Norwegian University
of Life Sciences

Master's Thesis 2023 30 ECTS
School of Economics and Business

From Headwinds to Tailwinds? A Comparison of Norwegian Households' Willingness to Pay for Wind Power Before and After the War Outbreak in Ukraine

Andrine Stengrundet
Master of Science in Economics

Abstract

This paper is a contribution to the discussion of stability of preferences and willingness to pay-estimates measured through nonmarket valuation. Such estimates are used by researchers conducting cost-benefit analyses of various policies, and their findings are often used by decision makers. The estimates thereby play an important part in discussions of policy implementations, which emphasizes that they should be valid and representative for the population in question.

This thesis tests how sensitive estimated preferences are when exogenous shocks occur, to give an indication of their stability. The exogenous shock considered is the war outbreak in Ukraine, which led to an insecure energy supply, rocketing energy prices and overall energy uncertainty. The data consists of a pilot and main survey sample of a discrete choice experiment survey mapping Norwegian households' attitudes towards land-based wind power. By using logit models, mean willingness to pay-estimates are measured for both survey samples. After comparing the estimates and checking for a statistically significant difference, a conclusion is drawn of whether the willingness to pay-estimates are stable when exogenous shocks, such as the war outbreak, occur.

The findings indicate that the main survey sample is less positive to increased renewable energy than the pilot, yet more accepting of installation of new land-based wind turbines. Moreover, the results indicate that this difference between the pilot and main survey sample is statistically significant. This implies that estimated preferences are sensitive to exogenous shocks and should be used with caution. However, the difference could be explained through survey alterations between the piloting and main survey. Furthermore, the significant difference in mean willingness to pay could be a shock response to the war outbreak rather than a change in Norwegian households' underlying preferences. Doing a re-testing of the main survey and checking for statistical difference to the initial main survey could aid in determining if the preferences did indeed change, which would strengthen the results found in this study.

Acknowledgement

This thesis is part of the larger research project LandValUse (project number: 319917), financed by the Research Council of Norway. I am grateful for the opportunity to participate in such an interesting project, which has yielded me rich insights into wind power in Norway and more knowledge about nonmarket valuation.

Words cannot express my gratitude to my supervisor Anders Dugstad. His deep understanding of environmental economics and extensive research on wind power have been highly valuable throughout my work. I am beyond grateful for all the time he has spent on feedback aimed to improve my thesis, and for providing me with relevant and helpful literature. He has been an exceptional mentor who I could always count on for great advice.

I am very grateful for my classmates at NMBU School of Economics and Business for all our valuable co-operation and discussions. A special thanks goes to my irreplaceable study partner Kristin, who has been a constant support both academically and morally. I want to give my warmest thank you to my fiancé Bendik, who has been my main supporter through five challenging, yet exciting years of studying. Lastly, I want to express deep gratitude for my family and friends who have cheered endlessly for me.

Contents

Abstract i

Acknowledgement ii

List of tables v

List of figures vi

Abbreviation list vii

1. Introduction 1

2. Background 2

 2.1. Wind power in Norway 2

 2.2. Literature review 5

 2.3. Research questions and hypotheses 8

3. Theory and concepts 10

 3.1. Ecosystem services 10

 3.2. Random utility maximization model 14

 3.3. Hicksian welfare demand 16

  3.3.1. Compensating surplus and equivalent surplus 18

4. Method 19

 4.1. Nonmarket valuation 19

  4.1.2. Stated preference method 20

   4.1.2.1. Validity and reliability 24

   4.1.2.2. Discrete choice experiment survey design 26

  4.1.3. Benefit transfer 33

 4.2. Econometric approach 35

  4.2.1. Multinomial and mixed logit 35

  4.2.2. Propensity score matching 39

5. Results 42

5.1. Sample vs. Population characteristics 42

5.2. Rank order survey questions results 43

5.3. Econometric models 47

5.3.1. Multinomial logit models 47

5.3.1.1. Interaction effects to account for sociodemographic differences 48

5.3.2. Mixed logit models 51

5.4. Estimated willingness to pay 52

5.4.1. Mean willingness to pay-estimates multinomial logit models 53

5.4.1.1. Mean willingness to pay-estimates multinomial logit models with interaction effects 55

5.4.2. Mean willingness to pay-estimates from the mixed logit models 57

5.5. Comparison of the survey samples 59

5.5.1. Transfer errors of the mean WTP estimates 59

5.5.2. Checking for significant difference in sociodemographic variables 60

5.5.3. Propensity score matching 62

6. Discussion and conclusion 64

6.1. Research questions and hypotheses 64

6.2. Implications of the findings 69

6.3. Content and construct validity 70

6.4. Limitations 71

6.5. Concluding remarks 72

7. References 73

Appendix I: Main survey 77

List of tables

Table 1: Research questions and hypotheses 9
Table 2: Classification of ecosystem services 11
Table 3: Attributes and the respective levels and intervals 28
Table 4: Sample vs. Population characteristics 43
Table 5: Coefficients of multinomial logit models 47
Table 6: Coefficients of multinomial logit model with interaction effects 49
Table 7: Coefficients of mixed logit models 52
Table 8: Mean WTP estimates for the pilot and main survey sample using multinomial logit coefficients 53
Table 9: Mean WTP values for multinomial logit model with interaction effects 55
Table 10: Mean WTP estimates for the pilot and main survey sample using mixed logit coefficients 57
Table 11: Transfer errors of mean WTP estimates 60
Table 12: Checking for significant difference in sociodemographic variables between the pilot and main survey sample 61
Table 13: Propensity score matching of individual-specific WTPs for the attributes 62
Table 14: Covariate balance summary for the two attributes after propensity score matching. ... 63
Table 15: Summary of mean WTP estimates from the pilot survey using the different logit models 66
Table 16: Summary of mean WTP estimates from the main survey using the different logit models 67

List of figures

Figure 1: Map of proposed areas for land-based wind power installations 2
Figure 2: Installed wind power capacity in Norway from 2000 to 2022 4
Figure 3: Increase in renewable power production in Norway 29
Figure 4: Example of choice cards from pilot and main survey 31
Figure 5: Importance ranking of increased renewable energy without land-based wind power .. 44
Figure 6: Importance ranking of further emissions due to land-based wind power 45
Figure 7: Importance ranking of increase in person-years and added-value from new land-based wind power 46
Figure 8: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for increase in renewable energy production using multinomial logit models.................................. 54
Figure 9: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for number of new wind turbines using multinomial logit models 55
Figure 10: 95% confidence intervals for mean WTPs for increase in renewable energy production using a multinomial logit model with interaction effects 56
Figure 11: 95% confidence intervals for mean WTPs for number of new wind turbines using a multinomial logit model with interaction effects.. 57
Figure 12: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for increase in renewable energy production using mixed logit models 58
Figure 13: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for number of new wind turbines using mixed logit models.. 59

Abbreviation list

ATE	Average treatment effect
ATT	Average treatment effect on the treated
BT	Benefit transfer
CI	Confidence interval
CS	Compensating surplus
CV	Contingent valuation
DCE	Discrete choice experiment
ES	Equivalent surplus
PSM	Propensity score matching
RP	Revealed preference
RUM	Random utility model
SP	Stated preference
TE	Transfer error
WTA	Willingness to accept
WTP	Willingness to pay

1. Introduction

Estimating preferences for environmental goods are often time-consuming and costly. For this reason, many researchers look to benefit transfer to incorporate already-found values from similar studies into their own study (Rosenberger & Loomis, 2017). This requires the researchers to find suitable studies to extract these values from in terms of the context of which they were estimated, which includes both the study site and good in question (Plummer, 2009).

Additionally, it is important to assess how stable the estimates are. This includes not only how they change over time, but also how sensitive they are to changes and shocks. The preference estimates are often used by decision makers considering, for instance, implementation of new policies. Moreover, these preferences express the population’s tastes towards a good or service. Ensuring that the preferences that the decision makers consider are valid is therefore essential for their assessments and decisions to meet the population’s interests. Acknowledging the stability of these estimates are equally important as it shows how sensitive they are to shocks.

This thesis is a contribution to the discussion of how stable estimated preferences and willingness to pay values are. This assessment is done by comparing the pilot and main version of a survey mapping Norwegian households’ attitudes towards land-based wind power through a discrete choice experiment. Firstly, the pilot survey was tested in January of 2022. After adjusting the pilot, the main survey was sent out a few months later in April. In the period between the two surveys, the war outbreak in Ukraine took place. This led to an overall energy uncertainty, which is considered an exogenous shock. Preferences and mean willingness to pay-estimates of Norwegian households towards land-based wind power prior to the war outbreak will be estimated by using the pilot sample. Similarly, the preferences and mean willingness to pay-estimates from the main survey sample will be representative of Norwegian households’ attitudes after the war outbreak. These will then be compared to evaluate whether the preferences changed between January and April, which will give an indication of the sensitivity and stability of preferences when exogenous shocks occur.

2. Background

2.1. Wind power in Norway

In 2017, the Ministry of Petroleum and Energy assigned the Norwegian Water Resources and Energy Directorate (NVE) the mission to design and develop the new national framework for land-based wind power in Norway. The aim of the new framework was for it to be used for future concessions for land-based wind power, and to enable more careful consideration of affected aspects of the potential installations. Moreover, NVE was asked to map out the best areas for wind power installations based on the data and information gathered in the design process of the framework. To achieve a complex and thorough foundation for the framework, NVE cooperated with several scientists, departments and professionals within various relevant fields to obtain a rich foundation of insights (Jakobsen et al., 2019).

Two years later, NVE published a report where the new national framework for land-based wind power was proposed. This included chapters concerning a range of affected categories that receive consequences from installations. Among these chapters were wildlife such as birds and reindeer, landscapes and cultural purposes, as well as business development and clean drinking water. Additionally, NVE proposed 13 areas that are suitable for new wind power installations. These are shown by the green areas in Figure 1 (Jakobsen et al., 2019).

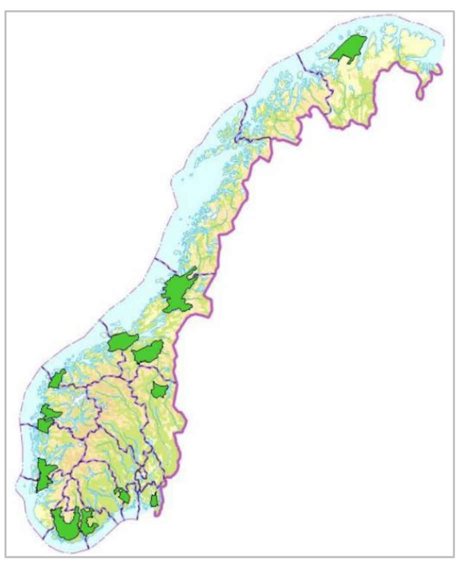


Figure 1: Map of proposed areas for land-based wind power installations

As the map shows, the areas are spread evenly throughout Norway. These locations are set with considerations to several aspects. Firstly, NVE seeks to reduce the potential for conflict by avoiding mountains and other locations that locals place value on for recreational or cultural purposes. Moreover, the map shows that there is a bigger density of proposed areas in southern Norway than in northern Norway. Although northern Norway is more suitable in terms of the conditions for power production, there is a lack of necessary transmission grids and infrastructure. Moreover, wind power installations can have significant consequences for reindeer husbandry. Consideration to reindeer husbandry is also seen by the proposed northern areas being relatively large, which leaves room for flexibility (Jakobsen et al., 2019).

Despite NVE's aim of reducing conflicts by including multiple considerations, their framework was met with discontent and initiated several conflicts both locally and nationally. Moreover, the basis of the framework was met with disapproval for lacking relevant considerations, such as the economic valuation of the considered areas. This led to the proposal eventually being discarded, which paused the current concession processes and caused a need for re-evaluation of the legal frameworks. Although this re-evaluation was necessary to improve the initial proposal, it led to a standstill for new concession applications up until the new framework was proposed in April of 2022 (Lindhjem et al., 2022).

Among several changes, the new framework includes a stronger dialogue between NVE and the affected municipalities, stricter requirements for early assessment of available grid capacity, and more attention to reindeer husbandry. Of particular relevance to this thesis is the strengthening of the decision basis used to estimate economic profitability of specific wind power installations. This includes the consideration of nonmarket values such as harm to recreational sites and biodiversity (Olje- og energidepartementet, 2020). The new and reviewed framework puts a stronger emphasis on economic evaluations, which is beneficial for the inclusion of environmental values that must be estimated through nonmarket valuation.

At the same time as NVE began accepting concessions again in April, the war outbreak in Ukraine was impacting the energy supply in Europe. The uncertain energy supply evolved into an energy crisis, pushing the electricity prices up to record-breaking levels. Eventually, the Norwegian government saw a need for establishing an energy commission (Lindhjem et al., 2022). The aim of this energy commission is to map energy needs and propose solutions for increased power production, with an underlying goal of maintaining a power production surplus in Norway and an adequate supply of renewable energy (Olje- og energidepartementet, 2022).

Over the last years, Norwegian wind power has experienced a significant growth. Statistics Norway reports that the wind power production in 2020 was 79% higher than in 2019, with 2019 also having a rapid growth from the previous year (Holstad, 2022b). The increasing production is explained through consistently large investments over the last years, which have contributed to the installation to new wind turbines. However, hydro power is still the dominating energy technology in Norway (Holstad, 2022a). In the upcoming years, NVE expects the power demand to increase past the power supply in the upcoming years, as a result of the expansion of electricity-intensive industries (Birkelund et al., 2021). Although this is the expected long-term development, NVE acknowledges that there are various factors that affect both the supply and demand for power. Among these factors are global economic development, as well as increasements in the power production capacity. Figure 2 shows the development of installed wind power capacity in Norway from 2000 up until 2022 (NVE, 2022).

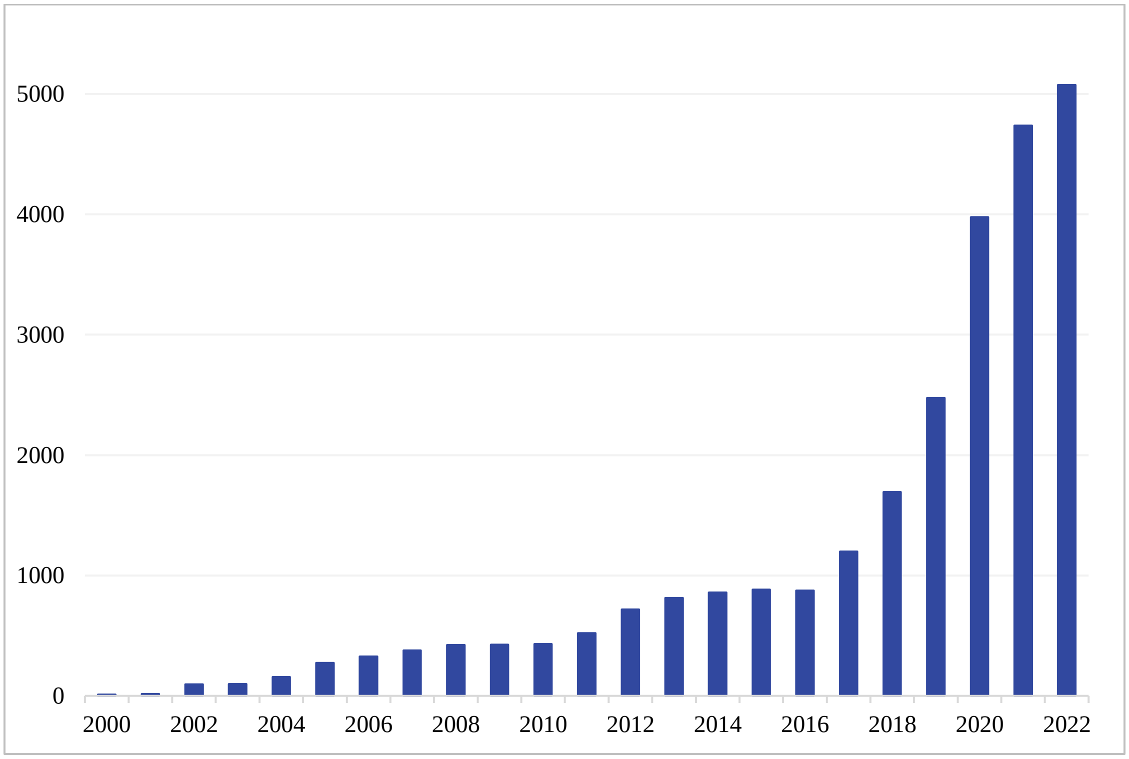


Figure 2: Installed wind power capacity in Norway from 2000 to 2022

As a response to the prediction of increasing power demand in the future, land-based wind power is a solution that is found to be an appropriate power technology for Norway. Firstly, there has been a cost reduction for wind power installations because of technology developments, and this development is predicted to continue in the upcoming years. This implies that potential land-based wind power expansion will be cheaper and that the new turbines will yield a higher power production. This development has led to land-based wind power being competitive with other power technologies, with the most important one being hydro power. As per 2019, hydro power was the power technology with the lowest production cost of 36 and 38 Norwegian øre/kWh for >10 MW and <10 MW respectively. Comparingly, land-based wind power had a production cost of 34 øre/kWh for the same year, making it competitive with the main power technology in Norway (Jakobsen et al., 2019).

Moreover, NVE explains that Norway has strong winds because of our long west coast, where winds that travel unhindered across the open sea can roll over Norway. Additionally, Norway's latitude often aligns with the polar front where there often is large atmospheric pressure, which causes powerful weather and strong winds. This places Norway in a better position to produce more wind power per turbine compared to other countries (Jakobsen et al., 2019).

Although land-based wind power has both technological and financial advantages, there are several disadvantages that can decrease its net benefit. Among these are the consequences that locals receive because of their proximity to the turbines. These consequences include decreased aesthetic experience from the landscape and noise generated from the turbines. Moreover, the installations can pose a significant threat to surrounding vegetation and biodiversity. The damage that is caused by land-based wind power can be estimated through how they affect the ecosystem services that the area in question provides, as is further explained in chapter 3.1.

2.2. Literature review

The literature review for this thesis includes previous studies measuring acceptability of land-based wind power and preferences towards increased renewable energy production. These provide an understanding and expectation of the estimates to be measured from the surveys used in this thesis. Moreover, the literature review contains studies of the temporal stability and sensitivity of estimated preferences and willingness to pay. This includes studies with test-retesting with a certain time interval to assess the temporal stability, as well as studies comparing preferences and willingness to pay before and after the occurrence of an exogenous shock to investigate sensitivity.

Dugstad et al. (2020) measured the willingness to accept land-based wind power expansion in Norway. Similar to this thesis, their methods include a discrete choice experiment and mixed logit models. In their study, Dugstad et al. (2020) compare the willingness to accept for Norwegians with proximity to wind farms with Norwegians who live further away. Additionally, the study investigates if Norwegians have positive willingness to pay for increased production of renewable energy in general. Finally, Dugstad et al. (2020) find that Norwegians are positive to increasing the production of renewable energy. Moreover, they find that the acceptance of land-based wind power is low (Dugstad et al., 2020).

Similarly, Dugstad et al. (2023) assessed how place attachment affects preferences towards wind power by using a discrete choice experiment and mixed logit models. Place attachment includes both attachment to a place because of the recreational activities it enables, as well as the emotions that people have towards a place because of, for example, personal identification. Dugstad et al. (2023) hypothesized that people with strong place attachment have a higher willingness to accept compensation for negative impacts to a landscape, and that place attachment made more people choose no wind farm installation in the discrete choice experiment. Resultingly, the findings suggest that people have negative preferences towards wind power, and that these were enhanced when place attachment was included in the mixed logit model specification. Moreover, their findings show support to the hypothesis of place attachment leading to more people choosing no wind farm installations. The status quo alternative of no wind farm installations was also chosen by a large share of the sample, indicating a general resistance towards wind power expansion (Dugstad et al., 2023).

In a study by Linnerud et al. (2022), the aim is to assess if the public’s acceptance of wind energy will change due to shifts in political focus. Among these shifts is the focus from onshore wind energy to offshore wind energy. The data is collected from a choice experiment with Norwegian individuals. Followingly, mixed logit models are specified to estimate preferences and willingness to pay to avoid outcomes that could occur due to the shift in political focus. Linnerud et al. (2022) find that the public is particularly concerned about having control over how Norwegian wind energy resources are managed, which corresponds with the benefit of knowing how the yielded value is distributed and that environmental concerns are acknowledged. Of particular relevance to this thesis is the finding that Norwegians prefer both offshore and nearshore locations for wind power installations over land-based wind power (Linnerud et al., 2022).

In a study by Meyerhoff et al. (2010), choice experiments from Germany were used to determine negative effects of land-based wind power installations. The study was conducted to assess acceptance for replacing older wind turbines with more modern turbines as part of increasing the share of renewable energy production in Germany. Their results showed that there would occur negative externalities from land-based wind power installations. Moreover, the findings from the choice experiment revealed that many German regions were resistant to replace older wind turbines, as well as to installing new wind turbines (Meyerhoff et al., 2010).

Skourtos et al. (2010) studied how human preferences for ecosystem services change over time, and if the existing methods and data were adequate in accurately assessing these. To do this, they review various studies that aim to investigate stability in preferences. Skourtos et al. (2010) conclude that the existing evidence indicate that estimates of willingness to pay and preferences are somewhat stable in the short- to medium-term, yet less stable in the long-term. Moreover, they conclude that there could be improvements regarding assessment methods that align better with more complex and dynamic socioecological systems. Skourtos et al. (2010) here propose that combining different methods and pooling data is key to make the methods more dynamic (Skourtos et al., 2010).

In a similar vein, Hynes et al. (2021) tested the stability of environmental preferences and willingness to pay before and after Covid-19. Their method is a discrete choice experiment across Canada, Norway and Scotland, conducted in late 2019 and then again in May 2020. The results of this analysis lead to a conclusion of stability in both preferences and willingness to pay, indicating that the environmental preferences are stable despite the exogenous shock of Covid-19 (Hynes et al., 2021).

Lew and Wallmo (2017) conducted a similar study of temporal stability of stated preferences for protection of endangered species. The testing is done by using data from two identical discrete choice experiment surveys that have been done on different samples drawn from the same population, but with a 17-month difference. Lew and Wallmo (2017) conclude that the preferences are stable, and that there is no statistical difference in willingness to pay. These findings indicate that preferences found through nonmarket valuation are stable over time, at least over shorter time spans (Lew & Wallmo, 2017).

In a study by Brouwer (2006), the focus is on temporal stability of contingent values. This is done by comparing willingness to pay for good bathing water quality before and after the occurrence of extreme weather conditions causing drought. The initial expectation was that the willingness to pay would increase as a response to the drought, but with no change in underlying preferences. Brouwer (2006) concludes that the preferences are robust and stable, and therefore acceptable for benefit transfer. This implies that the initial expectation was valid, and that the occurrence of exogenous shocks does not change underlying preferences (Brouwer, 2006).

Brouwer et al. (2017) tested the temporal stability of preferences, choices, and willingness to pay. This was done by using the methods of discrete choice experiment and open-ended willingness to pay elicitation, and by surveying the same sample three times throughout two years by presenting them with the same choice sets each time. This is done to maintain choice consistency between the tests. The study finds that having bigger differences between the alternatives and a low choice complexity is beneficial for the choice consistency, which is desirable for test-retesting. Finally, for the preferences gathered through willingness to pay elicitation methods, the study concludes that the preference parameters are stable over a two-year period. However, when using discrete choice experiment methods, the preferences differed significantly. This implies that the estimations gathered from discrete choice experiments are unsuitable for benefit transfer (Brouwer et al., 2017).

