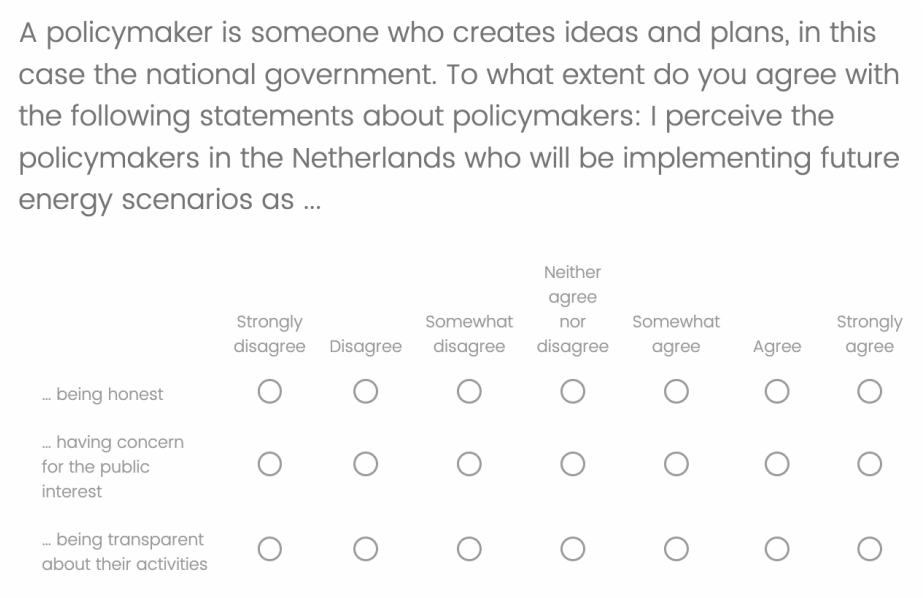


Figure A3

Perceived Benefits TRANSFORM Scale (as advantages of Scenario B)

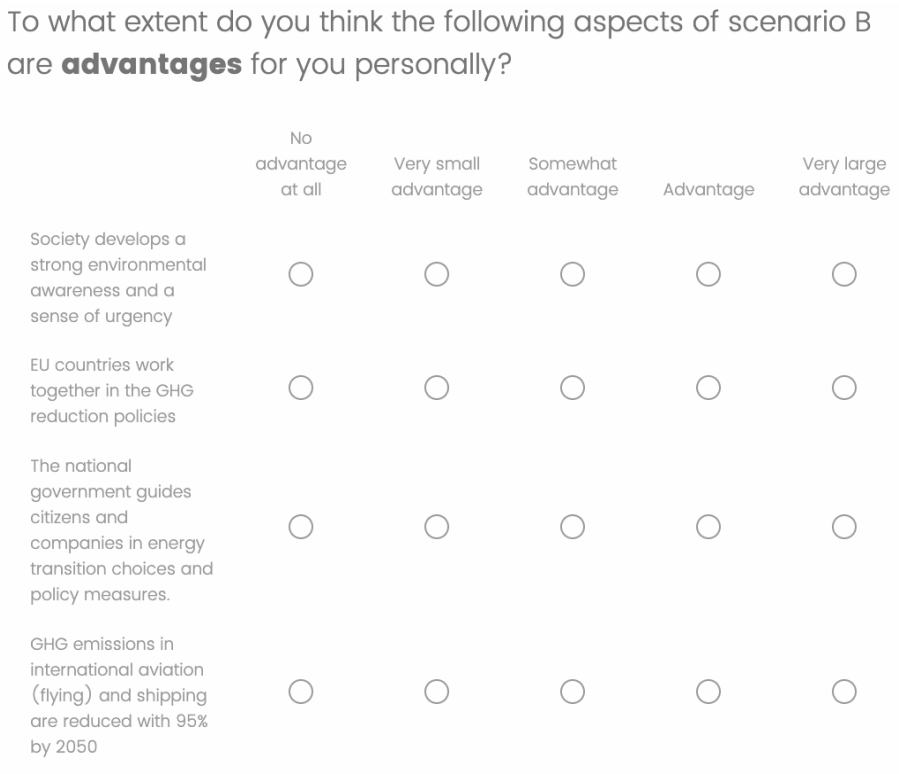


Figure A4

Perceived Costs TRANSFORM Scale (as disadvantages of Scenario B)

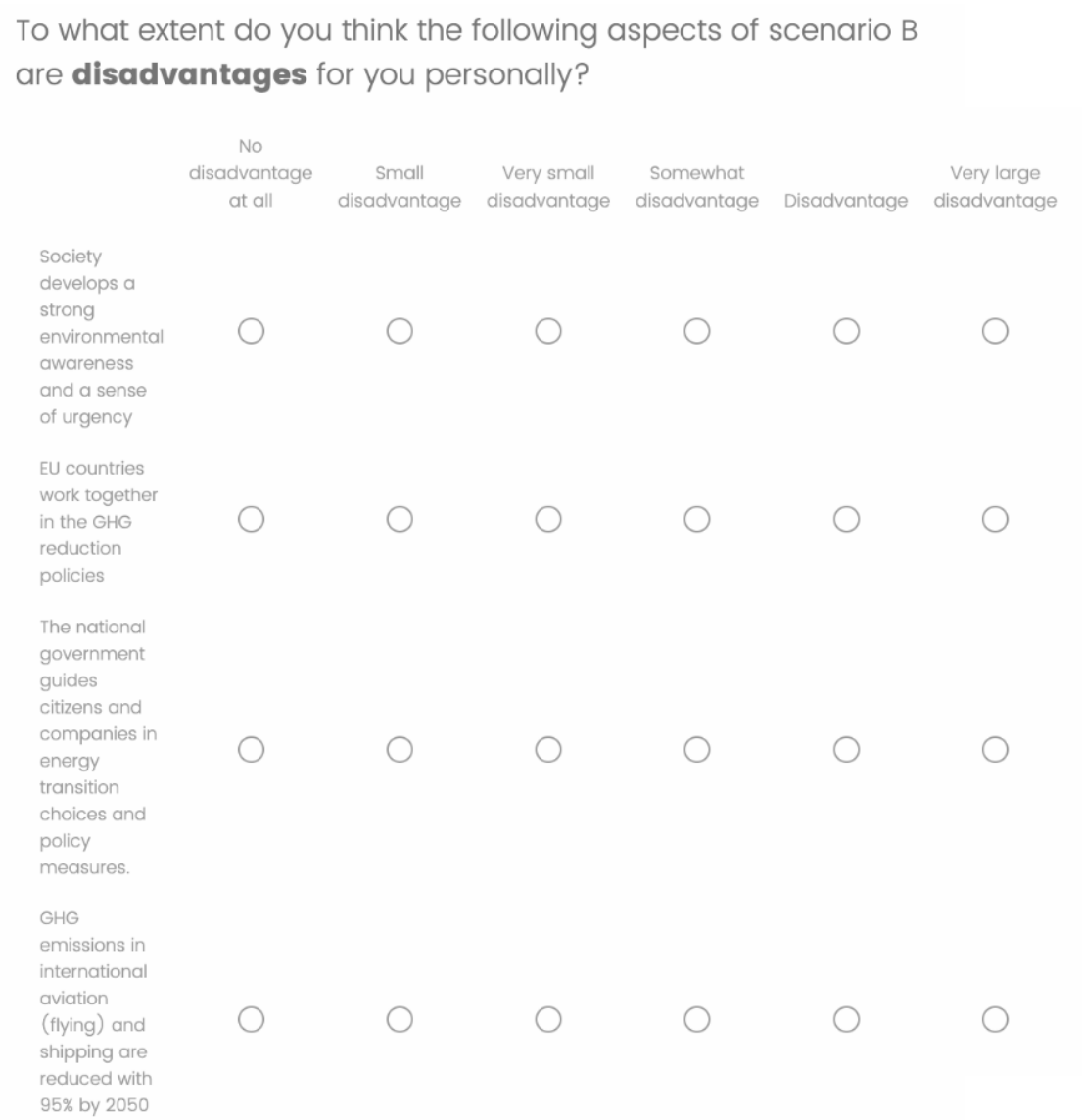


Figure A5

Acceptability of Scenario B Scale