2.3. Research questions and hypotheses

The main objective of this thesis is to investigate whether Norwegian households' attitudes towards land-based wind power and renewable energy in general changed after the war outbreak in Ukraine, and the resulting energy crisis, took place. This expresses the stability and sensitivity of the willingness to pay-estimates measured prior to the war outbreak. Furthermore, this objective is broken down into five research questions.

RQ1: Do Norwegian households prefer more land-based wind power?
RQ2: Do Norwegian households prefer an increased renewable energy production, without land-based wind power?

Research question one involves estimations of willingness to pay (WTP) for land-based wind power expansion. This is expressed as the attribute involving number of new wind turbines. Similarly, research question two requires estimation of WTP for the attribute of increase in renewable energy production. Assessing whether these are positive or negative will indicate if Norwegian households prefer more or less of the respective attributes.

RQ3: What is the mean willingness to pay for increased renewable energy without land-based wind power and new wind turbines of Norwegian households, prior to the war outbreak?
RQ4: What is the mean willingness to pay for increased renewable energy without land-based wind power and new wind turbines of Norwegian households, after the war outbreak?

Research question three and four involve comparison of the WTP estimates for the respondents in the pilot survey and the main survey. The estimates from the pilot express the WTP prior to the war outbreak, while the estimates from the main survey express the WTP after the war outbreak. This leads to the fifth and final research question:

RQ5: Is there a significant difference in the willingness to pay for increased renewable energy without land-based wind power and new wind turbines prior to and after the war outbreak?

In addition to comparing the mean WTP estimates from the pilot and main survey, several approaches will be employed to test for significant difference between the two survey samples. These will collectively express if there is a difference in mean WTP of Norwegian households after the war outbreak and energy crisis occurred.

Table 1: Research questions and hypotheses

RQ1: Do Norwegian households prefer more land-based wind power?

H1.1: Norwegian households do not prefer more land-based wind power.

RQ2: Do Norwegian households prefer an increased renewable energy production, without land-based wind power?

H2.1: Norwegian households prefer an increased renewable energy production, without land-based wind power.

RQ3: What is the mean willingness to pay for increased renewable energy without land-based wind power and new wind turbines of Norwegian households, prior to the war outbreak?

RQ4: What is the mean willingness to pay for increased renewable energy without land-based wind power and new wind turbines of Norwegian households, after the war outbreak?

RQ5: Is there a significant difference in the willingness to pay for increased renewable energy without land-based wind power and new wind turbines prior to and after the war outbreak?

H5.1: There is no significant difference in the willingness to pay before and after the war outbreak.

3. Theory and concepts

3.1. Ecosystem services

Ecosystem services capture the benefits and utility that the human population receive from ecosystems. The term is not limited to the benefits that we can yield directly from ecosystems, such as fish caught from fishing or wild berries picked from the forest, but also the indirect benefits that humans receive. This includes the aesthetic experience of a conserved river or the preservation of a forest with the interest of your future children having the opportunity of experiencing it as well. Fisher et al. (2009) therefore propose defining ecosystem services as the aspects of ecosystems that are utilized, either actively or passively, to produce human well-being, as a means of highlighting that the utility must be produced from ecosystems, and that they do not have to be direct (Fisher et al., 2009).

Moving past how ecosystem services can be defined as a general term, the term can be categorized into four sub-services to provide a more in-depth and concise understanding of ecosystem services. These four categories were classified by the Millenium Ecosystem Assessment (MA) (2005), which is an international work that consists of more than one thousand scientists researching and mapping ecosystem services, as missioned by decision makers. Their main priority is human well-being, and the goal is to create a scientific basis that can be used for matters concerning use of ecosystems and their direct and indirect benefits to humans (Millennium Ecosystem Assessment, 2005). As part of this scientific basis, the MA classifies ecosystems services into four different categories based on what benefits they provide (Millennium Ecosystem Assessment, 2005).

Table 2: Classification of ecosystem services

Category	**Examples**
Provisioning services	- Food - Fresh water - Wood and fiber - Fuel
Regulating services	- Climate regulation - Flood regulation - Disease regulation - Water purification
Cultural services	- Aesthetic - Spiritual - Educational - Recreational
Supporting services	- Nutrient cycling - Soil formation - Primary production

Table 2 displays the four categories of ecosystem services: provisioning, regulating, cultural and supporting. Provisioning services capture benefits that are obtained directly from the ecosystems, such as food as a product of crops or livestock, and wood collected from trees. This class thereby includes all benefits that humans extract directly from the ecosystem. Within the class of regulating services are the benefits that humans receive as a result of the regulatory activities that happen in the ecosystem naturally to regulate itself. Among these services are carbon capture in trees, and bees pollinating flowers. Respectively, these benefit humans through cleaner air and aiding plants used for food production. Cultural services capture services that are nonmaterial and benefit humans more indirectly. These go beyond the environmental and ecological benefits, and instead include services such as aesthetic experience and educational purpose. Finally, the last class is supporting services. As opposed to the three other classes, this includes benefits that are not directly used by humans, but rather required in order to maintain and support the continuation of the other ecosystem services. They include, among others, nutrient cycling, which is one of several services that are essential to sustain an ecosystem (Millennium Ecosystem Assessment, 2005).

Moreover, the values that humans receive from ecosystem services can be divided into use values and non-use values. Firstly, use values are the values that are directly received from the ecosystems. This category of values can be split further into direct and indirect use values. The direct use values capture benefits that are received from extractive use of the ecosystem, such as chopping wood. However, direct use values can also be nonextractive, and include benefits derived from cultural services such as aesthetic experience. The direct use values are thereby the benefits humans receive from direct use of the ecosystems (Pascual et al., 2010). Secondly, the other category is indirect use values. These are typically received from regulating ecosystem services. In the case of wind power, a related example is that wind turbine installation on a mountain area could have consequences for the climate regulation it provides for the local habitants (Schirpke, 2022). This climate regulation is provided through the mountain’s vegetation, as they can remove pollutants from the air and, in a local scale, lower the temperature (Petrović et al., 2017).

Non-use values are the values that do not require direct or indirect use of the ecosystem service. Humans receive such values through the knowledge that the ecosystem is maintained, for instance by knowing that the biodiversity is conserved or that other humans are able to receive direct or indirect use values from the ecosystem. Non-use values can be split into the two categories of bequest values and existence values. Firstly, bequest values include the values that humans receive from knowing that future generations will also be able to get benefits from ecosystems. This could be the knowledge that a recreational site is maintained and preserved so that it can be visited by other humans in the future. On the other hand, existence values are the benefits received simply from knowing that certain ecosystems and their biodiversity are upkept and continue to exist. Existence values could be obtained by knowing that the nature of an area is maintained as is and not being used for land-based wind power installations (Pascual et al., 2010). The majority of values obtained from the surveys used in this thesis therefore fall under the category of non-use values because most of the respondents do not use the areas considered for land-based wind power expansion for direct and indirect purposes, such as recreational. This is because the areas for wind power installations are selected with the intention to avoid conflict, as discussed in chapter 2.1.

Continuing with the situation of land-based wind power installations, this would affect more than one category of ecosystem services. Firstly, it affects the biodiversity in the area that will be used for wind power production. Wind power installations demand area in terms of the turbines, especially if the plan is to establish a wind farm. Moreover, there must be made access roads to enable both the construction and maintenance of the turbines after they are installed. Additionally, installations require power transmission lines and substations, and if the plan is a large-scale expansion of wind turbines, there will be a need to develop large power transmission grids to transport the generated wind power. Because wind power installations are the most optimal on higher sites such as mountains because of steadier winds, which are typically located somewhat far away from where the electricity is demanded, these power transmission grids would need to be long. This means that wind power installations are demanding in area for both the actual turbines and the necessary transmission grids. Moreover, if the area that will be used for wind power is a mountain that is considered a recreational site, installations will harm its cultural services through damaging its aesthetic and recreational services. Additionally, the turbines can also be in the way of paths and hike trails in the mountain, which further decreases the cultural services that this mountain provides humans (Ledec et al., 2011).

As well as affecting cultural services, wind power installation could also affect the supporting services by damaging biodiversity. The sites that are considered appropriate for wind power are typically rural, higher areas. Moreover, placing wind turbines further away from humans and city centres is also in favour of the area's cultural services because many consider the turbines to reduce the aesthetic experience. However, wind turbines can damage species and plants that are located on the site. This risk is especially significant when the considered area is very rural, because this often means that the concentration of such wildlife and plants is higher.

An example of harm to local species happened in Norway in 2002. Statkraft planned wind power installations on the Norwegian island group Smøla, despite the International Council for Bird Preservation in 1989 designating Smøla an "Important Bird Area" (IBA). Smøla got this designation because they had one of the world's highest concentration of breeding white-tailed eagles. The Norwegian government received several warnings from various conservation organisations saying that installations would threaten this eagle species, but the installations were approved and begun constructed (Ledec et al., 2011).

These installations did in fact pose a significant threat to the white-tailed eagles. A study by Dahl et al. (2012) discovered that the breeding success were significantly lower after the wind turbines were installed. One of the causes was that before the installations, the density of these eagles was the highest at the windfarm area. Moreover, the white-tailed eagle is a species that is more sensitive to adult mortality because they take longer to mature and lay fewer eggs than other birds. The installations led to the eagles having to move to other areas, where the conditions were not as optimal for the birds' chances of both survival and breeding. Moreover, the mortality of the white-tailed eagles was significantly increased because of turbine collision. This study thereby emphasize that wind power installations can pose high risks to the biodiversity, and that the sites should be chosen with caution (Dahl et al., 2012).

3.2. Random utility maximization model

The random utility maximization model (RUM) is a model based on the random utility framework developed by McFadden (1974), and it can be employed to analyse discrete choices. The RUM model is then used to model the choices that respondents make when faced with choice sets with finite and exclusive alternatives. This method is often used by researchers who have performed a discrete choice experiment as a way to model how the participants of the experiment responded to the choice sets they were presented to (Mariel et al., 2021).

When presented with a choice set, an individual *k* is faced with a choice set of *C* alternatives to choose from. Moreover, each individual *k* receives a certain amount of utility by picking alternative *i*, which is denoted by V_{ik}. In order to satisfy the assumption of utility maximizing behavior, the individual will choose the alternative that yields them the highest utility. Therefore, they will pick alternative *i* over alternative *j* in a choice set only if $V_{ik} > V_{jk}$, $\forall j \neq i$ (Train, 2009). The utilities V_{ik} and V_{jk} are the true utilities associated with each alternative for the individual. These utilities cannot be perfectly observed by the researcher and are therefore only known by the individuals themselves. The researcher is only able to observe utility through the attributes of the alternatives and the individuals, such as their sociodemographic characteristics. These observable components of the utility are captured in the term deterministic utility, which is denoted as v_{ik} for alternative *i* and individual *k*. Since the researcher cannot perfectly observe the true utility of the individuals, meaning that $v_{ik} \neq V_{ik}$, there will be some error to the deterministic utility. The error term ε_{ik} thereby include the unobservable components of the individuals' utility. This implies that the utility of individual *k* can be specified as

$$V_{ik} = v_{ik}(Z_i, y_k - p_i) + \varepsilon_{ik}, \tag{3.1}$$

where Z_i includes the attributes for alternative *i*, y_k is the individual's income, and p_i is the cost associated with alternative *i*. This decomposition of utility is then used to model how the individual will choose between the presented alternatives. Because the RUM model assumes that individuals inhabit utility maximizing behaviour, they are assumed to choose the alternative that will yield them the highest utility (Train, 2009). Following this rationale, individual *k* will choose alternative *i* over alternative *j* if and only if

$$v_{ik}(Z_i, y_k - p_i) + \varepsilon_{ik} > v_{jk}\left(Z_j, y_k - p_j\right) + \varepsilon_{jk}; \forall j \in C. \tag{3.2}$$

Equation (3.2) specifies how the individual will choose between a discrete set of alternatives, but this modelling can be expanded to account for the stochastic component in the error term. Due to the stochastic component being unobservable, the researcher treats it as a random variable. This implies that the alternatives that the individuals are faced with will be associated with random utilities. The researcher can then model the probability that individual *k* chooses alternative *i*, which will be equal to the probability that alternative *i* is the alternative associated with the highest utility out of all the alternatives in the choice set (Melo et al., 2023). This probability can thereby be expressed as

$$P_{ik} = P[v_{ik}(Z_i, y_k - p_i) + \varepsilon_{ik} > v_{jk}(Z_j, y_k - p_j) + \varepsilon_{jk}]; \forall j \in C. \tag{3.3}$$

This probability modelling can then be used by the researcher to model the choice behaviour of individuals when presented with a choice set. Moreover, the RUM model is the basis for logit models (Train, 2009). For these models, the researcher needs to assume a distribution of the stochastic component in the error term. The most common assumption is that the error term follows a type 1 error extreme value distribution known as the Gumbel distribution (Mariel et al., 2021). The logit models are explained further in chapter 4.2.1.

3.3. Hicksian welfare demand

When a researcher is interested in estimating a household's demand for an environmental good, one possible approach is to design a discrete choice experiment where the household is faced with several choice scenarios containing a set of alternatives with attributes of varying levels. This is a stated preference method within nonmarket valuation, as further explained in chapter 4.1. The Hicksian welfare demand functions are part of the economic theory which the nonmarket valuation methods are based upon, and they are therefore relevant to describe prior to the explanation of these methods.

In microeconomic theory, utility maximization is not possible without expenditure minimization, which is known as the duality concept. This duality implies that an individual seeking to maximize their utility must also minimize their expenditure. Throughout this chapter we will consider the example of Norwegian households' demand to maintain a recreational site that is considered for land-based wind power installations. This is expressed as the demand to maintain the initial quality of the recreational site. To start, the utility maximization problem and expenditure minimization problem can be expressed respectively as

$$\max_X U(X, Q, W, Z) \; s.t. \; P * X \leq Y \tag{3.4}$$

$$\min_X PX \; s.t. \; U(X, Q, W, Z) \geq U^0, \tag{3.5}$$

where X is a vector containing the private market goods, Q is a set of nonmarket goods, W is the current quality of the recreational site, and Z captures the Norwegian households' preferences. Moreover, the vector of market prices P and the vector of private market goods X are specified not to exceed the budget constraint Y, which is the households' income. In the expenditure minimization problem, the constraint is the initial level of utility U^0. This problem can be solved through the Hicksian demand function, which is a cost-minimizing demand function (Flores, 2017). It expresses how demand for a good, such as maintaining the quality of the recreational site, will be affected by a set of prices, given that there will be an income adjustment so that the utility will remain the same. For this reason, the Hicksian demand function is sometimes referred to as a compensating demand function, as it estimates how much the income would need to be adjusted with for the household to maintain the initial utility level (Johansson, 1987). The Hicksian demand function can then be expressed as

$$X^* = H(P, W, Q, Z, U^0). \tag{3.6}$$

The Hicksian demand is a function of prices P, the current state of the recreational site as measured by W, nonmarket goods Q, preferences Z, and the utility U^0. Moreover, the expenditure function can then be derived by inserting the Hicksian demand into the minimization problem presented in Equation (3.5) as a substitute for X

$$PX = PH(P, W, Q, Z, U^0) = E(P, W, Q, Z, U^0). \tag{3.7}$$

To illustrate the framework of the Hicksian welfare demand function, consider Norwegian households and the case of land-based wind power expansion. If this expansion were to take place, it would decrease the quality of the recreational site that would be designated for the wind turbines and transmission grids. This would be expressed as W^0, which is at a decreased level compared to the initial W. This change can be specified as

$$E(P, W, Q, Z, U^0) = E(P, W^0, Q, Z, U^0) + Y^1, \tag{3.8}$$

where the variable Y^1 represents the new income level that the households would need as compensation in order to reach the initial utility level U^0 if the turbine installations, and damage to the recreational site, were to happen. This same framework can also be used to measure environmental improvements, which would instead increase the quality from W to W^1. As opposed to with an environmental damage, this change would require the households to pay for the change to take place. The new income level Y^1 would then be at a lower level than the initial income of Y, and the difference would express the amount of income that Norwegian households would have to give up in order to achieve the environmental improvement (Dugstad, 2018). These concepts are known as willingness to accept (WTA) and willingness to pay (WTP), which are further described in chapter 4.1.2.

By using a Hicksian demand function to solve the duality problem and derive the expenditure function, a researcher can investigate the effect of a policy intervention that leads to more than simply one change in prices and quantity. This enables a more dynamic and complex analysis of how policies affect individuals and, resultingly, their utility and welfare. Moreover, the expenditure function is fundamental within welfare economics because of the objective of maintaining the initial utility level.

3.3.1. Compensating surplus and equivalent surplus

As a response to potential changes in prices, the concept of compensating and equivalent variation was developed. Compensating variation is a measure that would adjust the individual's income to return them to the original utility that they had before the price change occurred. Equivalent variation would instead be the adjustment in income, given the initial price levels, needed to reach the new utility level that the price change would lead to, given the initial income level. Similar to these concepts are compensating and equivalent surplus, which instead are focused on changes in quantities (Flores, 2017).

Compensating surplus (CS) and equivalent surplus (ES) are the adjustments in income that are needed to regulate an individual's utility because of changes in the quantity or quality of a good. Both measures are derived from the expenditure function through a change happening with the quality, quantity, or combination of one or more nonmarket goods. Consider the same example as before, with the change in nonmarket goods being that wind turbines are installed at a recreational site in Norway and therefore damaging its quality to Norwegian households. Suppose an initial expenditure function equal to the one presented in Equation (3.7). In this framework, the decreased quality would be expressed as W^0, where $W^0 > {}^1$. Moreover, Y is the minimum income that the household needs in order to keep the initial utility level, now noted as U. The CS and ES are then specified by

$$CS = E(P, W, Q, Z, U) - E(P, W^0, Q, Z, U^0) \tag{3.9}$$

$$ES = E(P, W, Q, Z, U^0) - E(P, W^0, Q, Z, U^0) \tag{3.10}$$

In Equation (3.9), the CS is the difference between the two expenditure functions because of the change in W, when utility is kept at the initial level of U. Compensating surplus is therefore the amount that should be paid to the household in order for them to get back to U. This amount expresses the households' minimum willingness to accept (WTA) the damage. Equation (3.10) instead measures the difference given that the utility level is constant at U^0, where $U^0 < U$. This is the utility level that the household will have, given the environmental damage expressed in W^0. The equivalent surplus is then derived by taking the expenditure function with the initial quality of W and subtracting the expenditure given the damaged quality W^0. Moreover, the difference between these expenditure functions expresses the households' maximum willingness to pay (WTP) to prevent the quality decrease W^0 of happening. The concepts of WTA and WTP are both further explained in chapter 4.1.2.

4. Method

4.1. Nonmarket valuation

Nonmarket valuation is the practice of valuing goods and services that are not traded in a market. The use of this method allows researchers to put a monetary value on environmental goods and services, such as the interest of not using an area for wind power installations in favour of preserving its biodiversity. Because of the inability to value these goods and services by how they are traded in the market, alternative methods must be used to estimate their demands. There are several approaches that can be employed, where they all fall under one of two methods: revealed or stated preferences (Segerson, 2017).

Revealed preference method is a method where the researcher observes actual behaviours of individuals. This can be done through, for example, the travel cost method. This method allows researchers to estimate the economic value of a recreational site, for example a potential area for wind power installations that is commonly used for hiking, by analysing the total travel costs of visiting this site. Total travel costs include the money needed for transportation, the time it takes to reach the site, and other encountered fees. Researchers can use total travel costs as an expression of the willingness to pay for the recreational site, and thereby indirectly valuate it as an environmental good (Graves, 2013).

The stated preference method differs from revealed preferences, as the valuation happens through individuals' stated responses, typically through surveys. Surveys used in these methods are intentionally designed with hypothetical questions and choice sets. In the choice sets, the individual is faced with a trade-off situation, and, assuming rational behavior, they will choose the option that yields them the highest utility. This principle enables researcher to estimate values of nonmarket goods and services through gathering information about individuals' choices when faced with finite and exclusive options (Johnston et al., 2017). The following chapter goes into further detail about the use of stated preference.

4.1.2. Stated preference method

Stated preference (SP) method is a direct approach to estimate economic values by using survey responses. The practice of SP is currently the only method to estimate values for changes in environmental goods, such as land-based wind power, in situations where the researcher does not have information about the individuals' revealed preferences. Because of this ability, SP is valuable in welfare analysis to estimate non-use values (Johnston et al., 2017). When employing this method, researchers take survey responses and use these to estimate values for the good or service in question as expressed by the respondents' willingness to give up something else for it. This is known as the willingness to pay (WTP) (Holmes et al., 2017).

WTP expresses the maximum amount of good Z that an individual is willing to give up in order to achieve the change X. This implies that the value of change X can be valued through the good Z, because the achievement of X is equal to the maximum amount of Z that the individual is willing to give up. Following this definition, the researcher knows that the more the individual is willing to give up of good Z, the higher they value change X. An example relevant to this thesis is to investigate the amount that an individual would be willing to pay to prevent a recreational site from becoming an area used for wind power. Moreover, there is no requirement of good Z being monetary. Good *Z* can be any good that the individual is willing to give up in favour of the change *X* to happen (Segerson, 2017).

In a similar vein as WTP, is the concept of WTA. Instead of expressing the amount of good *Z* that the individual is willing to give up to achieve change *X*, the WTA estimates the amount of good *Z* that the individual requires in order to accept change *X*. To continue with the example of a recreational site, the WTA could describe the amount of money that individuals would need as compensation if wind power expansion were to happen at a local recreational site. The two concepts WTP and WTA are therefore simply two ways of measuring a welfare change by the change in good *Z*, typically income, that makes individuals indifferent to change *X* (Mariel et al., 2021).

Although WTP and WTA both can be used to measure the same change, there should be some consideration by researchers before choosing between the two approaches. Because they measure the same change, the two estimates should theoretically be parallel. However, several studies have discovered that there is a disparity between the two measures, especially for nonmarket goods such as environmental goods (Tunçel & Hammitt, 2014). The disparity happens because WTA exceeds WTP, which could be explained by individuals typically valuing gains over losses. Moreover, if an individual pays for an environmental improvement, this would be a public good and an improvement that the community would benefit from unconditional of whether they contributed to paying for it. Contrastingly, if there was an environmental harm that the individuals were to be compensated for, this compensation would be transferred to the respective individuals and be spent on private goods instead. Following this rationale, the estimated WTA will exceed WTP. Moreover, the WTP is bound by the individual's income level, as they state a certain amount of their money (or good *Z*) that they are willing to give up. This, as well as the risk of WTA exceeding WTP because of gains being preferred over loss, is part of the reason why WTP is currently the recommended practice for environmental valuation (Mariel et al., 2021).

In the field of environmental valuation, discrete choice experiment (DCE) has become a common approach within stated preference methods (Mariel et al., 2021). DCEs are used to estimate economic values for the attributes or characteristics of an environmental good, such as its price. The DCEs are presented in surveys, and the respondents are asked to choose among a discrete number of alternatives, where each alternative includes attributes of varying levels. The levels of the attributes differ between the choice sets within the experiment, but they are typically within a specific range of realistic values. Resultingly, the responses from the DCEs can be used to estimate preferences towards the respective environmental good through its attributes (Holmes et al., 2017).