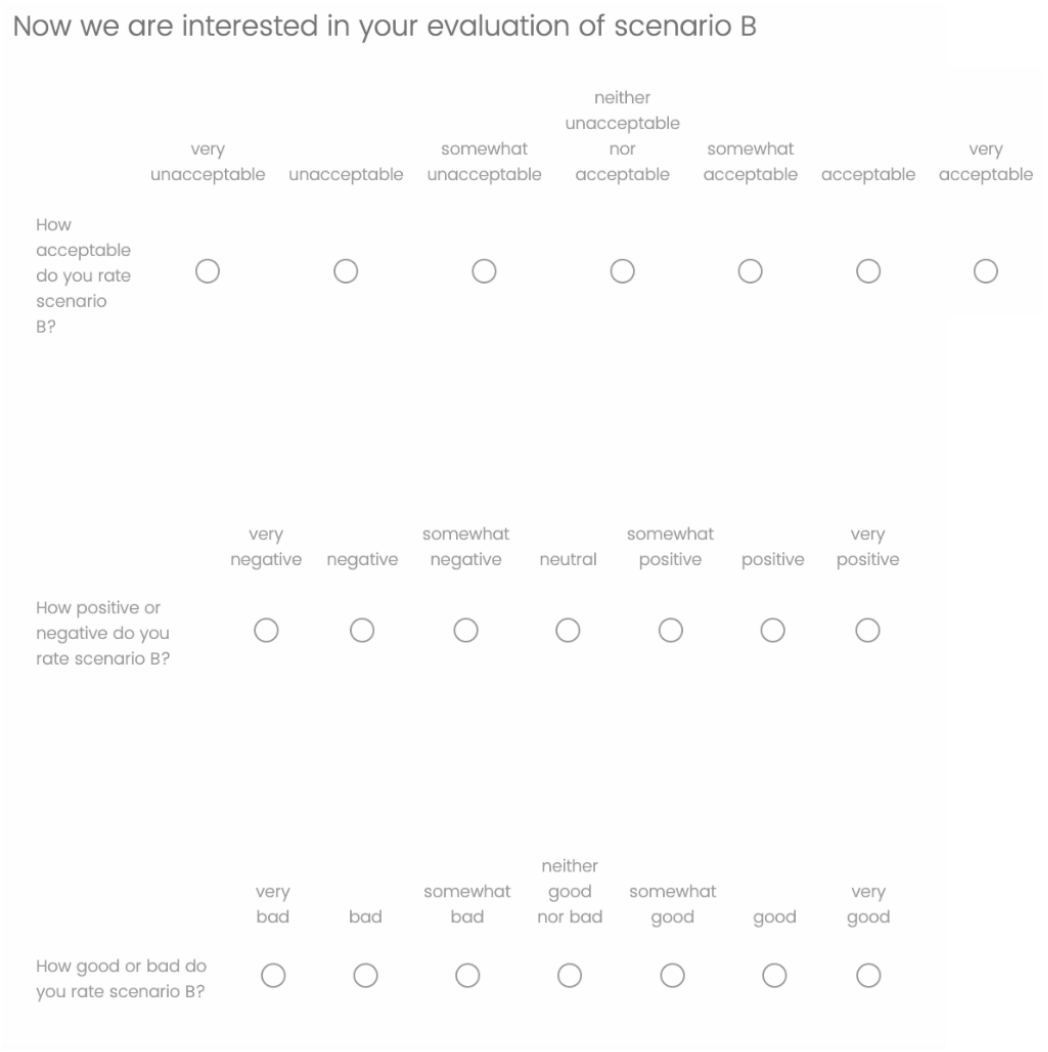
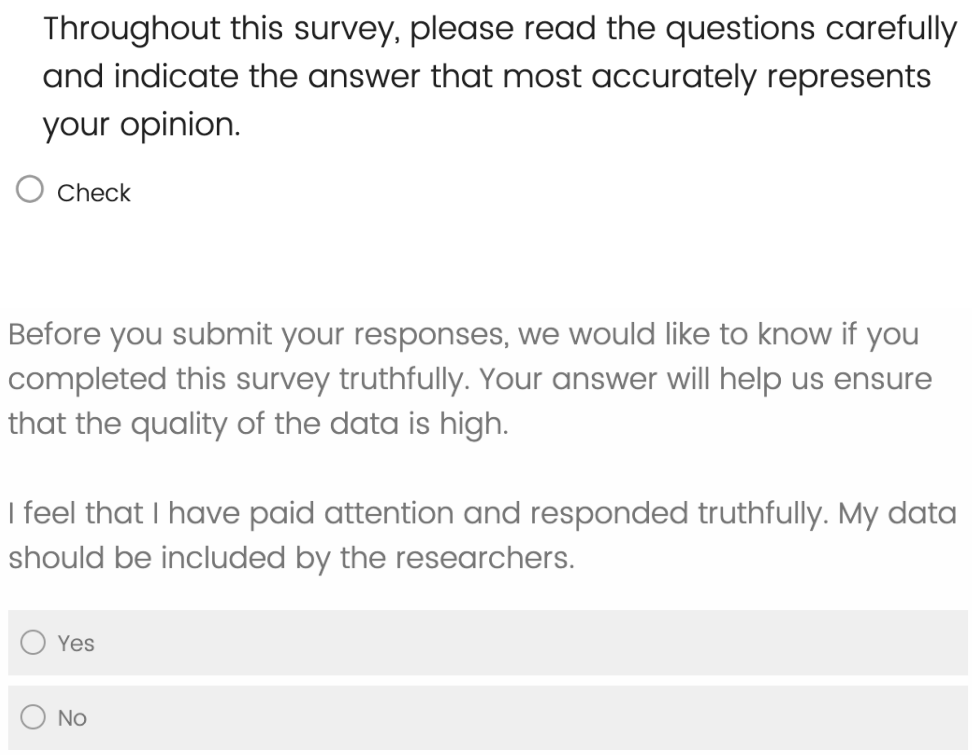


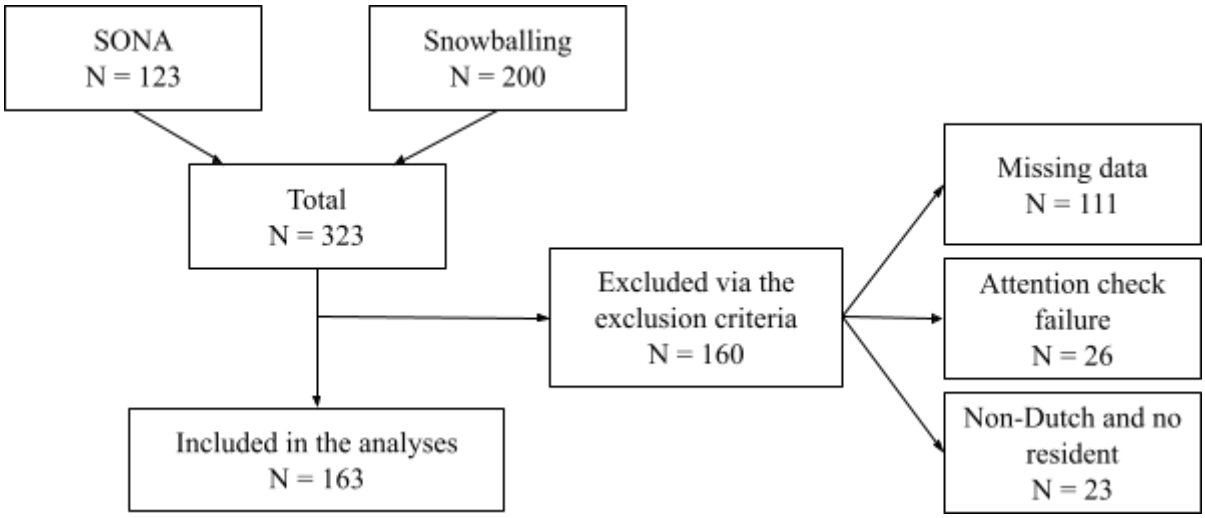
Figure A6

Attention Check and Seriousness Check



Appendix B

Participants Exclusion Process



Appendix C

Calculation and Tables

Calculation C1

Calculation of the A Priori Power Analysis

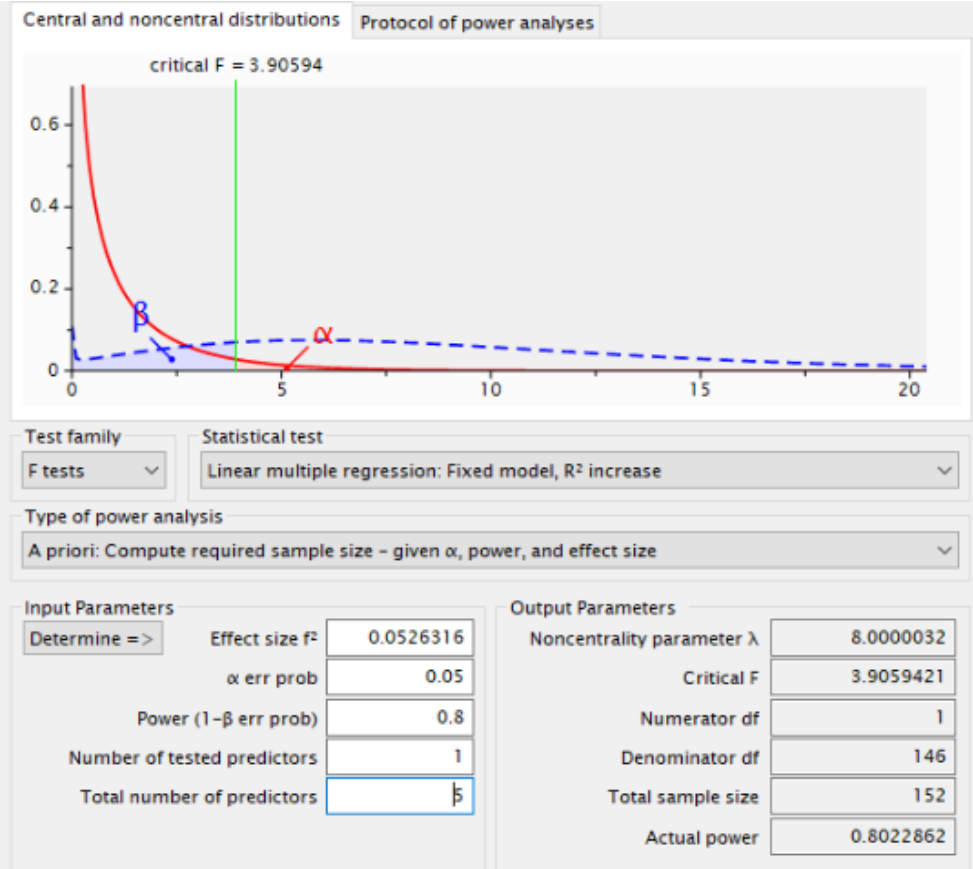


Table C2

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Trust in Policymakers	163	1.00	7.00	4.02	1.27
Perceived Benefits TRANSFORM	163	1.50	5.00	3.76	0.83
Perceived Costs TRANSFORM	163	1.00	5.00	1.91	0.92

Acceptability of TRANSFORM	163	1.00	7.00	5.62	1.04

Note. Trust and Acceptability were on a 7-point scale, and the perceived Benefits and Costs were on a 5-point scale.

Table C3

Descriptive Statistics and Correlation Table for Study Variables

Variable	*n*	*M*	*SD*	1	2	3	4
1. Trust in Policymakers	163	4.02	1.27	–	–	–	–
2. Perceived Benefits TRANSFORM	163	3.76	0.83	-.01	–	–	–
3. Perceived Costs TRANSFORM	163	1.91	0.92	.03	-.32**	–	–
4. Acceptability of TRANSFORM	163	5.62	1.04	.09	.55**	-.43**	–