Contingent valuation (CV) is a stated preference method that is similar to DCE as it is also based on survey responses. The respondents are asked about their maximum willingness to pay for an improvement of an environmental good by being presented different prices that the improvement, hypothetically, would cost. Alternatively, the respondents could be asked what their minimum willingness to accept would be for an environmental damage (Boyle, 2017).

A common version of the CV method is to use dichotomous choice, meaning that respondents can either accept the improvement for the given price, or decline and thereby accept the business-as-usual state of the good. For instance, the survey question could ask the respondent if they were willing to pay a price of x_1 to increase renewable energy production. If the respondent accepted this payment, the following survey question would be similar but with price x_2 instead, where $x_2 > x_1$. If the respondent had declined the initial price of x_1, the following question would then propose price x_0 instead, where $x_0 < x_1$. The objective of this method is to estimate the mean WTP for the improvement, or, alternatively, the WTA for the damage (Boyle, 2017).

Although DCE and CV are somewhat similar approaches, using DCE can be more beneficial than other stated preference methods as they provide the researcher with richer information. This can be illustrated by comparing it to CV, where the respondent is asked to state their WTP for a product with a bundle of attributes that is already determined. Comparingly, discrete choice experiments can thereby provide a more dynamic insight of the respondent's preferences and how the attributes are valued against each other (Liebe et al., 2016).

Moreover, Boyle (2017) argues that DCE and CV methods are the most common techniques within nonmarket valuation. CV methods were the first of the two methods, while the DCE approach is being used increasingly. Although they are similar, there are some important distinctions between the two approaches. As explained, CV methods are typically dichotomous, where the respondent can choose between accepting the change for a given price or instead accepting the business-as-usual scenario. Additionally, the CV technique describes the change in a written-out scenario to the respondents, while the DCE technique instead uses the varying levels of attributes to describe the change. This means that CV studies, because of the dichotomy, include one valuation question, while DCEs can include several valuation questions. In this sense, one could argue that DCE is a more dynamic approach as it allows for estimation of marginal values (Holmes et al., 2017).

Although the possibility of estimating marginal values for various attributes can make DCE superior to CV, this is not the case for all studies. For instance, some goods are more challenging to define in terms of attributes, which makes the less complex CV technique more appealing. Moreover, Johnston et al. (2017) argue that there are three questions that the researchers should ask themselves in order to get a better understanding of what technique is most advantageous for their study. The first question is regarding the change that is being studied and whether it will affect the good in question in its entirety or only certain characteristics of it. If the whole good will be affected, CV will be a more appropriate approach. Alternatively, if only some of the good's characteristics will be affected, Johnston et al. (2017) argue that DCE will be preferable. Secondly, the researcher should consider whether the respondents will value the change as a whole or in terms of its individual attributes. The choice between CV and DCE for this question follows the same rationale as for the first question, where a more holistic view of the good would imply that CV is more suitable and vice versa. Lastly, the third question asks in what way the format of the presented information affects the respondent's understanding of the good. If the good to be studied is complex, breaking it down into several attributes can make it even more complex for respondents. This can lead to simplifying manners from the respondents because the good and characteristics are too overwhelming, which results in responses that do not necessarily align with utility maximization. Although the possibility of this issue can be more probable when using a DCE approach, similar complexity-caused problems can occur when using CV as well (Johnston et al., 2017).

Despite there being some differences between the two approaches, DCE and CV are considered to be so similar that they should estimate equal values. Earlier studies have tried to compare the two methods to test their validity, but because of their differences in design, comparison has been a challenge. For example, CV methods include information presentation through text while DCE methods use tabular presentation. There is no clear-cut answer on which of the two methods is most appropriate, which highlights the importance of having guidelines to follow, such as the ones proposed by Johnston et al. (2017).

4.1.2.1. Validity and reliability

As the source of data for this thesis is survey responses, it is relevant to consider how a survey should be structured to obtain valid and reliable responses. Both the pilot and the main survey use the DCE method. Although DCEs can be advantageous to use when collecting information, the researcher should take into account that there are potential pitfalls that can affect the reliability of the responses. To diminish this risk, one measure is to incorporate attitudinal questions into the survey. These serve as control mechanisms to the choice experiment and can thereby be used to validate the choices made by the respondent (Liebe et al., 2016).

Moreover, the responses can be affected by a phenomenon called question context effects. Mariel et al. (2021) describe two sub-categories of these, namely directional and correlational context effects. The former can occur if responses to the target question is dependent on whether relevant attitudinal, or contextual, questions are asked prior to or after the target question. Secondly, correlational context effects can arise if the responses from the choice experiment is affected by the order of the questions in the survey. With regards to the possible question context effects that can decrease both validity and reliability of the collected responses, the researcher should be considerate when designing the survey (Mariel et al., 2021).

In addition to the order and structure of the survey, there are other aspects that the researcher should consider with regards to validity and reliability. If the survey has many questions and/or choice sets, it will lengthen the completion time. While there might not be one standard length that is optimal for all types of surveys, Mariel et al. (2021) recommend the researcher to keep the completion time on the shorter side. This could potentially increase the participation rate. Moreover, it is probable that longer surveys lead to the respondent speeding up the completion nearing the end, thereby making the answers from the last questions less reliable than the earlier answers. This probability would likely be decreased if the completion time was shorter. Additionally, having an introduction in the survey can be beneficial for the respondents to make more educated choices in their responses, and simultaneously less likely to end the survey before completion. However, although introductory questions help equip the respondent in making more informed choices, it can also negatively affect the validity of the responses by altering the view points of the respondents (Mariel et al., 2021).

These potential pitfalls highlight a need to assess both the validity and reliability of the values estimated through nonmarket valuation. Bishop and Boyle (2017) illustrate how these two concepts of accuracy differ by using an example of shooting arrows at a target, where validity measures how close the arrow was to bullseye, while reliability measures if the arrows were shot and grouped closely together. Validity therefore captures the bias, while reliability captures the variance (Bishop & Boyle, 2017).

In a scenario with perfect validity, the WTP estimates from using SP methods would be equal to the true WTP values in the population (Mariel et al., 2021). Because the true WTP values are unobservable for the researcher, the validity must instead be assessed through more indirect methods. As proposed by Bishop and Boyle (2017), one can assess the validity by splitting it into three different aspects: content validity, construct validity, and criterion validity. This framework is named "the three C's of validity" (Bishop & Boyle, 2017).

The first "C" in the framework of Bishop and Boyle stands for content validity. This aspect assesses whether the valuation method was adequately conducted to capture the values. This could be regarding the accuracy of the survey and how it was designed. Secondly, construct validity focuses on the data and results, and how these relate to other variables. The researcher often has expectations of how the true value is related to other variables before conducting the study, and these can be motivated by, for example, economic theory and empirical evidence from similar studies. For example, if previous studies found that people have a negative WTP for wind power installations, the researcher could have an expectation that an attribute describing increased installations of wind turbines to have a negative estimate. The third and last "C" stands for criterion validity, where the validity is assessed by comparing the WTP estimates with earlier WTP estimates for the same environmental good. The earlier study of which the WTP estimates are compared to must then have been obtained with a method considered to be of high validity, so that it works as a benchmark for the new WTP estimates (Bishop & Boyle, 2017).

Based on "the three C's of validity", it is recommended that the researcher keeps all three concepts in mind all the way through formulating hypotheses based on initial expectations, designing and structuring the survey, to analysing the obtained results and data. The objective with the framework is to prove to the end users that the obtained values are valid, and considering that the true values are unknown, careful consideration of the validity aspects can potentially replace comparison of true and estimated values as a validity assessment (Mariel et al., 2021).

In addition to testing the validity, the choice experiment's reliability should also be assessed. As illustrated by the arrow example, the reliability is concerned with variance and whether the arrows are grouped closely together. In many studies, the researcher only has one arrow to shoot, meaning that they can only do one single survey, which adds little to the reliability assessment. A common reliability test is therefore to conduct a test-retest study, where the same survey is repeated several times either with same test subjects or a different sample drawn from the same population. These types of test-retests are called, respectively, within-subject test-retests and between-subject test-retests, and they allow the researcher to shoot several arrows at the target despite having only one survey. When using test-retest methods, the researcher should acknowledge that some characteristics within the sample can change between the repeated surveys. If several years pass between the test and retest, some subjects may have increased levels of education and thereby increased their income, which could alter their responses compared to in the initial test. On the other hand, if the researcher opts for a shorter interval between the tests to reduce such potential changes, they might encounter the issue of subjects remembering their responses from the previous test, which would weaken the observations' independence. Finding the optimal interval between the test and retests can therefore be challenging (Mariel et al., 2021).

Moreover, a common criticism is the risk of hypothetical bias among respondents. Hypothetical bias occurs when the value or attitude that a respondent states in a survey is not equal to what it is in reality. In the case of WTP to avoid wind power installations, hypothetical bias could occur if respondents report a WTP that exceeds the actual willingness. This leads to the estimated values being false and causing a hypothetical bias, and this misleading valuation gives consequences to decision makers and other actors that use and depend on these values (Loomis, 2011).

4.1.2.2. Discrete choice experiment survey design

The survey used in this thesis was developed by scientists from Statistics Norway, Menon Economics, the Norwegian University of Life Sciences, and the University of Stavanger. Their aim was to estimate Norwegian households' preferences and willingness to pay for land-based wind power expansion by using the stated preference method of discrete choice experiment. The survey was then conducted by the survey agency Kantar as an internet panel survey.

To test the survey design, the survey was first piloted in late January of 2022. The pilot had a total of 460 responses and was lengthier than the final survey because it included more questions. Piloting revealed that the cost attribute in the choice experiment, which is described further in this chapter, was potentially set too low. This was discovered when many respondents tended to systematically choose alternative 1, which consistently involved increased renewable energy production without land-based wind power. Resultingly, the range was widened with a higher maximum value and lower minimum value, and with a different interval between the levels. After some adjustments, the main survey was sent out in April, three months after it was piloted. Survey invitations were sent out to a total of 11 103 households. From this sample, 4 057 respondents opened the survey and 3 412 of them completed it. This implies a response rate of approximately 31%. Moreover, the median completion time was measured to be 19 minutes (Lindhjem et al., 2022).

To ease into the topic of land-based wind power, the survey starts off with some introductory questions. Firstly, the respondents are asked what political issues they believe should be prioritized, with the option to pick two issues among topics ranging from climate-related measures to social concerns. Following this opening question, the respondents are asked how they believe the increased demand for electricity should be met. After these two introductory questions, the respondents are presented with several statements in which they are asked to report the extent to which they agree, as well as rank the importance of certain effects of land-based wind power. The answers to these statements and importance rankings capture the respondents' attitudes towards climate change, as well as how they feel about the relationship between economic activity and damage to ecosystems.

The respondents were then given information about the objective of the survey. Additionally, they were informed that the survey was developed by scientists who would share the results with decision makers, so that the respondents would potentially contribute to assessments regarding land-based wind power expansion and other related interventions. Providing this information was meant to enhance the incentive of completing the survey and give honest responses. When the respondents are informed about how their response will be used and for what purpose, they are given information about how their contribution is specifically valuable. This will give the respondents a perception of their response having actual consequences through influencing decision makers. Resultingly, this can enhance the validity of the SP estimates in two ways. Firstly, it can influence the respondents to put more effort and consideration into their responses because they are aware that they will be used for an actual purpose. Secondly, the respondents will realize that the considered policy might be implemented and that they therefore should respond carefully. This effect is especially relevant for the cost attribute, as the respondents themselves are also likely to be paying for the policy if implemented (Welling et al., 2022). This effect is called consequentiality, and this is part of the recommendations of Johnston et al. (2017) to enhance incentive compatibility and truthful responses.

After the introductory part of the survey follows the choice experiment. The respondents are firstly informed that they are going to be presented several choice sets where they are asked to choose between two alternatives. In all the choice sets, alternative 1 will constantly include an increased production of renewable energy towards 2040, but without land-based wind power expansion. Alternative 2 will also consistently include a higher renewable energy production than alternative 1, but with the inclusion land-based wind power expansion. Increase in renewable energy production is one of the three main attributes in the survey, and all three will be presented with varying levels between the different choice sets. However, all three attributes have a set range and interval that they follow, as described in Table 3.

Table 3: Attributes and the respective levels and intervals

Attribute	**Range**	**Interval**
Increase in renewable energy without land-based wind (in TWh)	10 – 40	10
The number of new wind turbines	0 – 2 100	700
Increase in annual grid fee the next five years for the household, pilot	1 200 – 5 400	600

Increase in annual grid fee the next five years for the household, main	1 000 – 8 000	1 000

The first of the three attributes is increase in renewable energy without land-based wind (in TWh). When introduced to the respondents, the survey explains the domestic power production in 2020 and how this was distributed across the different power technologies, as a means to inform the respondents about the current status of Norwegian power production. As seen in Table 3, this attribute varies within the range of 10 to 40 TWh. This range is motivated by the power market analysis for 2021 up to 2040, which was conducted and published by the Norwegian Water Resources and Energy Directorate (NVE) (Birkelund et al., 2021). The analysis is a prognosis of the power market in terms of production, consumption, and prices, for both Norway, Scandinavia, and Europe. In this analysis, NVE expects Norwegian power production to increase with 28 TWh leading up to 2040, where 26 TWh of these are from renewable energy sources. The prediction of a 26 TWh increase in renewable energy production is what motivated the scientists behind the survey to set the range from 10 TWh to 40 TWh. This predicted energy production development and the distribution between different technologies are illustrated in Figure 3 (Birkelund et al., 2021).

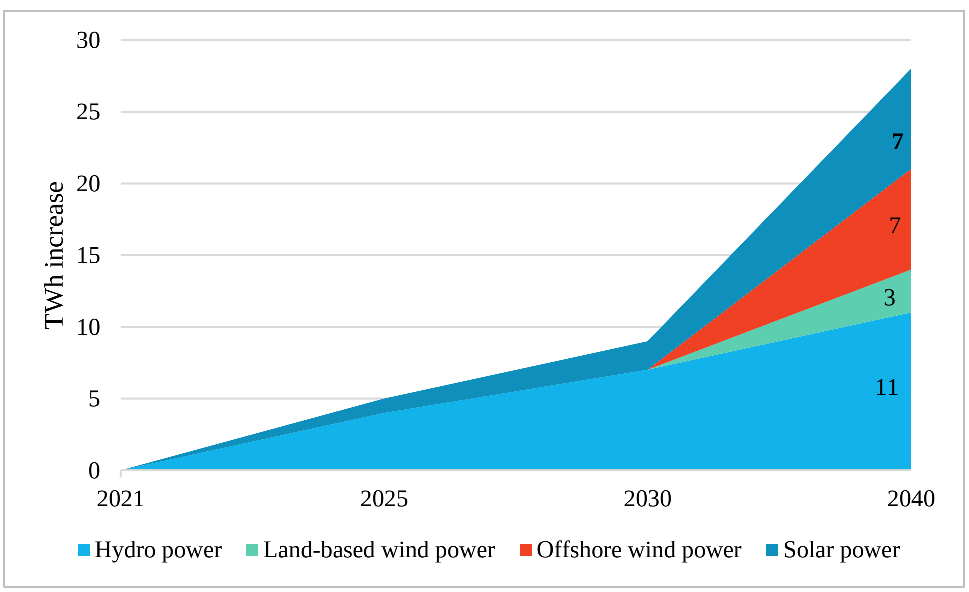


Figure 3: Increase in renewable power production in Norway

The second attribute of the survey is the number of new wind turbines. In its presentation, the respondents were informed of how many wind turbines were currently installed as of 2022 and how much power they provided, both measured in TWh and percentage of the total power production in Norway. This was complimented by a map that showed the respondents where these installations are, and where there were ongoing turbine installations. After having described the status quo of land-based wind power, the respondents were explained that expansion of land-based wind power can increase the domestic renewable energy production with 10 to 30 TWh. If the production were to increase with as much as 30 TWh, this would equal approximately 2 100 new wind turbines given the current wind power technology. Similarly, an increase of 10 TWh or 20 TWh would imply 7 000 or 14 000 new wind turbines. This prediction of 10 to 30 TWh is the motivation behind the levels of wind turbines that the attribute varies between (Lindhjem et al., 2022). Moreover, the respondents are presented the current number of wind turbines installed in Norway, a figure illustrating both positive and negative effects of wind turbines, as well as a picture example of how wind turbines affect their surrounding nature. The survey also shows the 13 areas that NVE has selected as appropriate for potential expansion, and then asks the respondents about their proximity to any wind farms.

The wind turbine attribute is therefore particularly well explained, and because of its complexity, it has three sub-attributes that will be included in the choice sets. One of these is the area that is needed for new wind turbines, as the installations would demand large areas to be given up. The survey describes the area demand in terms of both construction roads, power lines and the actual area needed. Given the maximum of 2 100 wind turbines, the area needed goes up to 882 km^2. Secondly, there is a sub-attribute that describes the avoidance of CO_2 emissions that will happen as increased wind power will replace non-renewable power sources over time. As the survey states, 10 TWh of Norwegian wind power will lead to a reduction of 5 million tonnes CO_2 emissions from the European power sector yearly. This means that one Norwegian wind turbine alone would generate yearly emission reductions of approximately 7 150 tonnes. The range of this sub-attribute is also connected with the main attribute of wind turbines, where its maximum value of 15 000 tonnes is the estimated emission reductions from 2 100 new turbines. Lastly, the third sub-attribute is the additional person-years and added-value that would be yielded from the land-based wind power expansion. One wind turbine is expected to provide Norway with eight person-years and nine million NOK in added-value. When estimated for the maximum of 2 100 new turbines, the maximum value of this sub-attribute is 16 800 person-years.

The last of the three main attributes is the cost attribute, which is expressed as an increase in annual grid fee for the households. The respondents are informed that alongside an increased renewable power production is the need to upgrade the power grid, which could be financed through an increased annual grid fee. Moreover, the survey explains that it is more challenging to estimate what this potential cost would be, which is why the range for this attribute is larger and including more levels than the other two. Finally, Figure 4 shows two example choice cards, one from the pilot survey and one from the main survey (Lindhjem et al., 2022).

Attribute description	Pilot	Main

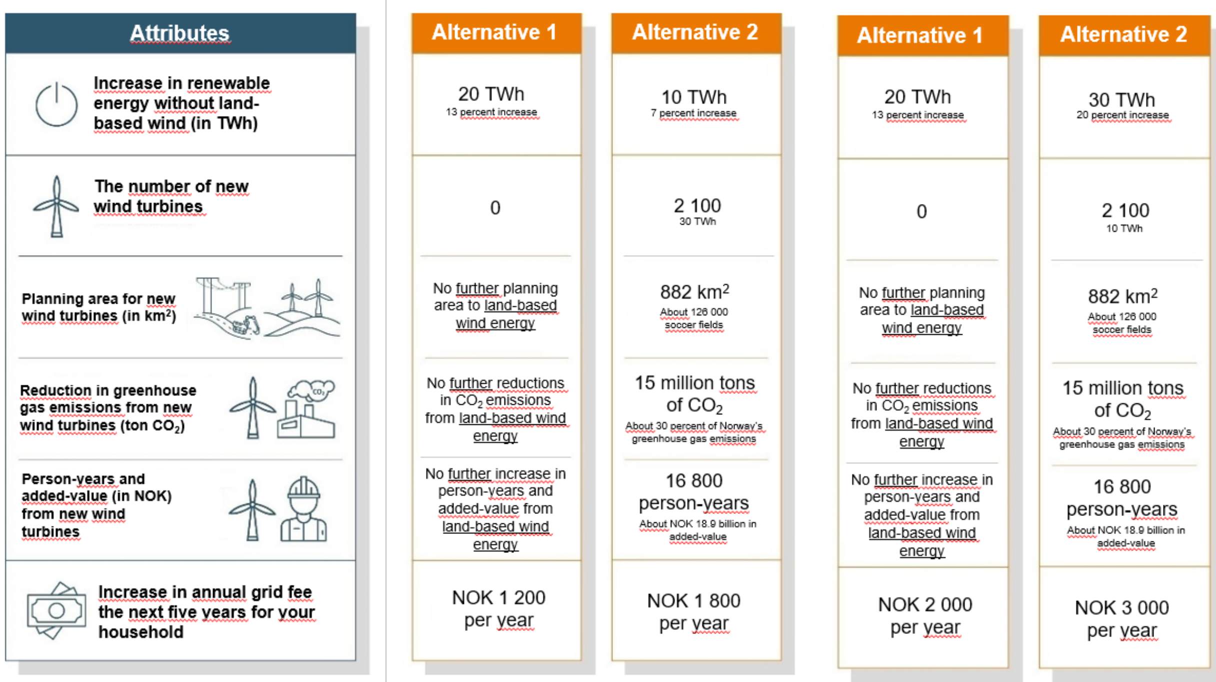


Figure 4: Example of choice cards from pilot and main survey

The blue column shows the three attributes and sub-attributes, while the two orange columns represent the two options. The levels of the increased annual grid fee illustrate the adjustments that happened with this attribute between the pilot and main survey. As stated earlier in this chapter, alternative 1 consistently includes no new wind turbine installations. In the example choice set for the main survey, alternative 2 includes the maximum number of new wind turbines, and an increased annual grid fee that is higher than alternative 1. Moreover, alternative 2 also includes the highest increase in renewable energy production of 30 TWh. The full main survey is included as Appendix I, and the pilot survey is available upon request.

All 3 412 respondents were faced with a total of eight choice sets. However, the respondents were randomly divided into two blocks. The choice sets that were given to one block were different from the ones that were given to the other block. This meant that although all respondents were faced with only eight different choice sets, the two halves of the sample answered eight different choice sets and thereby doubled the total number of sets. Dividing the sample into two blocks allowed the scientists to gain a greater variation in the presented scenarios, which in turn leads to less bias in the estimates.

To assess the survey, the recommendations of Johnston et al. (2017) can be used as a guideline. They propose several recommendations regarding all aspects of the survey, which should be considered when designing their survey to help achieve reliable and unbiased estimates. Seeing how the survey used in this thesis aligns with the recommendations of Johnston et al. (2017) can give an indication of the reliability of the survey responses and the values measured from it.

The first recommendation is that the survey should have a clear presentation of the current status, what effects will be seen if the policy is implemented, and sufficient information about the policy itself and what it includes. The changes that follow the policy implementation should be described relative to the current status, and this description should be thorough enough so that the respondents are equipped to make choices that align well with their preferences and attitudes. As explained in this chapter, the survey that this thesis is based on explains the current status of land-based wind power in Norway through the attribute descriptions. This provides the respondents with a basis that the estimated effects of wind power expansion can be compared to. Moreover, Johnston et al. (2017) recommend pretesting as a measure to ensure that the survey is understandable for the respondents, which in turn helps the developers get valid and reliable value estimates. Pretesting should be done by using a smaller sample drawn from the population of the main study, for instance by piloting the survey. This can provide the developers with insights of how effective the survey design is, as piloting can reveal parts that should be adjusted so that the effectiveness of the main survey will increase. This recommendation is followed by the developers of the survey used in this thesis, as they conducted a pilot to test their survey design (Johnston et al., 2017).

There is also a recommendation regarding the design of the choice experiment, which should be followed in order for it to yield unbiased estimates. The design should reflect back on discoveries from the pilot and consider previous studies of similar policies. Based on the recommendations of Johnston et al. (2017), the selection of attributes and their respective levels should be set with intention. As described earlier in this chapter, the choice of attribute levels is motivated by the power market analysis of NVE, which means that the attributes are set within a probable range of values. Secondly, the developers should put some consideration to how many alternatives they will have for each choice set and how many choice sets each respondent will be asked to answer. There were some consistent patterns that were continued through all the alternatives, such as alternative 1 always involving increase in renewable energy production without land-based wind. Using two alternatives can therefore be beneficial when the developers want to the alternatives to carry such distinctions throughout all the choice sets. Moreover, all respondents were presented with eight different choice sets. To increase the number of scenarios in the experiment, all respondents were split into two groups, where each group was faced with eight different choice sets. This gave the developers responses to a total of 16 different choice sets without the respondents having to answer all 16 of them, thereby avoiding a potential risk of respondent fatigue (Johnston et al., 2017).

Based on the correspondence between the survey and the recommendations from Johnston et al. (2017), the survey seems to be developed and designed with consideration to the proposed practices. This is beneficial for the upcoming values and estimates measured from the survey responses. However, the assessment of the survey done in this chapter only gives an indication of the survey's reliability and validity, which will be further discussed in chapter 6.

4.1.3. Benefit transfer

Benefit transfer (BT) is a procedure which allows researchers to transfer valuation information from a previous study site to a new policy site (Dugstad & Navrud, 2022). This procedure can be applied to both revealed preference methods and stated preference methods. The valuation of ecosystem services is highly useful for conducting economic analyses, as well as for both management and conservation of the ecosystem in question. Although BT is hardly ever the optimal way for analyzing the economic value of a policy site, it is recognized as an acceptable alternative. Gathering primary and site-specific data will undeniably result in the most accurate estimates for the study site, but this process is both time-consuming and costly (Plummer, 2009).

Dugstad & Navrud (2022) identify three different types of BT, starting with unit value transfer. This method involves transferring the mean WTP estimates from the study site to the policy site, either with or without adjustments for potential differences in incomes between the two sites. Secondly, value function transfer is the process where a researcher transfers the WTP function from the policy site rather than the estimates. The WTP function can be a function of, for example, sociodemographic characteristics of the study's respondents. Lastly, meta-analysis is a method where the researcher transfers WTP function estimates as a meta-regression function of data that is collected from multiple study sites rather than just one. The researcher can then choose several study sites that have similar characteristics as the policy site, and preferably that also aim to valuate a similar environmental good (Dugstad & Navrud, 2022). An example of such a study is a meta-analysis conducted by Brouwer et al. (2022) to estimate the economic value of the environmental services provided by the Brazilian Amazon rainforest. The researchers identified relevant literature regarding Brazilian valuation studies, which were gathered from various databases, conservation sites and previous studies of similar or related topics. Resultingly, the researchers used a total of 36 different studies covering almost 30 years of research on Amazon valuation research, which they used to estimate the economic value of the Brazilian Amazon rainforest's ecosystem services (Brouwer et al., 2022).

Although BT is recognized as an alternative to conducting new studies, there are several possible issues that a researcher can encounter if the BT is not performed properly. Arguably, the most important issue is lack of correspondence between the study site and the policy site. If the study site is a poor match, the transferred valuation information could lead to invalid results for the researcher. This highlights a need for proper guidance when performing BT, and to carefully consider the chosen study site and to what degree it applies to the policy site (Plummer, 2009).

As a means of ensuring that the BT process is as valid and reliable as possible, Plummer (2009) describes three steps that the researcher should follow. Firstly, the characteristics of the policy site should be thoroughly described. This includes its biological diversity, physical traits, and what utility it provides for humans. Followingly, the proposed policy should be described, and the researcher should identify its impacts on the policy site. Carefully executing this first step of BT aids the researcher in the upcoming steps (Plummer, 2009).

Moreover, Plummer (2009) suggests that the researcher should then identify study sites that adequately match the policy site. The evaluation of matching sites should cover whether the sites are similar in terms of physical and biological characteristics, and if their provided utility, and extent of it, are somewhat the same. While considering the comparability of this utility, the researcher should also evaluate if the study site covers the same use/non-use values as is the aim to cover in the new policy site. Other than their correspondence and similarity in characteristics, it is important that the data quality of the earlier study is satisfactory to achieve the highest accuracy (Plummer, 2009).

Finally, after deciding on a sufficient number of satisfactory studies, the last step is for the researcher to transfer relevant economic values and apply them to the policy site. This can be done in various ways, as illustrated by the three different types of BT that Dugstad and Navrud (2022) identifies. One of the most recognized and common methods is unit value transfer. Before transferring the values to one's own study, it is recommended to calculate the transfer error (TE). This is found by taking the estimation from the study site and subtracting the estimation from the policy site, and then dividing this difference on the estimation from the policy site. The resulting percentage is the transfer error, which is used to assess the reliability of the values transferred from the study site. Equation (4.1) shows the formula for TE for WTP estimates, where WTP_{SS} is the WTP estimate from the study site and WTP_{PS} is the WTP estimate from the policy site (Dugstad & Navrud, 2022).

$$TE = \frac{WTP_{SS} - WTP_{PS}}{WTP_{PS}} \tag{4.1}$$

In this thesis, the TE will be calculated between WTP estimates of the pilot and main survey sample. This way, the TE will give an expression of how suitable the pilot estimates are for BT when exogenous shocks like the war outbreak have occurred.

4.2. Econometric approach

4.2.1. Multinomial and mixed logit

The logit model is a commonly used discrete choice model that allows the researcher to model choice probabilities. This chapter will describe two types of logit models that will be used in this thesis, starting with the multinomial logit. As is implied by the term multinomial, this model can be used in situations where the respondents are faced with multiple alternatives to choose among, as a method to describe their choices. When using this model, the observed choices are explained by means of the individual's characteristics, for example through sociodemographic variables such as age (Mariel et al., 2021). Moreover, the multinomial logit is derived based on three properties that need to be satisfied in order for the model to represent choice behaviour (Train, 2009).

Firstly, the multinomial logit builds on the assumption that the unobserved utility is independent between the error terms. As mentioned in chapter 3.2, the RUM model is used to derive the logit model, hereunder the multinomial logit. The researcher must specify a certain distribution for the stochastic component in the error term. Recall that the stochastic component contains the unobserved utility, which in the RUM model was treated as random. When deriving the logit model, the researcher instead assumes that the error term follows a type 1 extreme value distribution, also known as the Gumbel distribution. This implies that each error term is independently, identically distributed extreme value. Moreover, having this distribution means that the stochastic components are independent over time, which enables the researcher to conduct repeated choice experiments (Train, 2009).

Secondly, the multinomial logit model is derived under a property known as the independence from irrelevant alternatives (IIA) (Train, 2009). Consider a choice set of two alternatives *i* and *j*, and that the cost attribute in alternative *i* decreases. A cost decrease is viewed as an improvement for individual *k*, and therefore increases the probability of alternative *i* being chosen over alternative *j*. Because probabilities always sum up to 1, the two probabilities for the alternatives being chosen can be specified as shown in Equation (4.1).

$$P_{ik} + P_{jk} = 1 \tag{4.1}$$

$$(P_{ik} + \Delta P_{ik)} + (P_{jk} - \Delta P_{ik}) = 1 \tag{4.2}$$

In order for the probabilities to sum up to 1, the probability P_{jk} must decrease when the probability P_{ik} increases due to the cost attribute change. This is called a pattern of substitution and is shown in Equation (4.2). Such patterns are important when a researcher wants to assess how sensitive the choice probabilities are to changes in the attributes. The multinomial logit model uses a specific substitution pattern across the alternatives, which can be viewed as a restriction on the ratios of probabilities. This ratio of logit probabilities is known as the property of independence from irrelevant alternatives (IIA), and is one of the main assumptions that the multinomial logit models are derived from (Train, 2009). Given the alternatives i and j in a choice set with J alternatives, this probability ratio is given by

$$\frac{P_{ik}}{P_{jk}} = \frac{exp^{V_{ik}} \Big/ \sum_J exp^{V_{Jk}}}{exp^{V_{jk}} \Big/ \sum_J exp^{V_{Jk}}} = \frac{exp^{V_{ik}}}{exp^{V_{jk}}}. \tag{4.3}$$

As seen in Equation (4.3), this ratio only depends on the two alternatives i and j, and is therefore irrelevant of the other alternatives. This implies that the relative probability of choosing alternative i over j will remain the same regardless of the other alternatives and their attribute levels (Train, 2009).

Finally, the third property of the multinomial logit is that it can describe some variation in taste for the attributes in the choice experiment. As is the case of the choice experiment of the surveys used in this thesis, consider that the households are presented choice sets with two alternative approaches to meet the increased electricity demand. Moreover, assume that the researcher can observe the same three attributes as in the choice experiment: increased renewable energy without land-based wind power, number of new wind turbines, and increase in annual grid fee for the household. These are denoted as IE_i, NT_i and GF_i respectively for alternative i. The utility of household k is then specified as

$$U_{ik} = \alpha IE_i + \beta NT_i + lGF_i + \varepsilon_{ik}. \tag{4.4}$$

For the multinomial logit, the households are assumed to have homogenous preferences. This assumption implies that all households have the same taste towards the three attributes. In the utility expressed by Equation (4.4), this is seen by the parameters not being specified for each specific household k. However, the parameters can be specified further, for instance by supposing that proximity to already installed wind farms having a negative effect on the importance that the household places on new wind turbines. This is a type of systematic taste variation, which is the only type of taste variation that the multinomial logit can incorporate. If the taste towards new wind turbines were to vary not only by proximity to wind farms but also by some unobservable factors, the multinomial logit is no longer an appropriate specification (Train, 2009). In cases when the multinomial logit is not appropriate because of its three properties, the mixed logit model can be used instead.

The mixed logit model is an extension of the multinomial logit, and it is a more flexible model that resembles a random utility model. Its flexibility allows for, as opposed to the multinomial logit, random attitude variation and correlation in unobserved factors, and it does not assume the IIA property. Moreover, the mixed logit has an unrestricted domain, meaning that the included values can be of any value ranging from minus infinity to positive infinity. The mixed logit can be illustrated by specifying the utility function of alternative *i* for household *k* again. For simplicity, consider now that the attributes IE_i, NT_i and GF_i are contained in vector Z_i.

$$U_{ik} = \beta Z_i + \varepsilon_{ik} = \bar{\beta} Z_i + \tilde{\beta}_k Z_i + \varepsilon_{ik} \tag{4.5}$$

In this specification, the coefficients specific for each household *k* is the sum of the population mean and an individual deviation, as denoted by respectively $\bar{\beta}$ and $\tilde{\beta}_k$. This allows the coefficients to be random. Moreover, the stochastic part is denoted as the two last terms $\tilde{\beta}_k Z_i + \varepsilon_{ik}$, and as opposed to the multinomial logit, the stochastic utility is correlated between the alternatives (Train, 2009).

Because the coefficients are not fixed in the mixed logit model, they will vary within the population. In this sense, the mixed logit models allow the households to have heterogenous preferences, meaning that the tastes towards the attributes differ between the households. Assume that they vary with a density distribution of $f(\beta|\theta)$. The variable θ captures underlying coefficients for taste variation, such as $\bar{\beta}$. This implies that the probability of household *k* choosing alternative *i* is dependent on their preferences, which can be expressed as the probability of choosing alternative *i* given the coefficients β_κ (Train, 2009). This is modelled as

$$P_{ik|\beta_k} = \frac{exp(\beta_k Z_i)}{\sum_{j=1}^{J} exp(\beta_k Z_k)}. \tag{4.6}$$

If the researcher instead wants to estimate the probability of household *k* choosing alternative *i* given all values that the coefficients can take, and not only β_κ, the model specification would instead be an unconditional probability. This probability is modelled as the integral

$$P_{ik|\theta} = \int L_{ik}(\beta_k) f(\beta|\theta) d\beta, \tag{4.7.1}$$

$$L_{ik} = \frac{exp(\beta_k Z_i)}{\sum_{j=1}^{J} exp(\beta_k Z_k)}. \tag{4.7.2}$$

In order to estimate the unconditional probability in Equation (4.7.1), the researcher must use simulation for any given value of θ. The simulation process consists of two steps that are repeated several times. The first of the two steps is to draw a random β from $f(\beta|\theta)$. This first draw will be denoted as β^r, with $r = 1$ referring to it being the first drawn β. Next, the researcher inserts β^r into Equation (4.7.2) to calculate the specific probability that this β is associated with. After having drawn a sufficient number of times, the researcher calculates the average using this formula where R is the total number of draws (Train, 2009).

$$\check{P}_{ik} = \frac{1}{R} \sum_{r=1}^{R} L_{ik}(\beta^r) \tag{4.8}$$

Additionally, the mixed logit would require the researcher to specify some distribution of the coefficients, where the most common ones are normal or log-normal distributions (Mariel et al., 2021). One approach is to assume that all households share the same sign for the coefficients, which would be a property of the log-normal distribution. In the case of land-based wind power, log-normal distribution could be relevant for the increase annual grid fee coefficient. This can be explained by all utility-maximizing households being interested in paying as little as possible, as this would imply that more money can be spent on other goods.

4.2.2. Propensity score matching

Propensity score matching (PSM) is an approach where a group of treated individuals are compared to a group of untreated individuals, often called a control group (Caliendo & Kopeinig, 2008). Moreover, PSM enables the researcher to mimic a randomized experiment, as the untreated individuals are as likely to be treated as the treated ones. This is done by first estimating the propensity scores of the individuals within the two groups. The propensity score is a probability of receiving a treatment, conditional on observable characteristics (Rosenbaum & Rubin, 1983). These characteristics are known as covariates and are contained in x, so that the propensity score is denoted as *p(x)*. Followingly, the researcher matches treated individuals with untreated individuals that have similar propensity scores (Cameron & Trivedi, 2005).

Before introducing the formula for propensity scores, it is necessary to introduce some notation. Firstly, D is a binary indicator for treatment assignment. If $D = 1$, it means that the individual has been assigned treatment, and otherwise if the value is equal to zero. Moreover, the vector *x* contains the observable covariates. These are sociodemographic characteristics of the individuals, such as their age. Finally, the propensity score is expressed as

$$p(x) = Pr[D = 1|X = x], \tag{4.9}$$

where *p(x)* is the function of the propensity score, which measures the propensity towards exposure to treatment given the covariates *x* (Rosenbaum & Rubin, 1983). When using PSM, the researcher must consider two criteria that should be satisfied in order for the two groups to be statistically similar. One of these is the requirement of common support. This implies that any individual that does not have a match from the other group, must be removed from the sample. As a result, the researcher will be left with a sample where the two groups only consist of individuals who have a match in the opposite group.

Additionally, the second criterion is the balancing requirement. The balancing requirement allows the researcher to compare the two treatment groups in a nonrandomized experiment in a more direct way. In randomized experiments, the units within the two groups are likely to be similar and can therefore be compared directly. For nonrandomized experiments, the units exposed to treatment are instead likely to have systematic differences from the control units (Rosenbaum & Rubin, 1983). The balancing requirement is then expressed as the following condition

$$D \perp x|p(x). \tag{4.10}$$

As implied in Equation (4.10), the balancing requirement states that conditional on the propensity score *p(x)*, the distribution of covariates *x* will be similar between the units of the two groups. This means that the researcher will divide the propensity score in intervals and test that the average propensity score of the two groups do not differ between the intervals. If satisfied, the mean of *x* within the intervals should not differ significantly between the treated and untreated individuals in the intervals. Moreover, for individuals with the same propensity score, the assignment to treatment is random and identical in terms of the covariates (Cameron & Trivedi, 2005).

When using propensity score matching, the researcher can estimate the average treatment effect (ATE) and average treatment effect on the treated (ATT). Consider that y^1 and y^0 denote outcome for the treated and nontreated group respectively, and that the difference between these outcomes is defined as $\Delta = y^1 - y^0$. Given this, ATE and ATT is specified as

$$ATE = E[\Delta] \rightarrow \widehat{ATE} = \frac{1}{N}\sum_{i=1}^{N}[\Delta_i], \tag{4.11}$$

$$ATT = E[\Delta|D = 1] \rightarrow \widehat{ATT} = \frac{1}{N}\sum_{i=1}^{N_T}[\Delta_i|D_i = 1]. \tag{4.12}$$

The ATE is used to compare treatments in randomized experiments. ATE measures the difference in mean between treated and untreated units. On the other hand, ATT measures the average gain from treatment for only the treated individuals. These two measures differ as ATE describes the individual treatment effects of the population, while ATT only describes the treated share of the population (Cameron & Trivedi, 2005).

In terms of land-based wind power, one example could be to use proximity to wind power as the treatment in an aim to investigate preferences towards wind turbine expansion. Households living close to existing wind turbines would then be part of the treated group, while households living further away would serve as the control group. The two groups could then be matched based on income, number of household members and other observable characters. Any households that did not have a match from the opposing group would be excluded from the sample. Resultingly, the researcher could perform PSM and investigate how proximity to existing turbines affects attitudes towards further installations. In this thesis, propensity score matching will be used to match respondents from the pilot and main survey sample by sociodemographic variables, where the treatment will be a survey sample dummy indicating which survey the respondent answered.

5. Results

5.1. Sample vs. Population characteristics

To investigate whether the two samples are representative of the Norwegian population, it is necessary to compare mean values of various sociodemographic variables. In addition to expressing how representative the samples are of the population, the mean values also give an indication of how well the pilot and main sample match. The sociodemographic variables to be compared include gender, income, age, education, and region.

First, the gender distribution is measured. The samples are relatively similar to the population, with the main sample being the closest. When comparing household income, we see that the mean is lower in both the pilot and the main. A possible explanation of this can be seen in the age group distribution. For the population, the age group under 30 consists of individuals from 15 up to 30. Similarly, the age group 60+ consists of individuals from age 60 up to 74. For both the pilot and the main there is a higher density of individuals in the age group 60+ than in the population. Individuals in this age group could be retired and thereby lower the mean household income.

Moreover, we compare the education level of the individuals. The pilot and main resemble in their distribution, while they are somewhat different to the Norwegian population. The samples have a lower density of individuals that have below upper secondary education. However, the percentages of individuals in the population with tertiary vocational education and higher education (Master's degree/PhD) are lower than both the pilot and the main. Upper secondary education and higher education (Bachelor's degree) have similar percentages for both samples and the population. Lastly, we compare the distribution of regions that the individuals are located in. We see a consistent distribution for Trønderlag/Nord-Norge, but somewhat bigger differences for Oslo and surrounding area, rest of Østlandet, and Sør-/Vestlandet.

Table 4: Sample vs. Population characteristics

		Pilot	Main	Norwegian population
Gender				
	Male	54,35%	50,06%	50,44%
	Female	45,65%	49,94%	49,54%
Income				
	Mean household income	906 006	845 460	927 200
Age				
	Under 30	10,41%	15,36%	22,98%
	30-44	25,11%	28,14%	24,97%
	45-59	26,82%	29,63%	24,95%
	60+	37,66%	26,88%	19,52%
Education				
	Below upper secondary education	6,28%	6,86%	24,07%
	Upper secondary education	36,09%	37,14%	36,52%
	Tertiary vocational education	18,40%	13,57%	3,08%
	Higher education (Bachelor's degree)	21,40%	23,09%	24,85%
	Higher education (Master's degree/PhD)	17,83%	19,34%	10,93%
Region				
	Oslo and surrounding area	26,68%	26,70%	36,16%
	Rest of Østlandet	26,11%	24,94%	6,87%
	Sør-/Vestlandet	30,81%	30,22%	39,28%
	Trønderlag/Nord-Norge	16,41%	18,14%	17,69%

Sources: (SSB, 2023b) (SSB, 2023a) (SSB, 2022a) (SSB, 2022b)

5.2. Rank order survey questions results

The pilot and main survey both included several questions where the respondents needed to take a standpoint or rank the importance of certain effects. These give the researcher an indication of the preferences and attitudes of the Norwegian population. In our case, the responses give an indication of Norwegian households' attitudes towards land-based wind power.

Prior to analyzing the discrete choice experiment part of the surveys, I first investigated three of the rank order survey questions that were presented to the respondents. Recall that the number of respondents in the pilot survey sample is 460, while the main survey sample consists 3 412 respondents. These three rank order survey questions are of particular relevance to this thesis and give an indication of what could be revealed further on in this chapter as I look deeper into the data. The importance scale goes from one to seven, with one being the score with least importance and seven being the most important. The lighter green represents responses from the pilot survey, while the darker green represents the main survey. Firstly, Figure 5 shows how respondents ranked the importance of increased renewable energy without land-based wind power.

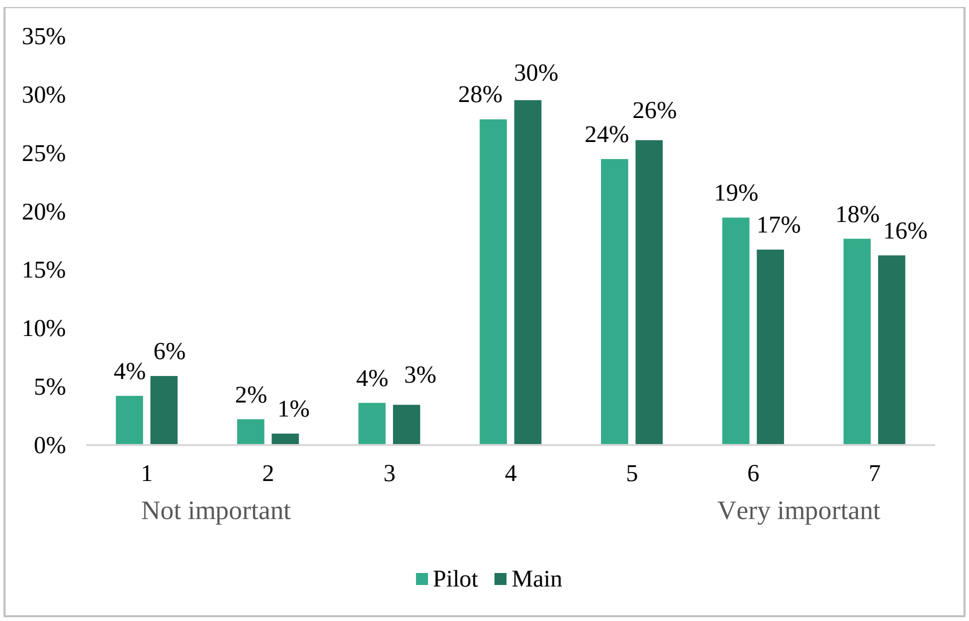


Figure 5: Importance ranking of increased renewable energy without land-based wind power

For both the pilot and the main survey, the majority ranked increased renewable energy without land-based wind power as somewhat important, as can be seen by the 24% and 26% respectively choosing the score 5. For the two scores that indicate a higher degree of importance, we see that 37% of the pilot respondents were distributed between these two scores. Similarly, 33% of the main survey respondents ranked this importance to be above the score of five. This implies that a higher share of the respondents in the pilot found increase of renewable energy without land-based wind power to be of a higher degree of importance than in the main survey. This could, although very weakly, indicate a somewhat higher acceptability of land-based wind power by the time the main survey responses were collected. Moreover, another rank order survey question asked the respondents to rank how important they believed the effect of further reduction in emissions due to land-based wind power to be. The results are shown in Figure 6.