Note. *. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix D

Graphs

Figure D1

Residual vs Predicted Value Scatterplot for the Acceptability of Scenario B

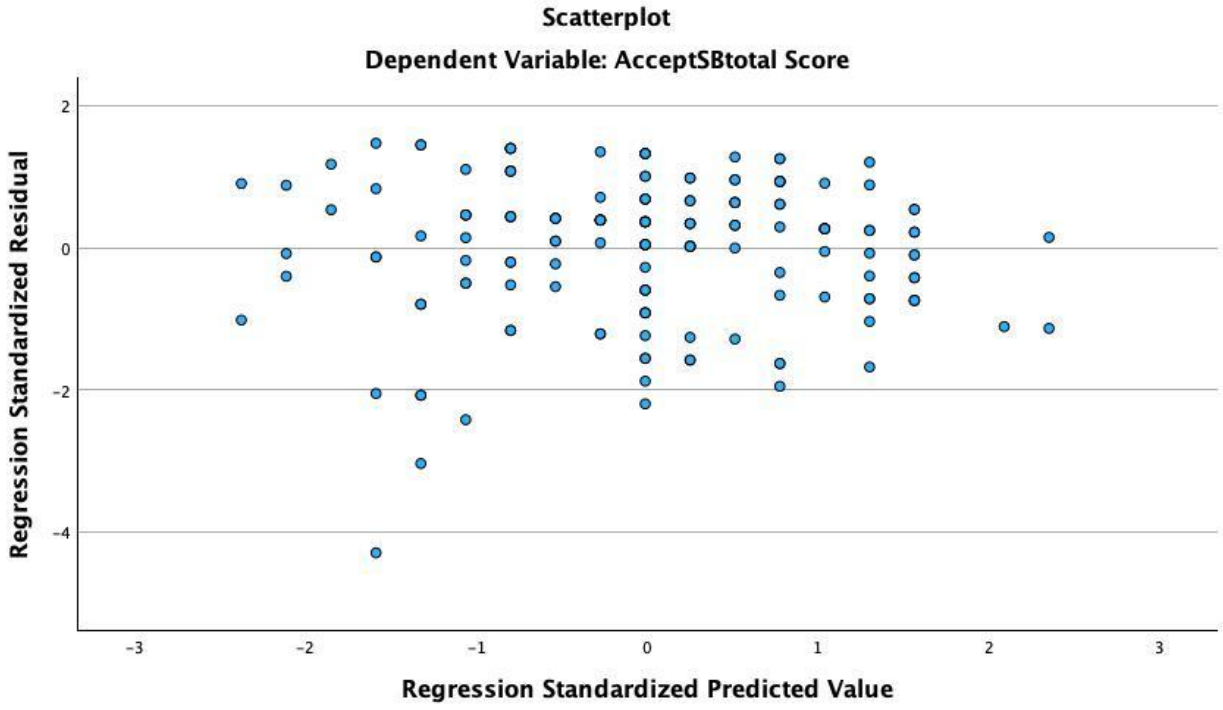