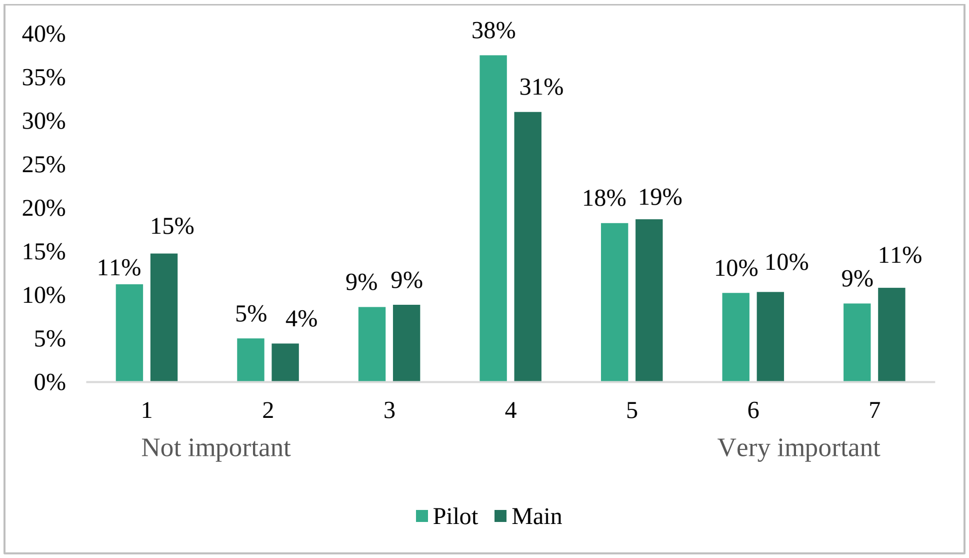


Figure 6: Importance ranking of further emissions due to land-based wind power

In this ranking, slightly over a third of the respondents from the pilot survey chose the neutral middle score 5. This was also the most chosen score for the main survey. The three scores indicating somewhat to very important were chosen by 37% of the respondents from the pilot survey, and 40% from the main. This corresponds with 25% choosing lower importance ranking in the pilot, and 28% in the main. Investigating these ranking results thereby show a somewhat similar distribution of importance ranking for the two survey samples. A bigger share of the main survey respondents chose an importance score of 6 or 7 compared to the pilot, yet a higher share also chose the lowest score of 1. If anything, this could indicate more Norwegian households taking a clear standpoint on how they value land-based wind power as a means to reduce emissions. Lastly, the third investigated importance ranking is regarding further increase in person-years and added-value from new land-based wind power. These results are presented in Figure 7.

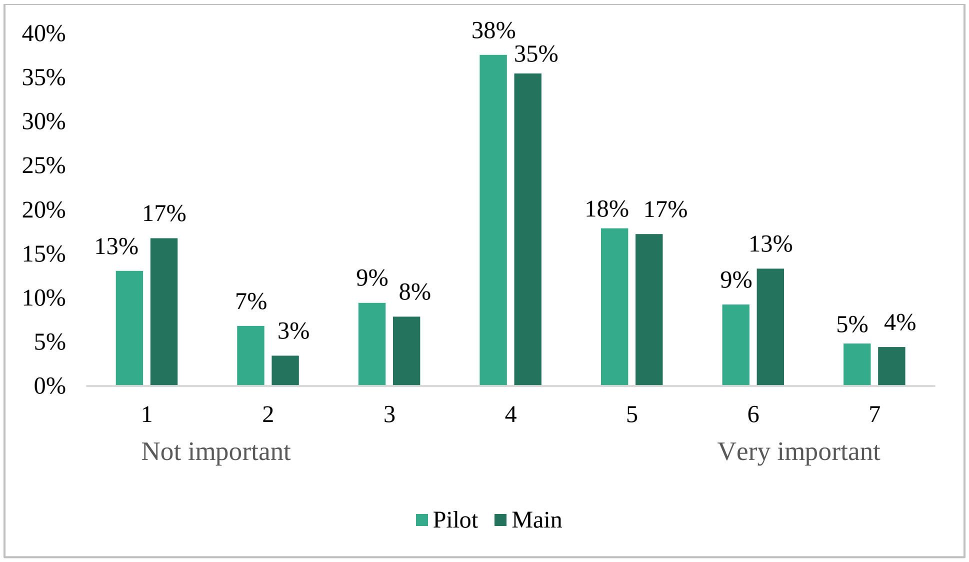


Figure 7: Importance ranking of increase in person-years and added-value from new land-based wind power

In the pilot survey, 38% of the respondents took a neutral standpoint when ranking importance of increase in person-years and added-value from land-based wind power. The score of somewhat important was selected by 18%, with this percentage decreasing for the two highest importance degrees. Moreover, 13% considered this effect of new land-based wind power to be not important. For the main survey, we see that approximately as many respondents chose the neutral score of 4. A similar distribution of respondents can be seen for the three upper and lower scores. The second highest importance score is chosen by a higher percentage of the main survey respondents, but the same goes for the lowest importance score of 1.

These three importance ranking questions give some insights to how the respondents answered in the surveys, and how they differed between the pilot and main. Although the observed rankings indicate very little difference between the pilot and survey, they provide some understandings of how Norwegian households feel towards land-based wind power expansion, and how much they value the positive effects that more wind turbines offer. The conclusion that could be drawn based solely on these three ranking questions is that Norwegian households are positive to increasing the renewable energy production, but not through installing new wind turbines. These preferences will be specified and further explored in the following sub-chapters where the econometric results are presented.

5.3. Econometric models

5.3.1. Multinomial logit models

The first step in the econometric analysis was to develop multinomial logit models for the pilot and main sample. These were specified with response as the dependent variable, and the attributes as independent variables. The model coefficients are presented in Table 5.

Table 5: Coefficients of multinomial logit models

	Pilot	**Main**
	Coefficient (s.e.)	Coefficient (s.e.)
Increase in renewable energy production	0.01143** (0.00189)	0.00924** (0.00129)
Number of new wind turbines	-0.00046** (0.00002)	-0.00035** (0.00001)
Increased annual grid fee	-0.00021** (0.00002)	-0.00019** (0.0000)
Log likelihood	-2 671.1379	-15 254.17
Pseudo R^2	0.0736	0.0313
Number of observations	8 320	45 438

*Note: ** $p < 0.01$*

The coefficients express the preferences for the pilot and main survey respectively. All the coefficients are significant at a 1% level. Considering the first attribute of increase in renewable energy production, we see that the coefficients are positive in both the pilot and the main survey. This implies that the respondents are more likely to choose alternatives with higher levels of the attribute of increased renewable energy production without land-based wind power. Moreover, this aligns with the expectation that Norwegian households prefer more renewable energy, as we also saw an indication of in the previous sub-chapter. The preference coefficient is higher in the pilot than in the main, respectively as 0.01143 and 0.00924. Some of this difference can be explained by the annual grid fee attribute being adjuster to higher levels for the main survey, thereby making households more hesitant towards increased renewable energy production as it would involve a higher annual grid fee.

Secondly, the preferences towards new wind turbines have a negative sign. Norwegian households were expected to be negative to new wind turbine installations, based on the status of land-based wind power in Norway discussed in chapter 1 and the studies from the literature review. We see that the respondents are less likely to choose alternatives involving more wind turbines. When comparing the pilot and survey, we see that the negative preferences were slightly stronger in the pilot. This could indicate that there was a somewhat bigger acceptance for new wind turbines when the main survey responses were collected.

The last attribute is the cost attribute of the survey, which is the increase in annual grid fee. As expected, this is negative. This implies that respondents were less likely to choose alternatives with higher annual grid fee increases in both the pilot and main survey. Rationally, households prefer to spend as little money as possible, as that would leave more money for other purposes that might yield them more utility. Conclusionary, the multinomial logit models imply that Norwegian households are negative towards new wind turbines, but positive to increased renewable energy production in general.

5.3.1.1. Interaction effects to account for sociodemographic differences

To further investigate whether there is a significant difference between the pilot and main survey sample, a multinomial logit model with interaction effects was specified. This model accounts for any differences in sociodemographic variables. As consistently used throughout the thesis, the sociodemographic variables include household income, age, gender, education, and region. The interaction terms are generated using the two attributes and each of the five sociodemographic variables, as well as a sample dummy. The sample dummy takes the value of one if a respondent is from the main survey, and zero if it they are from the pilot survey.

Moreover, three dummy variables are generated for the categorical variable *region*. The dummies are generated for Oslo and surrounding area, Sør-/Vestlandet, and Trønderlag/Nord-Norge. The fourth region, which is rest of Østlandet, acts as the reference group. Rest of Østlandet was chosen as reference group as it is the region with the least exposure to proposed wind power installation areas, as seen in Figure 1 in chapter 2.1. The coefficients for the three other regions will thereby be interpreted relative to rest of Østlandet. With a total of 12 interaction terms generated, the multinomial logit with interaction effects gave the following coefficients.

Table 6: Coefficients of multinomial logit model with interaction effects

	Increase in renewable energy production	**Number of new wind turbines**
Interaction terms	Coefficient (s.e.)	Coefficient (s.e.)
Sample	-0.00457** (0.00157)	0.00032** (0.00004)
Age	-0.00302** (0.00084)	-0.00010** (0.00001)
Female	-0.00489** (0.00170)	-0.00003 (0.00003)
Education	-0.00011 (0.00055)	0.00000 (0.00000)
Oslo and surrounding area	0.00118 (0.00238)	0.000046 (0.00003)
Sør-/Vestlandet	-0.00012 (0.00226)	-0.00163** (0.00003)
Trønderlag/Nord-Norge	0.00120 (0.00257)	-0.00003 (0.0000)

	Coefficient (s.e.)
Increased annual grid fee	-0.00018** (0.00000)
Log likelihood	-18 192.967
Pseudo R^2	0.0483
Number of observations	52 264

*Note: ** $p < 0.01$*

Table 6 presents the coefficients for all the interaction terms, as well as the coefficient for *fee* which will be used in estimation of mean WTP in chapter 5.4.1.1. Firstly, the coefficients for *age* are both negative and significant at the 1% level, indicating that respondents of higher age are more negative towards both increased renewable energy production and new wind turbines. Similarly, the interaction terms for the female dummy also indicate that female respondents are more negative to both attributes, although the interaction term for new wind turbines is not significant. For the interaction terms with education, the coefficient is negative for increased renewable energy. Moreover, the interaction term with new wind turbines was expressed with scientific E notation, indicating that coefficient is approximately zero. However, none of the two coefficients for the interactions between education and the attributes are found to be significant.

Furthermore, the coefficients show that respondents from Oslo and surrounding area are slightly more positive towards increased renewable energy production and new wind turbines compared to the reference group rest of Østlandet. When comparing the reference group to Sør-/Vestlandet, we see that respondents from Sør-/Vestlandet are more negative towards both attributes. For the region of Trønderlag/Nord-Norge, the respondents are more positive towards increase in renewable energy production, yet more negative regarding new wind turbines compared to rest of Østlandet. However, out of all the interaction terms between the region dummies and attributes, only the interaction term between Sør-/Vestlandet and number of new wind turbines was found to be significant.

Finally, the sample coefficients show the interaction between the sample dummy and the two attributes, both of which are significant at the 1% level. This implies a significant difference between the two samples even when the sociodemographic variables are accounted for. Firstly, the coefficient for the interaction with increased renewable energy production is -0.00457. This implies that the main survey sample has a more negative preference towards this attribute. For number of new wind turbines, the coefficient is 0.00032, which implies that respondents from the main survey sample are more positive towards new wind turbines.

5.3.2. Mixed logit models

After the multinomial logit models, mixed logit models were specified. The cost attribute, increased annual grid fee, is specified as fixed. This implies that the cost was held constant for all respondents. This assumption allows us to avoid WTP estimates being extremely high, as can be the case if the cost attribute is close to zero (Holmes et al., 2017). The two other attributes, increase in renewable energy and number of new wind turbines, are instead specified to have random coefficients. Moreover, the mixed logit models are specified to allow these two attributes to be correlated.

The mixed logit model is difficult to compute as it includes simulations. This, alongside the specification of correlation, makes the models computationally demanding and prone to local optima convergency. Resultingly, the simulations were set to 100 draws. Having a high number of draws is preferable to ensure that the estimated parameters have a simulation error that is as low as possible. However, estimation of models with many draws can take several hours, often between 2 and 20 hours (Train, 2000). To approach the issue with long computer run-times, the mixed logit models for this thesis use Halton draws rather than random draws. In earlier studies, using 100 Halton draws led to lower simulation error in estimated parameters compared to 1 000 random draws. Moreover, Halton draws are designed in a way that gives more evenly spread draws for the observations, which in turn leads to the simulated probabilities to have less variation between observations as compared to when using random draws (Train, 2000). Finally, the coefficients found in the mixed logit models are presented in Table 7.

Table 7: Coefficients of mixed logit models

	Pilot	**Main**
	Coefficient (s.e.)	Coefficient (s.e.)
Increase in renewable energy production	0.06326** (0.00912)	0.01213* (0.00576)
Number of new wind turbines	-0.00255** (0.00033)	-0.00130** (0.00008)
Increased annual grid fee	-0.00080** (0.00006)	-0.00061** (0.00002)
Log likelihood	-1 573.3526	-8 849.9199
Number of observations	8 320	45 438

*Note: ** $p < 0.01$, * $p < 0.05$.*

We see that all coefficients are significant at the 1% level except for increase in renewable energy for the main survey sample, which is instead significant at the 5% level. The coefficient for increase in renewable energy production is lower for the main survey sample compared to the pilot. Moreover, the coefficients for number of new wind turbines and increased annual grid fee are less negative. Table 7 thereby show the same indication as the multinomial logit coefficients, which is that Norwegian households prefer more renewable energy but not by increasing the number of wind turbines.

5.4. Estimated willingness to pay

The mean WTP for increase in renewable energy production without land-based wind and number of new wind turbines were estimated using the coefficients from the different logit models. These are estimated by using the following formulas:

$$WTP_{increased\ renewable\ energy\ production} = -\left(\frac{coefficient_{increased\ renewable\ energy\ production}}{coefficient_{annual\ grid\ fee}}\right) \quad (5.1)$$

$$WTP_{number\ of\ new\ wind\ turbines} = -\left(\frac{coefficient_{number\ of\ new\ wind\ turbines}}{coefficient_{annual\ grid\ fee}}\right) \quad (5.2)$$

5.4.1. Mean willingness to pay-estimates multinomial logit models

Firstly, the mean WTPs are estimated by using the multinomial logit coefficients presented in Table 5. The estimated mean WTPs and 95% confidence intervals (CI) are shown in Table 8.

Table 8: Mean WTP estimates for the pilot and main survey sample using multinomial logit coefficients

	Pilot		**Main**	
	WTP (s.e.)	95% CI	WTP (s.e.)	95% CI
Increase in renewable energy production	54.83** (11.90)	[31.52 – 78.15]	48.12** (6.95)	[34.50 – 61.73]
Number of new wind turbines	-2.19** (0.25)	[(-2.67) – (-1.71)]	-1.84** (0.08)	[(-2.01) – (-1.67)]

*Note: ** $p < 0.01$*

Firstly, all the mean WTP estimates are significant at the 1% level in both the pilot and main survey sample. For the pilot, the mean WTP is estimated to be approximately 55 per TWh, while the main survey sample has a mean WTP of 48 per TWh. The second attribute of new wind turbines have negative mean WTPs for both the pilot and main survey, with the estimate from the pilot being the lowest. This implies that Norwegian households have a willingness to pay to avoid additional wind turbines. The estimates in Table 8 thereby suggest that Norwegian households had a lower WTP for increase in renewable energy production after the war outbreak, yet a higher acceptance of new wind turbines. However, it is necessary to consider the cost adjustments that were made prior to the main survey being sent out. This could have resulted in more households being more reluctant to choose alternatives involving bigger increases in renewable energy production and, followingly, a higher annual grid fee.

When comparing the survey samples, it is necessary to test for a significant difference between the pilot and main survey sample. To do so, we compare the confidence intervals of the mean WTPs for the attributes. If the CIs from the pilot and main survey overlap, it indicates that the difference in WTP of the two samples do not have a statistically significant difference. The confidence intervals are presented in Table 8, where the confidence level is 95%. For a clearer presentation of whether there is overlap, Figure 8 and Figure 9 present the confidence intervals for the two attributes visually.

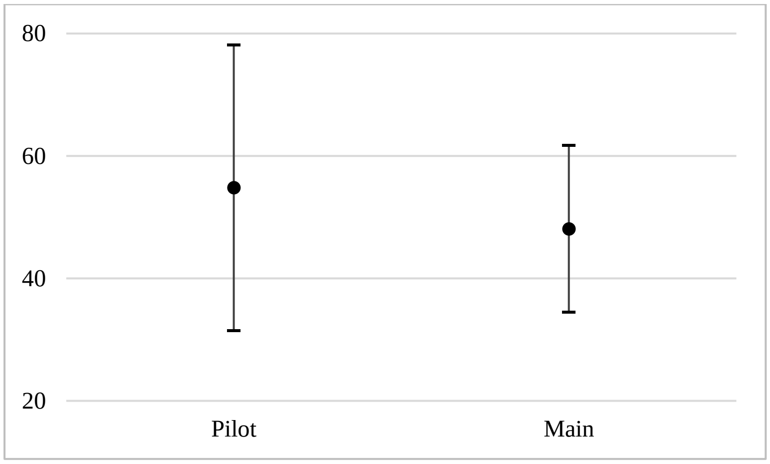


Figure 8: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for increase in renewable energy production using multinomial logit models

Firstly, Figure 8 presents the confidence intervals for increased renewable energy production. As the figure illustrates, there is a clear overlap between the pilot and main survey sample. The pilot CI is wider than the main, where the whole CI for the main survey is within the pilot CI. This clear overlap indicates that the difference in mean WTP between the pilot and main survey sample is not significant. Moreover, Figure 9 shows the two confidence intervals for the attribute number of new wind turbines.

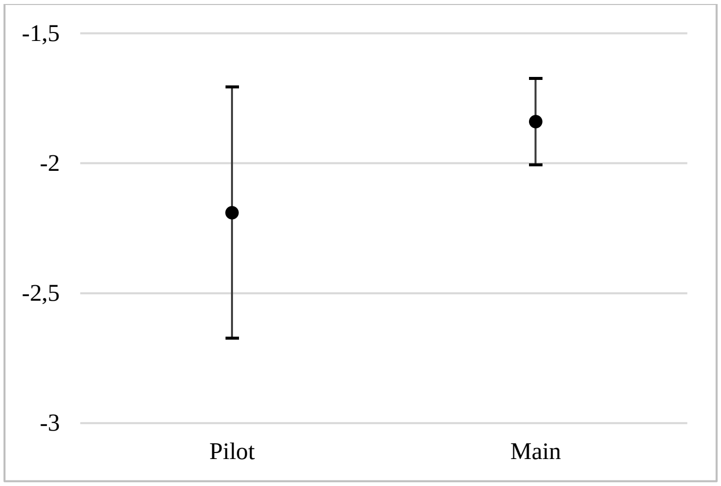


Figure 9: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for number of new wind turbines using multinomial logit models

Figure 9 shows an overlap between the two confidence intervals for number of new wind turbines. The CI for the pilot estimate is wider than the main CI for this attribute as well, with almost the whole main CI being within the pilot CI. This illustration shows a clear overlap between the estimates, indicating that there is no significant difference between the mean WTP of the pilot and main survey sample.

5.4.1.1. Mean willingness to pay-estimates multinomial logit models with interaction effects

Similarly, the mean willingness to pay is estimated using the coefficients for the sample dummy from the multinomial logit model with interaction effects. These are presented in Table 9.

Table 9: Mean WTP values for multinomial logit model with interaction effects

	Pilot		Main	
	WTP (s.e.)	95% CI	WTP (s.e.)	95% CI
Sample and increased renewable energy production	138.68** (23.91)	[91.82 – 185.53]	113.13** (22.31)	[69.41 –156.86]

Sample and number of new wind turbines	-1.84** (0.36)	[(-2.54) – (-1.13)]	-0.04 (0.31)	[(-0.65) – 0.57]

*Note: ** p < 0.01*

Firstly, when controlled for sociodemographic variables, we see that the mean WTP for increased renewable energy decreased between the pilot and main survey. Moreover, the mean WTP for new wind turbines increased, indicating a higher acceptance for land-based wind power expansion among the main survey sample. However, the mean WTP found for this attribute for the main sample is not significant at the 1% level nor the 5% level.

In chapter 5.3.1.1., the sample dummy coefficients presented in Table 6 indicated a significant difference between the pilot and main survey sample. To add to this conclusion, confidence intervals for the mean WTP estimates are compared to see if there is any overlap.

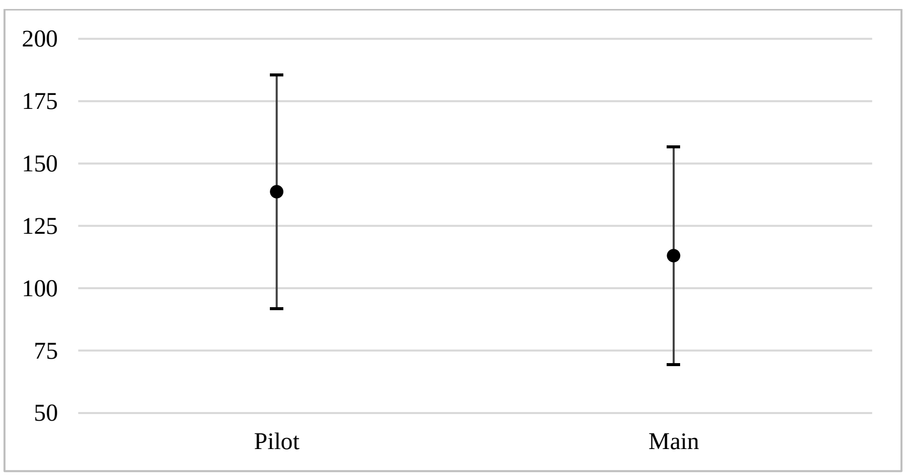


Figure 10: 95% confidence intervals for mean WTPs for increase in renewable energy production using a multinomial logit model with interaction effects

The confidence intervals of mean WTP for increase in renewable energy production are shown in Figure 10. The figure shows a clear overlap between the two estimates' confidence intervals, which indicates that there is no significant difference between the mean WTP estimates. This contradicts the sample interaction term's coefficient in Table 6, which indicated a difference between the two survey samples. Furthermore, Figure 11 shows the confidence intervals for mean WTP for number of new wind turbines.

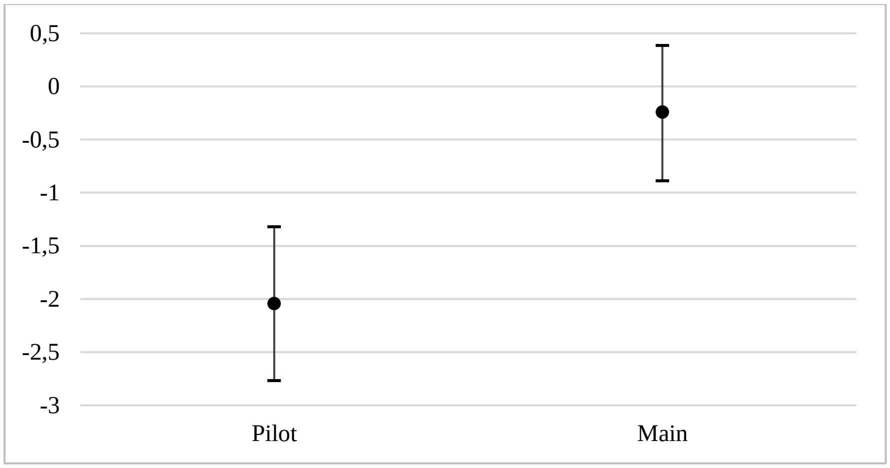


Figure 11: 95% confidence intervals for mean WTPs for number of new wind turbines using a multinomial logit model with interaction effects

Figure 11 shows no overlap between the two confidence intervals for the mean WTP. This indicates that there is a significant difference between the two estimates even when sociodemographic variables are controlled for through interaction effects. This corresponds with the conclusion drawn from the coefficient of the sample interaction term in Table 6.

5.4.2. Mean willingness to pay-estimates from the mixed logit models

Moving on, the estimated mean WTPs using the mixed logit models are presented in Table 10.

Table 10: Mean WTP estimates for the pilot and main survey sample using mixed logit coefficients

	Pilot		**Main**	
	WTP (s.e.)	95% CI	WTP (s.e.)	95% CI
Increase in renewable energy production	78.99** (10.86)	[57.70 – 100.27]	19.99* (9.61)	[1.17 – 38.82]
Number of new wind turbines	-3.19** (0.39)	[(-3.95) – (-2.42)]	-2.14** (0.13)	[(-2.41) – (-1.88)]

*Note: ** $p < 0.01$, * $p < 0.05$.*

Considering the attribute of increase in renewable energy production, the mean WTP is significant at the 1% level in the pilot sample and at the 5% level in the main sample. For the pilot, the WTP is approximately 79 per TWh. This differs from the WTP found in the main sample, which is instead estimated to be approximately 20 per TWh. The WTP for new wind turbines is negative, and thereby expresses the willingness to pay to avoid further installations. This was found to be approximately 3 per turbine for the pilot and approximately 2 for the main, both of which are significant at the 1% level. The lower WTP to avoid new wind power installations for the main pilot could indicate a higher acceptance of wind turbines for Norwegian households at the time when the main survey was sent out. Furthermore, we compare the confidence intervals of the mean WTPs to check for a significant difference between the pilot and main survey sample. These are presented visually in Figure 12 and Figure 13, where an overlap of the confidence intervals indicates no significant difference.

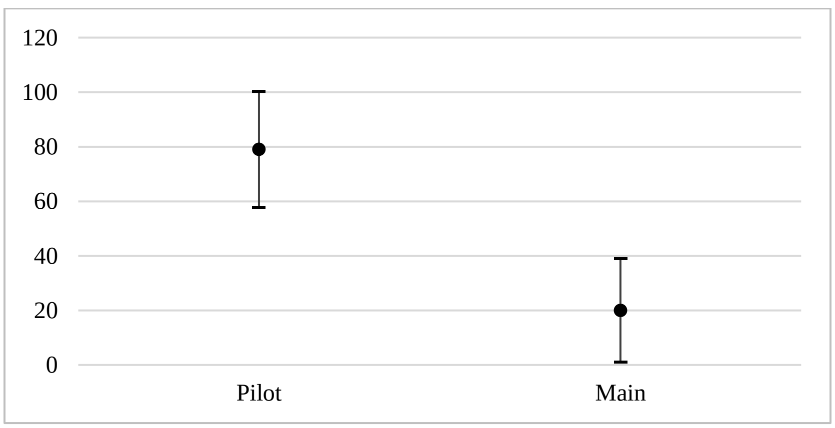


Figure 12: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for increase in renewable energy production using mixed logit models

Firstly, Figure 12 displays the confidence intervals for the mean WTP of increase in renewable energy production. As the figure shows, there is a gap between the two intervals and thereby no overlap. The lack of overlap can also be seen in Table 10, where the mean WTP of the pilot has a confidence interval reaching from 57.70 to 100.27, while the mean WTP of the main has a confidence interval of 1.17 to 38.82. The difference in the mean WTP for this attribute could possibly be explained by the adjustments of the increased annual grid fee attribute that happened between the pilot and main survey, as previously discussed. The lack of overlap implies that the two WTP estimates are significantly different at the 5% level. Secondly, Figure 13 displays the confidence intervals for mean WTP for number of new wind turbines.

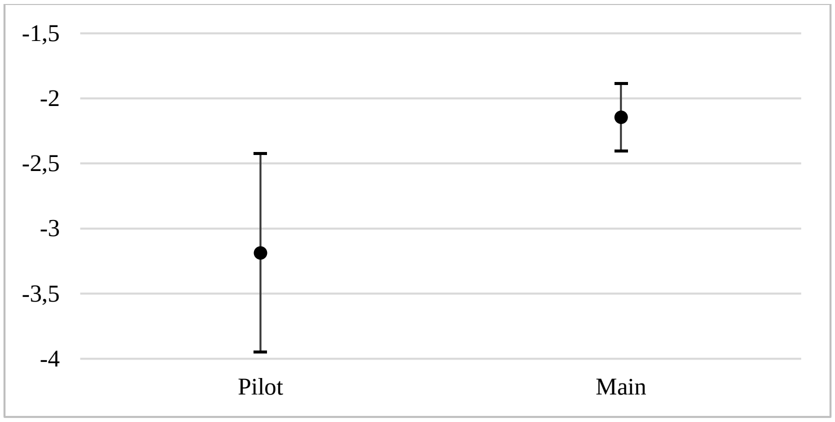


Figure 13: 95% confidence intervals for mean WTPs estimated from the pilot and main survey for number of new wind turbines using mixed logit models

From the figure, we see that the gap between the two confidence intervals is smaller compared to in Figure 12. However, there is no overlap between the confidence intervals for this attribute either. As presented in Table 10, the CI for the mean WTP of the pilot reaches from -3.95 to -2.42, compared to the CI of the main sample being -2.41 to -1.88. This implies that there is a significant difference between the mean WTP estimates of the pilot and main survey sample.

As Brouwer (2006) tested and confirmed, the WTP will change when an exogenous shock occurs, as proved by the WTP for good bathing water quality increasing after a period of extreme drought. Based on the findings of Brouwer (2006), the short-term effect of the war outbreak considered in this thesis would be a higher acceptance of wind power compared to before the outbreak, as a response to the energy uncertainty (Brouwer, 2006). However, the comparisons of the confidence intervals of the various logit models differ in whether they indicate a significant difference between the mean WTP of the pilot and main survey sample. For further investigation, chapter 5.5. will compare the survey samples using three additional approaches.

5.5. Comparison of the survey samples

5.5.1. Transfer errors of the mean WTP estimates

To further compare the mean WTP estimates, the transfer errors (TE) are calculated. These express the percentage difference between the mean WTP estimates of the pilot and main survey sample. Moreover, the percentage difference tells us the error margin of using the estimates from the pilot for benefit transfer to new studies after the war outbreak (Dugstad & Navrud, 2022). The TEs are calculated using the formula in Equation (4.1) in chapter 4.1.3.

Table 11: Transfer errors of mean WTP estimates

	Multinomial logit model	**Multinomial logit model with interaction effects**	**Mixed logit model**
Increase in renewable energy production	14%	23%	295%
Number of new wind turbines	19%	4617%	49%

Firstly, Table 11 shows that the estimated mean WTPs of the multinomial logit model have transfer errors of 14% and 19% for the two attributes. Both of these transfer errors are low, meaning that the estimated WTPs for the pilot survey sample are acceptable to transfer to studies done after the war outbreak. For the multinomial logit with interaction effects, the TEs are higher. The TE for increased renewable energy is still somewhat acceptable at 23%, while the TE for number of new wind turbines is 4617%. The latter is extremely high and indicates that the estimated WTP from the pilot is not appropriate to transfer to new studies. Lastly, the mixed logit model has a high TE for increased renewable energy production of 295%, implying that this WTP estimate is not acceptable for transferring to studies after the war outbreak. Moreover, the number of new wind turbines mean WTP also has a high TE of 49%, making it less acceptable for benefit transferring (Dugstad & Navrud, 2022).

5.5.2. Checking for significant difference in sociodemographic variables

As part of assessing the comparability of the pilot and main survey sample, it is necessary to see whether there is a significant difference in the sociodemographic variables. To do so, I have specified a logistic model with the sample dummy as dependent variable. The independent variables are the sociodemographic variables household income, age, gender, education, and region. After the logit regression, I test the joint significance of the sociodemographic variables for the sample dummy.

Table 12: Checking for significant difference in sociodemographic variables between the pilot and main survey sample

	Coefficient (s.e.)
Household income	-0.11482** (0.00630)
Age	-0.14368** (0.01115)
Gender	0.05404* (0.02191)
Education	0.00919 (0.00728)
Oslo and surrounding area	0.19010** (0.03017)
Sør-/Vestlandet	0.11557** (0.28555)
Trønderlag/Nord-Norge	0.08805** (0.03278)
Testing joint significance	
chi2(5)	583.37
Prob > chi2	0.00000

*Note: ** p < 0.01, * p < 0.05*

From the logistic regression we see that the coefficients for household income and age are significant at the 1% level, and that the coefficient for gender is significant at the 5% level. Moreover, education is not found to be significant, while all the region coefficients are significant at the 1% level. With most of the sociodemographic variables having a significant coefficient, thereby a significant effect on the sample dummy, there is indications that there are differences in the sociodemographic variables between the two survey samples. To test this, a chi-square test is performed. The testing is done with the null hypothesis that the sociodemographic variables have no significance on the sample dummy. In other words, the null hypothesis states that there is no difference in sociodemographic variables between the pilot and main survey sample. The p-value is presented as the value Prob > chi2. As we see from the test results in Table 12, the p-value is 0.0000. The null hypothesis of no significant difference is then rejected, and we conclude that there is evidence that the coefficients differ between the two survey samples. This will be accounted for in chapter 5.5.3 through propensity score matching.

5.5.3. Propensity score matching

To do propensity score matching of the two survey samples, we first need to estimate the individual-specific preferences. These are obtained from the mixed logit parameters. By dividing these by the increased annual grid fee coefficient, we obtain the individual-specific WTPs, which we use as the outcome variable for the propensity score matching. Moreover, the sample dummy is used as the treatment variable. The covariates used are the sociodemographic variables household income, age, gender, education, and region. As we want to compare for both attributes, we do the propensity score matching twice, using first the individual-specific WTPs for increase in renewable energy as the outcome, and then the individual-specific WTPs for number of new wind turbines. The results are presented in Table 13.

Table 13: Propensity score matching of individual-specific WTPs for the attributes

	Coefficient (s.e.)	**95% CI**
Increase in renewable energy production	-60.28338** (1.14634)	[(-62.53017) – (-58.03659)]

Number of new wind turbines	0.94716** (0.02843)	[0.89143 – 1.00289]
Number of observations	76 464	

*Note: ** p < 0.01*

The table shows the estimated average treatment effect (ATE) for the two attributes. As explained in chapter 4.2.2., ATE measures the difference in mean between treated and untreated units. Firstly, the ATE for increase in renewable energy production is approximately -60.28. This implies that the mean WTP for this attribute is 60.28 units lower in the main sample compared to the pilot sample. Moreover, we see that this treatment effect is significant at the 1% level, which indicates that there is a significant difference between the two survey samples. For the other attribute, new wind turbines, the estimated ATE is approximately 0.95. This tells us that respondents in the main sample had a mean WTP that is 0.95 units higher than the pilot sample. Additionally, this treatment effect is significant at 1% level, which implies that the difference in WTPs for new wind turbines is significant.

After doing propensity score matching, I want to check whether matching balanced the covariates. If a covariate is perfectly balanced, the standardized difference will be equal to zero and the variance ratio will be equal to one. The covariate balance summary is shown in Table 14.

Table 14: Covariate balance summary for the two attributes after propensity score matching.

	Standardized differences		**Variance ratio**	
	Raw	**Matched**	**Raw**	**Matched**
Household income	-0.26860	-0.04130	1.18820	1.18385
Age	-0.18565	0.03894	1.08634	0.93077
Gender	0.11929	-0.01508	1.02577	0.99850

Education	-0.05254	0.05184	1.10821	1.08115
Oslo and surrounding area	-0.07211	0.00071	1.08325	1.00732
Sør-/Vestlandet	0.01220	0.01511	1.01074	1.01350
Trønderlag/Nord-Norge	0.00029	-0.02921	1.00036	0.95330

	Raw	**Matched**
Number of observations	76 464	152 928
Treated observations	69 216	76 464
Control observations	7 248	76 464

As the covariate balance summary in Table 14 shows, propensity score matching improved the balance for household income, age, gender, and education. This is seen by the standardized differences being closer to zero after matching. Similarly, the variance ratios are closer to one for these four covariates. For the region covariates, we see that the matched standardized difference improved for Oslo and surrounding area after propensity score matching, but not for Sør-/Vestlandet and Trønderlag/Nord-Norge. These are both further away from the ideal values after matching. However, we see that the matched standardized difference is still quite close to zero, and that the variance ratio is not far off from being equal to one.

6. Discussion and conclusion

6.1. Research questions and hypotheses

The first research question asks if Norwegian households prefer more land-based wind power. Based on similar and previous studies included in the literature review, my hypothesis H1.1. was that Norwegian households do not prefer more land-based wind power. To investigate this, the mean WTP for the attribute new wind turbines was estimated in chapter 5.4. by using three different logit model specifications. These include a multinomial logit, multinomial logit with interaction effects, and a mixed logit. There is a total of six mean WTP values, with all three different logit models being used to measure the mean WTP from the pilot and main survey sample. All three model specifications led to negative WTPs for new wind turbines, indicating that Norwegian households are resistant to land-based wind power expansion and willing to pay to avoid installations.

The finding that Norwegian households are negative towards more land-based wind power corresponds with the findings in previous, similar studies, as covered in the literature review. Firstly, Dugstad et al. (2020) found that Norwegians have a low acceptance of land-based wind power, indicating that the mean WTP should be either low or negative. In a more recent study, Dugstad et al. (2023) once again found a general resistance towards wind power expansion. This is further supported by the findings of Linnerud et al. (2022), who found that Norwegians are more positive to offshore wind power installations than land-based installations. Finally, the study by Meyerhoff et al. (2010) from Germany also revealed resistance to both modernizing and new installations of land-based wind power turbines. The correspondence with findings in previous literature strengthens the results in this thesis of Norwegian households not preferring more land-based wind power, meaning that we cannot reject H1.1.

Moreover, the second research question asks if Norwegian households prefer an increased renewable energy production, without land-based wind power. Similar to my first research question, the hypothesis H2.1. that Norwegian households prefer an increased renewable energy production was also set based on findings in earlier studies. An answer to the research question was found by the estimations of mean WTP, as presented in chapter 5.4. For both the pilot and main survey sample, the estimated mean WTPs are positive when measured using all the three logit models. My findings indicate that Norwegian households do prefer the renewable energy production, without land-based wind power, to increase.

The previous studies in the literature review have findings that align with mine regarding preferences towards renewable energy production. In a study by Dugstad et al. (2020), they found that Norwegians have a positive willingness to pay for increased production of renewable energy in general, similar as to my findings. Moreover, Linnerud et al. (2022) found that Norwegians are concerned about how wind energy resources are managed due to, among other factors, benefits from knowing that environmental concerns are acknowledged. This environmental interest aligns with my finding that Norwegians do prefer an increased production of renewable energy production. Resultingly, we fail to reject H.2.1.

The third research question asks for the mean willingness to pay for increase in renewable energy production without land-based wind power and new wind turbines of Norwegian households, prior to the war outbreak. The answer to this research question is found by the mean WTP estimates from the pilot survey samples estimated throughout chapter 5.4., which are summarized in Table 15.

Table 15: Summary of mean WTP estimates from the pilot survey using the different logit models

	Multinomial logit model	**Multinomial logit model with interaction effects**	**Mixed logit model**
Increase in renewable energy production	54.83**	138.68**	78.99**
Number of new wind turbines	-2.19**	-1.84**	-3.19**

*Note: ** $p < 0.01$*

Firstly, all the estimated WTPs are significant at the 1% level. As shown in Table 15, there are somewhat big differences between the estimated WTPs for the first attribute, with the lowest estimate being 54.83 and the highest being 138.68. Overall, all three estimates show a high willingness to pay for increased renewable energy production.

When investigating the estimations for new wind turbines, all the WTPs are significant at the 1% level. The differences between the three estimations are smaller compared to the other attribute, with the lowest and highest WTPs being -3.19 and -1.84. In this sense, the three models are more consistent in their estimates for this attribute, with all three showing a slightly negative WTP for new wind turbines.

Additionally, research question four asks the mean willingness to pay for increase in renewable energy production without land-based wind power and new wind turbines of Norwegian households, but after the war outbreak. These are presented by the mean WTP estimates from the main survey samples measured in chapter 5.4, which are summarized in Table 16.

Table 16: Summary of mean WTP estimates from the main survey using the different logit models

	Multinomial logit model	**Multinomial logit model with interaction effects**	**Mixed logit model**
Increase in renewable energy production	48.12**	113.13**	19.99*
Number of new wind turbines	-1.84**	-0.04	-2.14**

*Note: ** p < 0.01, * p < 0.05*

For the attribute of increased renewable energy production, the estimations from the different models have somewhat big differences between them, as also seen for the estimations before the war outbreak as presented in Table 15. The mean WTPs for this attribute are all significant at the 5% level, with the estimates from the two multinomial logit models being significant even at the 1% level. All the estimates express a strong, positive WTP of Norwegian households for increased renewable energy production after the war outbreak. For number of new wind turbines, all the models estimated a slightly negative WTP. However, the estimation from the multinomial logit model with interaction effects, which is the lowest of the three estimates, was not found to be significant, while both the other estimates are significant at the 1% level. The overall conclusion to be drawn is that Norwegian households have a negative WTP for new wind turbines after the war outbreak, and that they are instead willing to pay to avoid installation of new wind turbines.

The fifth and final research question asks if there is a difference in the willingness to pay for increased renewable energy production without land-based wind power and new wind turbines, prior to and after the war outbreak. For this research question, my hypothesis H5.1. was that there is no difference. As revealed when answering the previous research questions, the estimated mean WTPs differed between the pilot and main survey samples. Comparison of the WTP estimates before and after the war outbreak implies that Norwegian households are less positive to increasing the renewable energy production and more accepting to land-based wind power expansion after the war outbreak.

However, to ensure that there is a significant difference between the two survey samples, several approaches were employed. Firstly, a multinomial logit model was specified with interaction effects to control for differences in sociodemographic variables in chapter 5.4.1.1. The aim was to assess the significance of the interaction term coefficients between the sample dummy and the attributes. Both interaction terms were found to be significant, which indicates a significant difference between the two survey samples even when controlled for sociodemographic differences.

Moreover, a logit model with the sample dummy as dependent variable and sociodemographic variables as independent variables was specified in chapter 5.5.2. The regression output showed that several of the coefficients were significant for the sample dummy, indicating that there is a difference between the pilot and mean survey sample. Furthermore, a chi-square test was performed with the null hypothesis of no differences between the two survey samples. The resulting p-value of zero led to the rejection of the null hypothesis, which strengthens the indication that there are differences between the survey samples.

To further investigate potential significant differences in sociodemographic variables between the two survey samples, propensity score matching was performed. The average treatment effect was found to be -60.28338 for increase in renewable energy production and 0.94716 for new wind turbines, both of which were significant at the 1% level. This provided further proof that there was a significant difference between the pilot and main survey sample.

Furthermore, transfer errors were calculated to investigate the error margin that would occur if the estimates from the pilot survey were transferred to studies conducted after the war outbreak. These are presented and discussed in chapter 5.5.1. The multinomial logit model estimates were found to have estimated the most acceptable WTPs for benefit transfer, while the other two models had significantly larger errors.

The tests were performed to check for a statistically significant difference between the pilot and main survey using various methods. With all the tests and approaches indicating a significant difference, I reject H4.1. of there being no difference between the pilot and main survey.

6.2. Implications of the findings

The motivation for comparing the pilot and main survey sample was to investigate whether the willingness to pay differed before and after the war outbreak. This would provide further insights to the discussion of whether estimates found through nonmarket valuation are stable when exogenous shocks occur. As concluded in chapter 6.1, my findings provide evidence that there is a significant difference between the pilot and main survey sample, thereby a significant difference before and after the war outbreak.

This result has implications for cost-benefit analyses. In such analyses, the researcher incorporates all costs and benefits of a policy in monetary terms to assess whether the benefits outweigh the costs. This often include nonmarket values, such as the ones estimated in this thesis through the stated preference method. As discussed, nonmarket value estimation is a time-consuming and often costly procedure, which has led to the practice of benefit transfer being an acceptable alternative. This allows researchers to transfer already found nonmarket value estimates from a previous study to their own. However, this requires some understanding of how stable and sensitive the estimations to be transferred are (Plummer, 2009).

As the studies in the literature review indicates, such estimations are found to be stable over time and when exogenous shocks occur, which is in favor of benefit transfer. On the contrary, my conclusion of a significant difference instead proposes that the WTP values are not stable. Consider a researcher conducting a cost-benefit analysis of the installation of new wind turbines in a specific region in Norway by using the WTP estimates found for the pilot survey sample. The WTP to avoid new wind turbines would be expressed as a cost, which would be set lower than what was measured after the war outbreak. Similarly, the benefit that Norwegian households receive from increased renewable energy would be set too high. This could lead to the conclusions of the cost-benefit analysis not being valid or representative for the Norwegian population, as the WTP values have changed (Plummer, 2009).

Furthermore, nonmarket values are often used by policy makers considering the implementation of new policies. In a similar sense as for researchers conducting cost-benefit analyses, using WTP values that are no longer valid will have consequences for policy makers. Consider a Norwegian policy maker deciding whether to install wind turbines on-shore or off-shore. If for instance land-based wind power expansion had been considered using the estimations found from the pilot survey sample, or by considering findings from cost-benefit analyses using the pilot survey sample, these would have differed significantly from the newer estimations from the main survey.

In addition to the implications my findings have for nonmarket valuation and cost-benefit analyses, they provide implications for expansion of wind power in the future. The finding of a WTP to avoid new wind turbines imply that Norwegian households are negative towards installing more land-based wind power. However, the positive and somewhat strong WTP for increased renewable energy production implies that Norwegians have an interest in renewable energy in general. An approach that could account for both these effects could be expansion through offshore wind power rather than land-based wind power. This could complement the estimated WTPs for increased renewable energy and new land-based wind turbines, and might avoid the conflict that could follow the expansion of land-based wind power as it impacts, among other aspects, aesthetic experience and wildlife (Jakobsen et al., 2019).

6.3. Content and construct validity

As explained in chapter 4.1.2.1., it is important to assess the validity of a study as it reflects how valid the estimated values are (Bishop & Boyle, 2017). Included in this assessment is the consideration of the content validity. This concerns the design of the discrete choice experiment survey. Generally, piloting a survey is beneficial to increase the content validity, as this can reveal potential errors (Johnston et al., 2017). When the survey used in this thesis was piloted, it revealed that the levels of the increased annual grid fee attribute were set too low. This led to the respondents of the pilot survey being presented with alternatives involving lower increases in their annual grid fee than in the main survey. Moreover, the adjustments in the increased annual grid fee attribute might have been part of the reason as to why the estimated mean WTP in the main survey sample is lower than for the pilot. This difference is thereby not necessarily caused by the war outbreak, but instead the alterations to the attribute.