Figure D2

Q-Q plot for the Acceptability of Scenario B Score

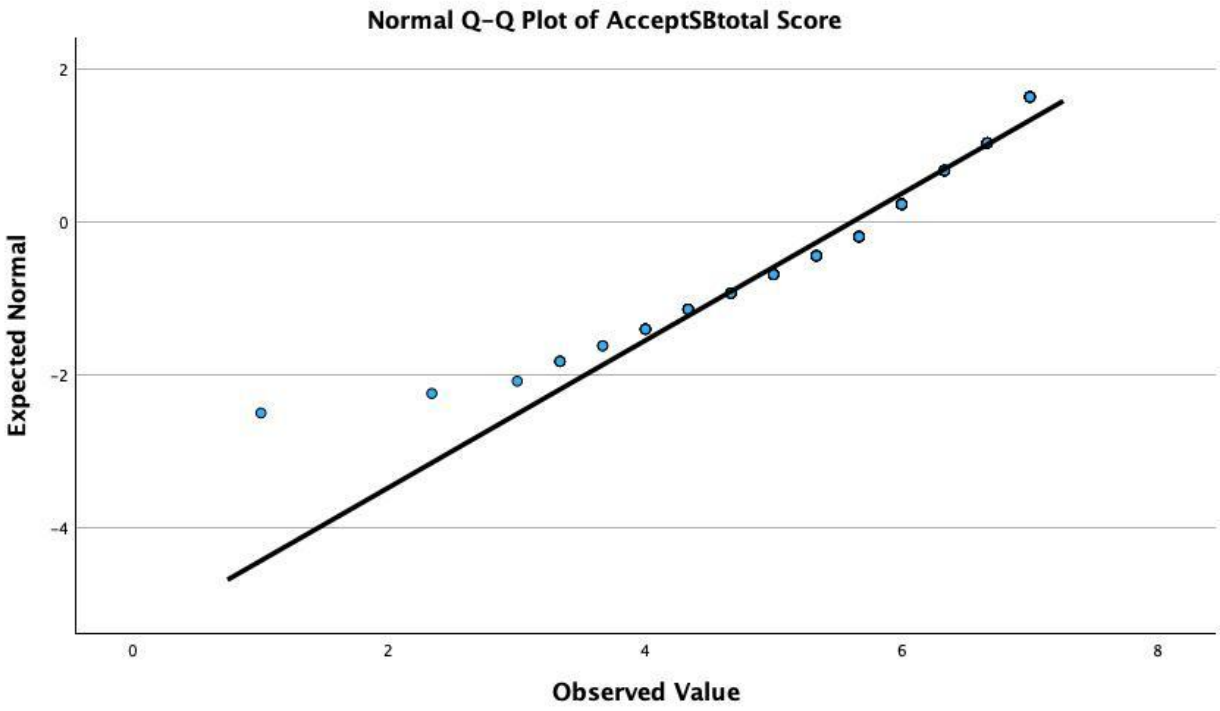


Figure D3

Boxplots for Trust, Perceived Benefits, Perceived Costs, and Acceptability of Scenario B