Additionally, the construct validity refers to how the WTP estimates relate to previous literature. Among the hypotheses of this study was hypothesis H1.1. stating that Norwegian households do not prefer more land-based wind power. This hypothesis was set based on previous literature, where the researchers found a low acceptance of land-based wind power expansion. These studies include Dugstad et al. (2020), Dugstad et al. (2023), Linnerud et al. (2022), and Meyerhoff et al. (2010). Moreover, H2.1. stated that Norwegian households do prefer an increased renewable energy production, which is based on the results of Dugstad et al. (2020) and Linnerud et al. (2022). My results correspond well with what previous studies have concluded on, as I found a negative WTP for new wind turbines and a positive WTP for increased renewable energy production. This strengthens the construct validity of the study. However, my results show that there is a significant difference between the mean WTP before and after the outbreak. The hypothesis was that there was no significant difference, as previous literature had found WTP estimates to be stable and robust. These studies include Hynes et al. (2021), Lew and Wallmo (2017), and Brouwer et al. (2017). The lack of correspondence between my findings and the findings in the previous studies weakens the construct validity of my thesis.

6.4. Limitations

Before the concluding remarks, there are some limitations to this study that should be acknowledged. Firstly, the number of respondents of the pilot and main sample differ greatly. As explained in chapter 4.1.2.2., the pilot had 460 respondents, while the main survey had 3 412. Piloting usually involves less respondents as it is a testing procedure before the main survey (Champ, 2017). However, considering that the main survey sample consists of significantly more respondents than the pilot, the estimated WTPs for the main survey sample might be more representative for the Norwegian population compared to the WTPs of the pilot survey sample.

Moreover, the mixed logit models were adjusted with regards to long computer-run times. This led to the simulations being set to 100 Halton draws. However, earlier studies have found Halton draws to be preferable to random draws. As described in chapter 5.3.2., even 100 Halton draws were found to have a lower simulation error 1 000 random draws (Train, 2000). Despite this, I acknowledge that specifying the model to have a higher number of draws could have improved the results and given an even lower estimation error.

Additionally, the logit models were estimated with the attributes as linear. If the logit models included level-specific attributes instead, the results would open up for a more dynamic comparison as the models would estimate the samples' WTP for the respective levels of the attributes (Dugstad et al., 2021). However, because of the long computer-run times of the mixed logit, using level-specific attributes made the mixed logit models too difficult to run. Therefore, the multinomial logit models, both with and without interaction effects, and the mixed logit models, were specified with the attributes as linear.

6.5. Concluding remarks

The findings suggest that there are significant differences between the estimated preferences and WTPs of the pilot and main survey sample. However, some of the differences can possibly be explained by the increased annual grid fee attribute adjustments between the pilot and main survey, which could have made respondents more hesitant to choose alternatives involving expansion of either renewable energy without land-based wind power or number of new wind turbines. The finding of a bigger acceptance of new wind turbines in the main survey therefore strengthens the conclusion that Norwegian households were indeed more positive towards land-based wind power expansion after the war outbreak.

Although my findings corresponded with previous literature in terms of Norwegian households preferring more renewable energy production but not expansion of land-based wind power, my results deviate from similar studies regarding stability in estimated preferences. Hynes et al. (2021) estimated WTP and preferences before and after the pandemic and concluded with the estimations to be stable despite of the external shock of the pandemic. Similarly, Lew & Wallmo (2017) found no statistical difference of estimated WTP for endangered species protection when doing a test-retest with a 17-month difference.

However, Brouwer et al. (2017) surveyed the same sample three times using identical discrete choice experiment surveys and found significant differences in the preferences. This, however, corresponds with my findings. Similarly, Brouwer (2006) hypothesized and confirmed that the WTP for good bathing water quality would increase after a period of drought occurred, but that the underlying preferences would remain stable. This could potentially be the case for my findings as well, where the differences in WTPs prior to and after the war outbreak are shock responses rather than changes in Norwegian households' preferences.

Whether the found differences can be explained by the exogenous shock of the war outbreak and the effects it had on the energy market, is difficult to pinpoint. However, the differences indicate that the estimated WTPs are sensitive to shocks. Concluding that the found difference are proof of estimated WTPs not being stable over time would therefore be difficult. For future research, re-testing the main survey now that more time has passed from the war outbreak and comparing the responses to both the pilot and main survey sample, would be valuable to make better conclusions regarding the stability. Carrying out the survey once more could verify whether the differences are indications of changes in willingness to pay or simply shock reactions caused by the war outbreak.

7. References

Birkelund, H., Arnesen, F., Hole, J., Spilde, D., Jelsness, S., Aulie, F. H., & Haukeli, I. E. (2021). *Langsiktig kraftmarkedsanalyse 2021 – 2040*. Retrieved 11.11.2022 from https://publikasjoner.nve.no/rapport/2021/rapport2021_29.pdf

Bishop, R. C., & Boyle, K. J. (2017). Reliability and Validity in Nonmarket Valuation. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 463-497). Springer Nature.

Boyle, K. J. (2017). Contingent Valuation in Practice. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 83-131). Springer Nature.

Brouwer, R. (2006). Do stated preference methods stand the test of time? A test of the stability of contingent values and models for health risks when facing an extreme event. *Ecological Economics*, *60*(2), 399-406.

Brouwer, R., Logar, I., & Sheremet, O. (2017). Choice consistency and preference stability in test-retests of discrete choice experiment and open-ended willingness to pay elicitation formats. *Environmental and Resource Economics*, *68*, 729-751.

Brouwer, R., Pinto, R., Dugstad, A., & Navrud, S. (2022). The economic value of the Brazilian Amazon rainforest ecosystem services: A meta-analysis of the Brazilian literature. *PloS one*, *17*(5), e0268425.

Caliendo, M., & Kopeinig, S. (2008). Some practical guidance for the implementation of propensity score matching. *Journal of economic surveys*, *22*(1), 31-72.

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: methods and applications*. Cambridge university press.

Champ, P. A. (2017). Collecting Nonmarket Valuation Data. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 55-82). Springer Nature.

Dahl, E. L., Bevanger, K., Nygård, T., Røskaft, E., & Stokke, B. G. (2012). Reduced breeding success in white-tailed eagles at Smøla windfarm, western Norway, is caused by mortality and displacement. *Biological Conservation*, *145*(1), 79-85.

Dugstad, A. (2018). *Norwegian households' willingness to pay to preserve a global public good: the Amazon Rainforest*. Retrieved 29.03.2023 from https://nmbu.brage.unit.no/nmbu-xmlui/handle/11250/2571825

Dugstad, A., Grimsrud, K., Kipperberg, G., Lindhjem, H., & Navrud, S. (2020). Acceptance of wind power development and exposure–Not-in-anybody's-backyard. *Energy Policy*, *147*, 111780.

Dugstad, A., Grimsrud, K., Kipperberg, G., Lindhjem, H., & Navrud, S. (2023). Place attachment and preferences for wind energy – A value-based approach. *Energy Research & Social Science, [In press]*.

Dugstad, A., Grimsrud, K. M., Kipperberg, G., Lindhjem, H., & Navrud, S. (2021). Scope Elasticity of Willingness to pay in Discrete Choice

Experiments. *Environmental and Resource Economics*, *80*(1), 21-57.

Dugstad, A., & Navrud, S. (2022). The Reliability of Delphi Surveys and Benefit Transfer to Predict Outcomes of Contingent Valuation Estimates. *Land Economics*.

Fisher, B., Turner, R. K., & Morling, P. (2009). Defining and classifying ecosystem services for decision making. *Ecological Economics*, *68*(3), 643-653.

Flores, N. E. (2017). Conceptual Framework for Nonmarket Valuation. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 27-54). Springer Nature.

Graves, P. E. (2013). *Environmental economics: an integrated approach*. CRC Press.

Holmes, T. P., Adamowicz, W. L., & Carlsson, F. (2017). Choice Experiments. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 133-186). Springer Nature.

Holstad, M. (2022a). *Lavere kraftproduksjon*. Retrieved 11.11.2022 from https://www.ssb.no/energi-og-industri/energi/statistikk/elektrisitet/artikler/lavere-kraftproduksjon-190722

Holstad, M. (2022b). *Ny rekord for vindkraftproduksjonen*. Retrieved 11.11.2022 from https://www.ssb.no/energi-og-industri/energi/statistikk/elektrisitet/artikler/ny-rekord-for-vindkraftproduksjonen

Hynes, S., Armstrong, C. W., Xuan, B. B., Ankamah-Yeboah, I., Simpson, K., Tinch, R., & Ressurreição, A. (2021). Have environmental preferences and willingness to pay remained stable before and during the global Covid-19 shock? *Ecological Economics*, *189*, 107142.

Jakobsen, S. B., Mindeberg, S. K., Østenby, A. M., Dalen, E. V., Lundsbakken, M., Bjerkestrand, E., Haukeli, I. E., Berg, M., Johansen, F. B., Weir, D., Krogvold, J., Aabøe, A. M., Arnesen, F., Willumsen, V., Butt, B., Bølling, J. K., Solberg, K. G., Ramtvedt, A. N., Aass, H., . . . Engebrigtsen, K. H. (2019). *Nasjonal ramme for vindkraft*. NVE.

Johansson, P.-O. (1987). *The economic theory and measurement of environmental benefits*. Cambridge University Press.

Johnston, R. J., Boyle, K. J., Adamowicz, W., Bennett, J., Brouwer, R., Cameron, T. A., Hanemann, W. M., Hanley, N., Ryan, M., & Scarpa, R. (2017). Contemporary guidance for stated preference studies. *Journal of the Association of Environmental and Resource Economists*, *4*(2), 319-405.

Ledec, G. C., Rapp, K. W., & Aiello, R. G. (2011). *Greening the wind: environmental and social considerations for wind power development*. World Bank Publications.

Lew, D. K., & Wallmo, K. (2017). Temporal stability of stated preferences for endangered species protection from choice experiments. *Ecological Economics*, *131*, 87-97.

Liebe, U., Hundeshagen, C., Beyer, H., & von Cramon-Taubadel, S. (2016). Context effects and the temporal stability of stated preferences. *Social science research*, *60*, 135-147.

Lindhjem, H., Dugstad, A., Grimsrud, K., Kipperberg, G., & Navrud, S. (2022). Medvind for landbasert vindkraft eller stille før ny storm? *Samfunnsøkonomene*(5), 48-60.

Linnerud, K., Dugstad, A., & Rygg, B. J. (2022). Do people prefer offshore to onshore wind energy? The role of ownership and intended use. *Renewable and Sustainable Energy Reviews*, *168*, 112732.

Loomis, J. (2011). What's to know about hypothetical bias in stated preference valuation studies? *Journal of economic surveys*, *25*(2), 363-370.

Mariel, P., Hoyos, D., Meyerhoff, J., Czajkowski, M., Dekker, T., Glenk, K., Jacobsen, J. B., Liebe, U., Olsen, S. B., & Sagebiel, J. (2021). *Environmental valuation with discrete choice experiments: Guidance on design, implementation and data analysis*. Springer Nature.

McFadden, D. L. (1974). Conditional logit analysis of qualitative choice behavior. In P. Zarembka (Ed.), *Frontiers in econometrics* (pp. 105-142). Academic Press.

Melo, E., Müller, D., & Schlotter, R. (2023). *A Distributionally Robust Random Utility Model*.

Meyerhoff, J., Ohl, C., & Hartje, V. (2010). Landscape externalities from onshore wind power. *Energy Policy*, *38*(1), 82-92.

Millennium Ecosystem Assessment. (2005). *Ecosystems and Human Well-being: Biodiversity Synthesis*. World Resources Institute.

NVE. (2022). Data for utbygde vindkraftverk i Norge. In. https://www.nve.no/energi/energisystem/vindkraft/data-for-utbygde-vindkraftverk-i-norge/.

Olje- og energidepartementet. (2020). *Vindkraft på land: Endringer i konsesjonsbehandlingen*. ((Meld. St. 28 (2019-2020))). Retrieved from https://www.regjeringen.no/no/dokumenter/meld.-st.-28-20192020/id2714775/

Olje- og energidepartementet. (2022). *Oppnevning av en energikommisjon*. https://www.regjeringen.no/contentassets/4c4553f37b544db48dc18a24cecf3a91/kgl.res-dato-oppnevning-av-en-energikommisjon-l1306203.pdf

Pascual, U., Muradian, R., Brander, L., Gómez-Baggethun, E., Martín-López, B., Verma, M., Armsworth, P., Christie, M., Cornelissen, H., & Eppink, F. (2010). The economics of valuing ecosystem services and biodiversity. *The economics of ecosystems and biodiversity: Ecological and economic foundations*, 183-256.

Petrović, E. K., Vale, B., & Zari, M. P. (2017). Materials for a Healthy, Ecological and Sustainable Built Environment. In: Elsevier.

Plummer, M. L. (2009). Assessing benefit transfer for the valuation of ecosystem services. *Frontiers in Ecology and the Environment*, *7*(1), 38-45.

Rosenbaum, P. R., & Rubin, D. B. (1983). The central role of the propensity score in observational studies for causal effects. *Biometrika*, *70*(1), 41-55.

Rosenberger, R. S., & Loomis, J. B. (2017). Benefit Transfer. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 431-462). Springer Nature.

Schirpke, U. (2022). Ecosystem Services and Sustainable Development in the European Alps: Spatial Patterns and Mountain-Lowland Relationships. *Ieva Misiune Daniel Depellegrin*, 127.

Segerson, K. (2017). Valuing Environmental Goods and Services: An Economic Perspective. In P. A. Champ, K. J. Boyle, & T. C. Brown (Eds.), *A Primer on Nonmarket Valuation* (Vol. 13, pp. 10-25). Springer Nature.

Skourtos, M., Kontogianni, A., & Harrison, P. (2010). Reviewing the dynamics of economic values and preferences for ecosystem goods and services. *Biodiversity and conservation*, *19*(10), 2855-2872.

SSB. (2022a). *Personer 16 år og over, etter måleenhetvariabel, region, utdanningsnivå, statistikkvariabel og år*. Retrieved 18.04.2023 from https://www.ssb.no/statbank/table/08921/tableViewLayout1/

SSB. (2022b). *Registrerte inntekter for hushald, etter hushaldstype, statistikkvariabel og år*. Retrieved 21.04.2023 from https://www.ssb.no/statbank/table/07780/tableViewLayout1/

SSB. (2023a). *Befolkning, etter måleenhetvariabel, alder, statistikkvariabel og år*. Retrieved 13.04.2023 from https://www.ssb.no/statbank/table/07459/tableViewLayout1/

SSB. (2023b). *Befolkning, etter måleenhetvariabel, kjønn, statistikkvariabel og år*. Retrieved 13.04.2023 from https://www.ssb.no/statbank/table/07459/tableViewLayout1/

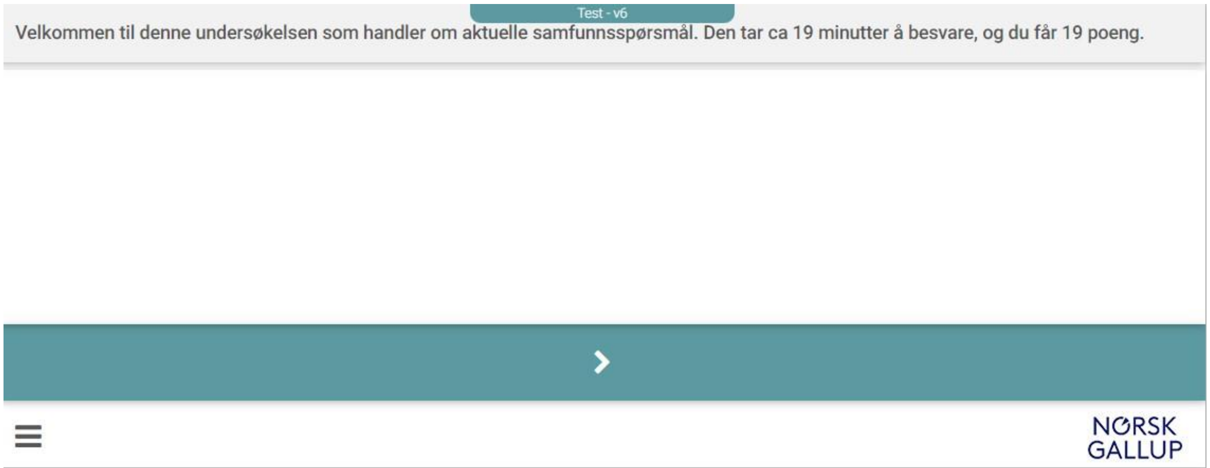
Train, K. (2000). Halton sequences for mixed logit.

Train, K. E. (2009). *Discrete choice methods with simulation*. Cambridge university press.

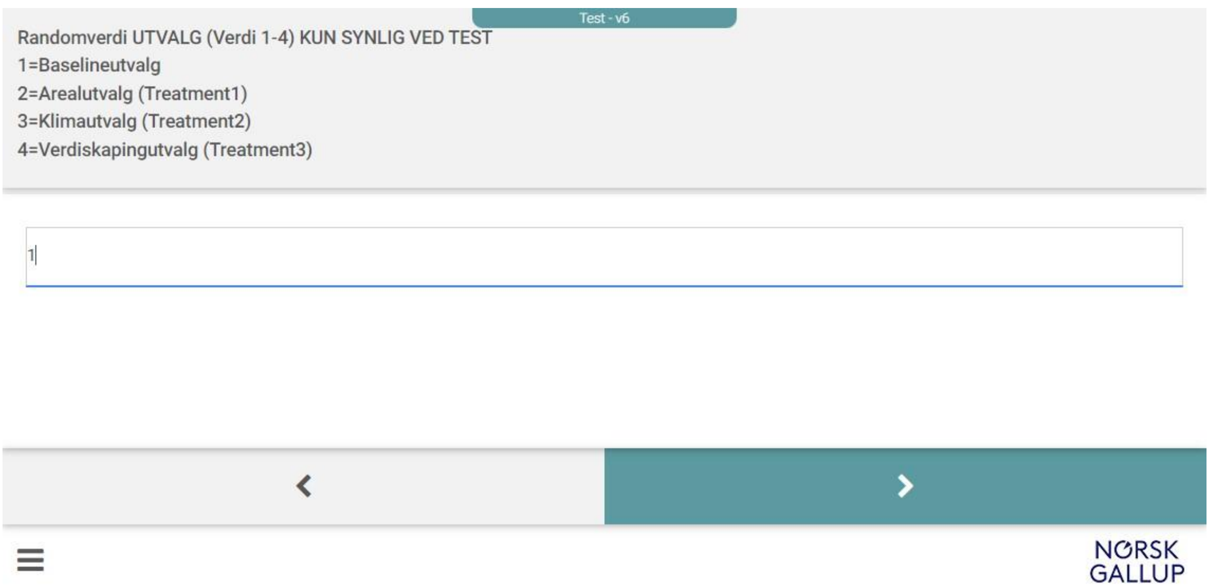
Tunçel, T., & Hammitt, J. K. (2014). A new meta-analysis on the WTP/WTA disparity. *Journal of Environmental Economics and Management*, *68*(1), 175-187.

Welling, M., Zawojska, E., & Sagebiel, J. (2022). Information, consequentiality and credibility in stated preference surveys: A choice experiment on climate adaptation. *Environmental and Resource Economics*, *82*(1), 257-283.

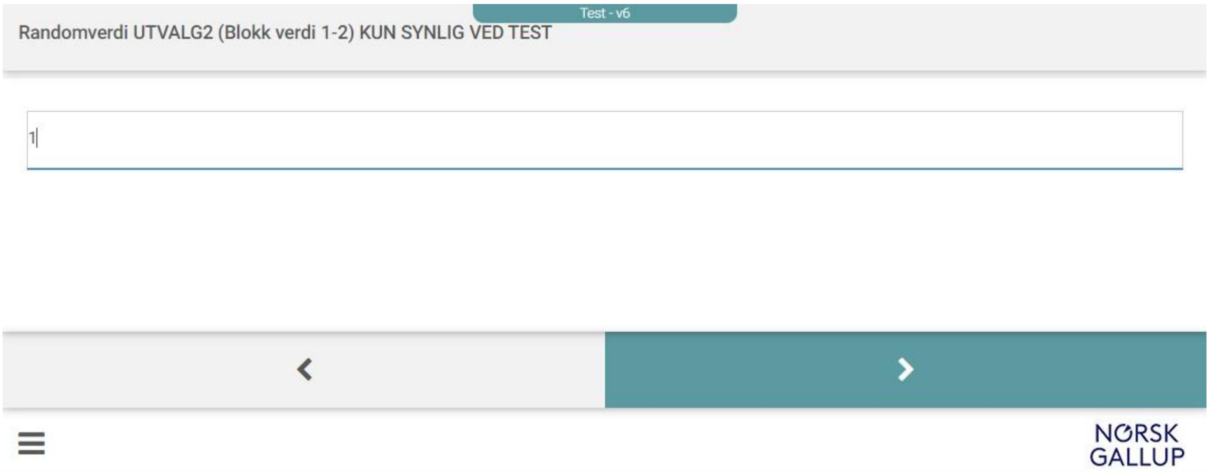
Appendix I: Main survey



UTVALG, randomisering av eksperimentelt utvalg:



dimVBYD, randomisering av blokk:



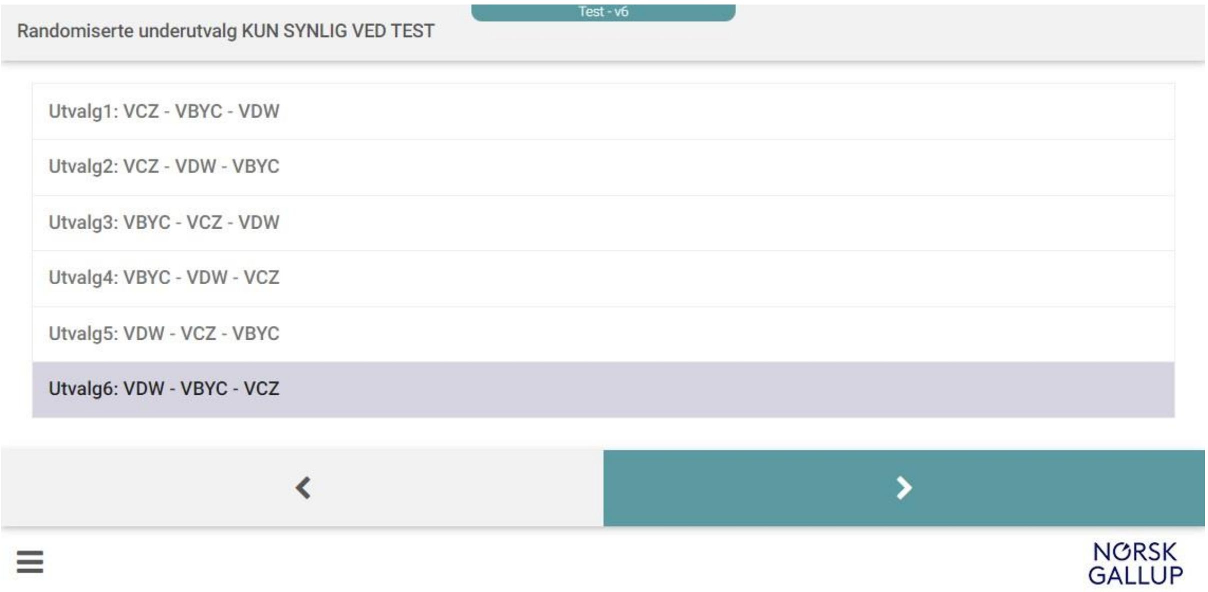
dimValgkort*, randomisering av rekkefølge av valgkort:

Test - v6

Valgkort som er presentert

1Baselineutvalg: Blokk1: Valgkort1	1Baselineutvalg: Blokk1: Valgkort2	1Baselineutvalg: Blokk1: Valgkort3
1Baselineutvalg: Blokk1: Valgkort4	1Baselineutvalg: Blokk1: Valgkort5	1Baselineutvalg: Blokk1: Valgkort6
1Baselineutvalg: Blokk1: Valgkort7	1Baselineutvalg: Blokk1: Valgkort8	1Baselineutvalg: Blokk2: Valgkort1
1Baselineutvalg: Blokk2: Valgkort2	1Baselineutvalg: Blokk2: Valgkort3	1Baselineutvalg: Blokk2: Valgkort4
1Baselineutvalg: Blokk2: Valgkort5	1Baselineutvalg: Blokk2: Valgkort6	1Baselineutvalg: Blokk2: Valgkort7
1Baselineutvalg: Blokk2: Valgkort8	2Arealutvalg: Blokk1: Valgkort1	2Arealutvalg: Blokk1: Valgkort2
2Arealutvalg: Blokk1: Valgkort3	2Arealutvalg: Blokk1: Valgkort4	2Arealutvalg: Blokk1: Valgkort5
2Arealutvalg: Blokk1: Valgkort6	2Arealutvalg: Blokk1: Valgkort7	2Arealutvalg: Blokk1: Valgkort8
2Arealutvalg: Blokk2: Valgkort1	2Arealutvalg: Blokk2: Valgkort2	2Arealutvalg: Blokk2: Valgkort3
2Arealutvalg: Blokk2: Valgkort4	2Arealutvalg: Blokk2: Valgkort5	2Arealutvalg: Blokk2: Valgkort6
2Arealutvalg: Blokk2: Valgkort7	2Arealutvalg: Blokk2: Valgkort8	3Klimautvalg: Blokk1: Valgkort1
3Klimautvalg: Blokk1: Valgkort2	3Klimautvalg: Blokk1: Valgkort3	3Klimautvalg: Blokk1: Valgkort4
3Klimautvalg: Blokk1: Valgkort5	3Klimautvalg: Blokk1: Valgkort6	3Klimautvalg: Blokk1: Valgkort7
3Klimautvalg: Blokk1: Valgkort8	3Klimautvalg: Blokk2: Valgkort1	3Klimautvalg: Blokk2: Valgkort2
3Klimautvalg: Blokk2: Valgkort3	3Klimautvalg: Blokk2: Valgkort4	3Klimautvalg: Blokk2: Valgkort5
3Klimautvalg: Blokk2: Valgkort6	3Klimautvalg: Blokk2: Valgkort7	3Klimautvalg: Blokk2: Valgkort8
4Verdiskapingutvalg: Blokk1: Valgkort1	4Verdiskapingutvalg: Blokk1: Valgkort2	4Verdiskapingutvalg: Blokk1: Valgkort3
4Verdiskapingutvalg: Blokk1: Valgkort4	4Verdiskapingutvalg: Blokk1: Valgkort5	4Verdiskapingutvalg: Blokk1: Valgkort6
4Verdiskapingutvalg: Blokk1: Valgkort7	4Verdiskapingutvalg: Blokk1: Valgkort8	4Verdiskapingutvalg: Blokk2: Valgkort1
4Verdiskapingutvalg: Blokk2: Valgkort2	4Verdiskapingutvalg: Blokk2: Valgkort3	4Verdiskapingutvalg: Blokk2: Valgkort4
4Verdiskapingutvalg: Blokk2: Valgkort5	4Verdiskapingutvalg: Blokk2: Valgkort6	4Verdiskapingutvalg: Blokk2: Valgkort7
4Verdiskapingutvalg: Blokk2: Valgkort8	1Baselineutvalg: Blokk1: Valgkort9	1Baselineutvalg: Blokk2: Valgkort9
2Arealutvalg: Blokk1: Valgkort9	2Arealutvalg: Blokk2: Valgkort9	3Klimautvalg: Blokk1: Valgkort9
3Klimautvalg: Blokk2: Valgkort9	4Verdiskapingutvalg: Blokk1: Valgkort9	4Verdiskapingutvalg: Blokk2: Valgkort9

UTVALG3, randomisering av rekkefølge på skala VCZ, VBYC og VDW



VBYD, randomisering av om skala VDW, VBYC og VCZ kommer etter VBD eller etter VCY:

General survey:

VBC*:

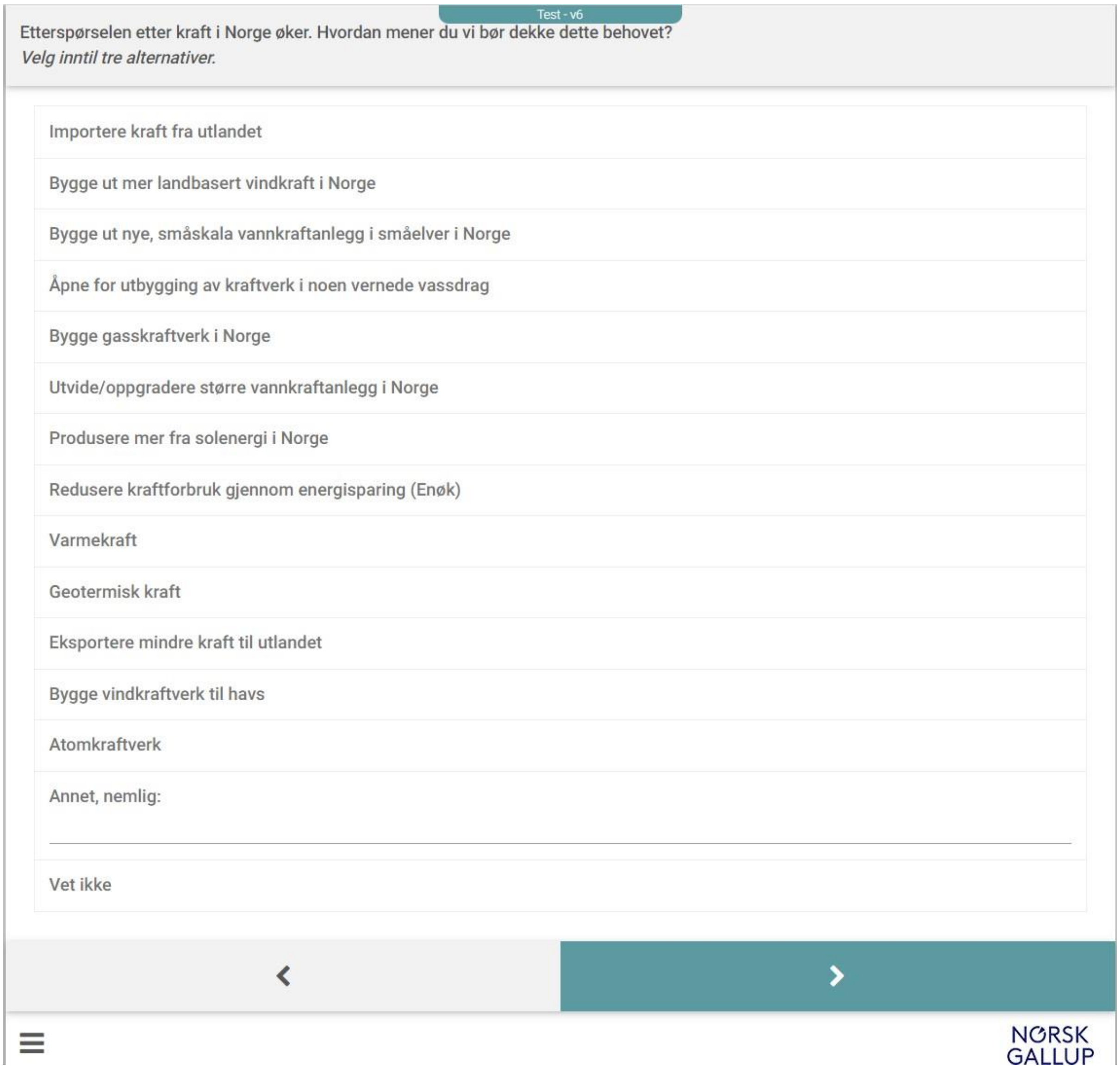
Test - v6

Hvilke politiske saker mener du er viktigst å prioritere i offentlige budsjetter?
Velg inntil to viktigste saker.

- Arbeidsplasser og økonomisk omstilling
- Utdanning og forsking
- Samferdsel og annen infrastruktur
- Politi og forsvar
- Idrett og kultur
- Helse og eldreomsorg
- Klimatiltak (utslippsreduksjoner og tilpasning)
- Asyl og integrering
- Vern av natur og biologisk mangfold
- Annet, nemlig:

NORSK GALLUP

VBD*:


Test - v6

Etterspørselen etter kraft i Norge øker. Hvordan mener du vi bør dekke dette behovet?
Velg inntil tre alternativer.

- Importere kraft fra utlandet
- Bygge ut mer landbasert vindkraft i Norge
- Bygge ut nye, småskala vannkraftanlegg i småelver i Norge
- Åpne for utbygging av kraftverk i noen vernede vassdrag
- Bygge gasskraftverk i Norge
- Utvide/oppgradere større vannkraftanlegg i Norge
- Produsere mer fra solenergi i Norge
- Redusere kraftforbruk gjennom energisparing (Enøk)
- Varmekraft
- Geotermisk kraft
- Eksportere mindre kraft til utlandet
- Bygge vindkraftverk til havs
- Atomkraftverk
- Annet, nemlig:
- Vet ikke

NORSK GALLUP

Test - v6

Denne undersøkelsen gjennomføres av forskere ved Statistisk Sentralbyrå, Menon Economics, Norges Miljø- og Biovitenskapelige Universitet og Universitetet i Stavanger. Temaet er produksjon av fornybar energi i Norge.

Resultatene vil inngå i myndighetenes informasjonsgrunnlag for beslutninger om fremtidige konsesjoner og utbygginger. Din mening er derfor viktig for disse beslutningene.

NORSK GALLUP

Test - v6

Hva mener du om utbygging av fornybar kraftproduksjon i Norge?

Du vil nå bli bedt om å ta stilling til flere valgsituasjoner. Hver valgsituasjon har to alternative planer du kan velge mellom:
- Det første alternativet har økning i fornybar kraftproduksjon i Norge frem mot 2040, uten ytterligere utbygging av landbasert vindkraft.
- Det andre alternativet har økning i fornybar kraftproduksjon i Norge frem mot 2040, med landbasert vindkraft som bidrar til en ytterligere økning i fornybar kraftproduksjon sammenliknet med det første alternativet.

For hver valgsituasjon ber vi deg om å velge det alternativet du liker best.

Før du velger, vennligst les nøye gjennom informasjonen som kommer i de neste skjermbildene.

NORSK GALLUP

Baseline-utvalg:

Test - v6

Om de ulike valgalternativene:

Hver av de to alternative planene består av seks egenskaper som til sammen beskriver produksjon av fornybar energi i Norge fremover. Disse egenskapene er:

1. Økningen i produksjon av fornybar kraft fra alle fornybare kilder utenom landbasert vindkraft
2. Antall nye landbaserte vindturbiner («vindmøller»)
3. Areal til nye landbaserte vindturbiner
4. Reduksjon i klimagassutslipp som de nye landbaserte vindturbinene bidrar til
5. Verdiskaping og arbeidsplasser fra nye landbaserte vindturbiner
6. Endring i årlig nettleie i kroner for husstanden din

Nivåene på disse egenskapene vil variere for de ulike alternativene og valgsituasjonene. Vi vil nå informere kort om hver enkelt egenskap.

NORSK GALLUP

Areal-utvalg:

Test - v3

Om de ulike valgalternativene:

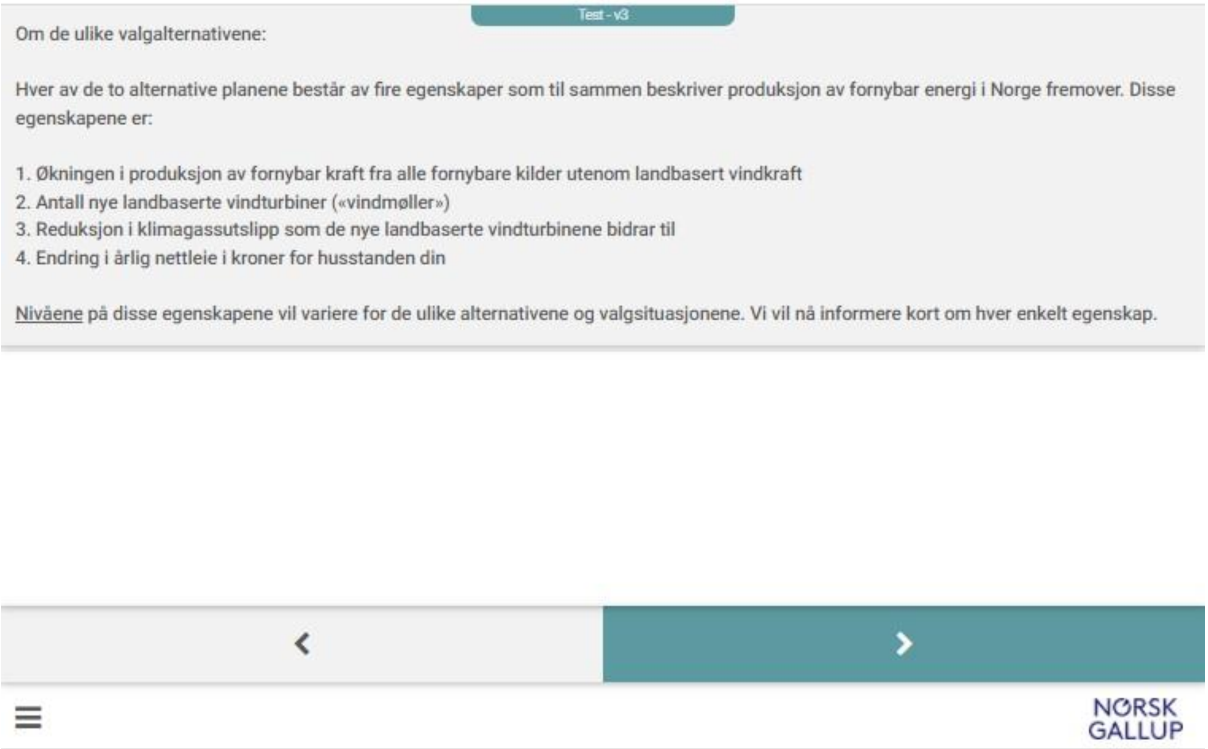
Hver av de to alternative planene består av fire egenskaper som til sammen beskriver produksjon av fornybar energi i Norge fremover. Disse egenskapene er:

1. Økningen i produksjon av fornybar kraft fra alle fornybare kilder utenom landbasert vindkraft
2. Antall nye landbaserte vindturbiner («vindmøller»)
3. Areal til nye landbaserte vindturbiner
4. Endring i årlig nettleie i kroner for husstanden din

Nivåene på disse egenskapene vil variere for de ulike alternativene og valgsituasjonene. Vi vil nå informere kort om hver enkelt egenskap.

NORSK GALLUP

Klima-utvalg:



Test - v3

Om de ulike valgalternativene:

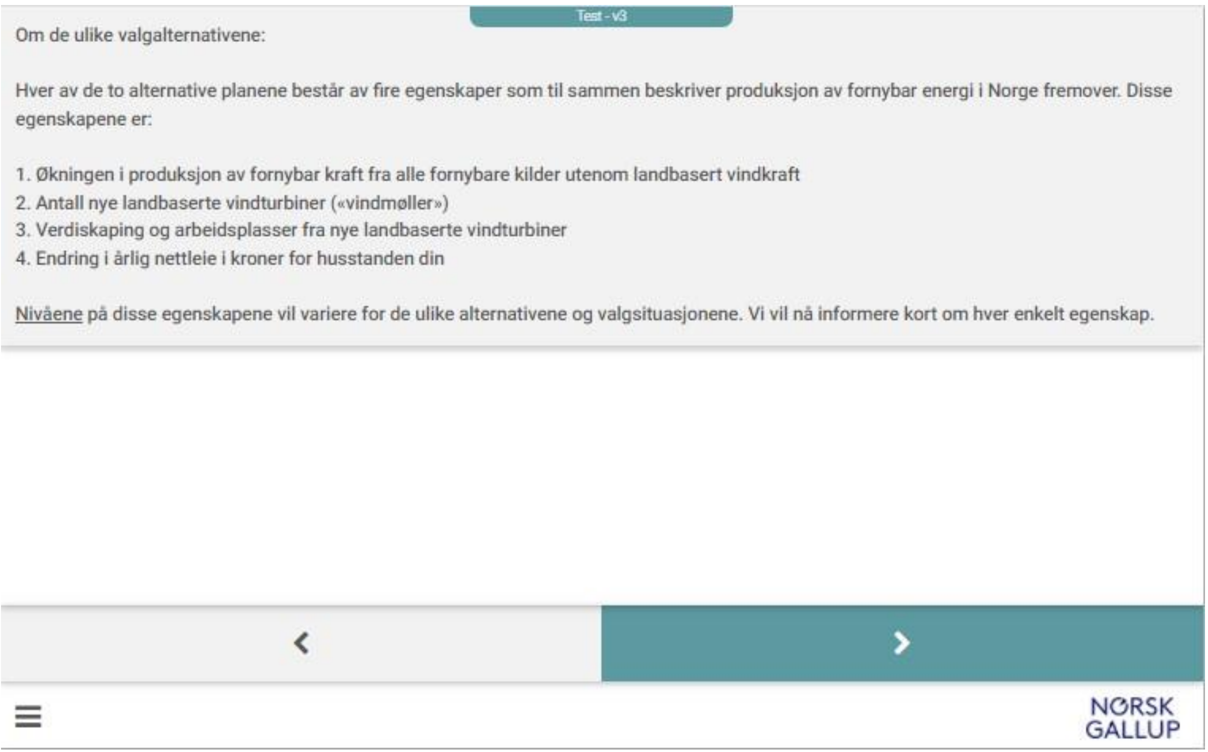
Hver av de to alternative planene består av fire egenskaper som til sammen beskriver produksjon av fornybar energi i Norge fremover. Disse egenskapene er:

1. Økningen i produksjon av fornybar kraft fra alle fornybare kilder utenom landbasert vindkraft
2. Antall nye landbaserte vindturbiner («vindmøller»)
3. Reduksjon i klimagassutslipp som de nye landbaserte vindturbinene bidrar til
4. Endring i årlig nettleie i kroner for husstanden din

Nivåene på disse egenskapene vil variere for de ulike alternativene og valgsituasjonene. Vi vil nå informere kort om hver enkelt egenskap.

NORSK GALLUP

Verdi-utvalg:



Test - v3

Om de ulike valgalternativene:

Hver av de to alternative planene består av fire egenskaper som til sammen beskriver produksjon av fornybar energi i Norge fremover. Disse egenskapene er:

1. Økningen i produksjon av fornybar kraft fra alle fornybare kilder utenom landbasert vindkraft
2. Antall nye landbaserte vindturbiner («vindmøller»)
3. Verdiskaping og arbeidsplasser fra nye landbaserte vindturbiner
4. Endring i årlig nettleie i kroner for husstanden din

Nivåene på disse egenskapene vil variere for de ulike alternativene og valgsituasjonene. Vi vil nå informere kort om hver enkelt egenskap.

NORSK GALLUP

General survey:

Test - v6

EGENSKAP 1:

Økning i TWh fornybar kraftproduksjon utenom landbasert vindkraft

I 2020 ble det produsert 152 TWh (terawattimer) kraft i Norge: 92 prosent vannkraft, 7 prosent vindkraft og 1 prosent annet. 80 prosent av kraften ble brukt i Norge, mens resten ble eksportert.
Kraftforbruket vil øke på grunn av befolkningsvekst, ny industri og mer elektrisk transport framover.

Norges vassdrags- og energidirektorat (NVE) beregner at Norges kraftproduksjon kan øke med 10-40 TWh innen 2040. Ny kraftproduksjon vil kunne komme fra:
* Mer nedbør til vannkraftverkene
* Tekniske oppgraderinger av eksisterende vannkraftanlegg
* Mer småskala vannkraft
* Andre fornybare energikilder som solenergi og noe havbasert vindkraft
* Energisparende tiltak som frigjør kraft til annen bruk

NORSK GALLUP

VBK:

Test - v6

EGENSKAP 1:

Økning i TWh fornybar kraftproduksjon utenom landbasert vindkraft

I de følgende valgsituasjonene vil økning i fornybar kraftproduksjon fra kilder *utenom landbasert vindkraft* i Norge variere fra 10 til 40 TWh.

Hvordan stiller du deg generelt til økt kraftproduksjon i Norge fra de kildene vi nettopp nevnte?

- 1 Svært negativ
- 2
- 3
- 4 Nøytral
- 5
- 6
- 7 Svært positiv

NORSK GALLUP

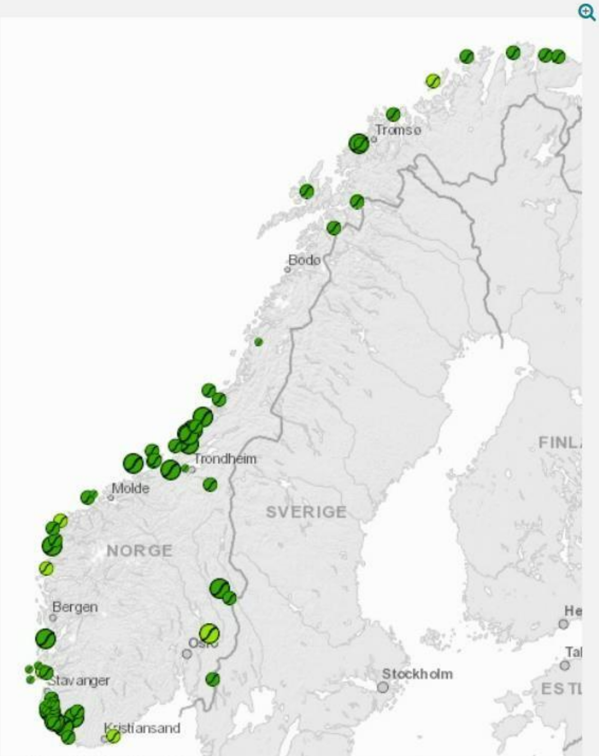
Test - v6

EGENSKAP 2:

Antall nye landbaserte vindturbiner i Norge

I 2022 er det omtrent 1350 vindturbiner i drift på land i Norge fordelt på 61 vindkraftverk. Disse har en samlet produksjon på 14 TWh (10 prosent av dagens kraftforbruk i Norge).

Kartet nedenfor viser vindkraftverk i Norge som er utbygd og under utbygging.



Trykk på bildet for å forstørre.

VBM:

Test - v6

EGENSKAP 2:

Antall nye landbaserte vindturbiner i Norge

Politikerne vurderer om det skal bygges ytterligere landbasert vindkraft. Da kan Norges fornybare kraftproduksjonen øke ytterligere med 10-30 TWh frem mot 2040. Med dagens teknologi innebærer 30 TWh omtrent 2100 nye vindturbiner.

Før du fikk denne informasjonen, trodde du antallet vindturbiner i drift i Norge i 2022 (1350 stykk) var...:

.. lavere

.. høyere

.. omtrent dette antallet

Jeg hadde liten/ ingen forhåndskunnskap

NORSK GALLUP

Test - v6

I de følgende valgsituasjonene vil antall nye vindturbiner som bygges i Norge, utover de 1350 som er i drift i 2022, variere fra 0 til 2100. Dette vil gi ytterliggere økning i samlet mengde fornybar kraftproduksjon.

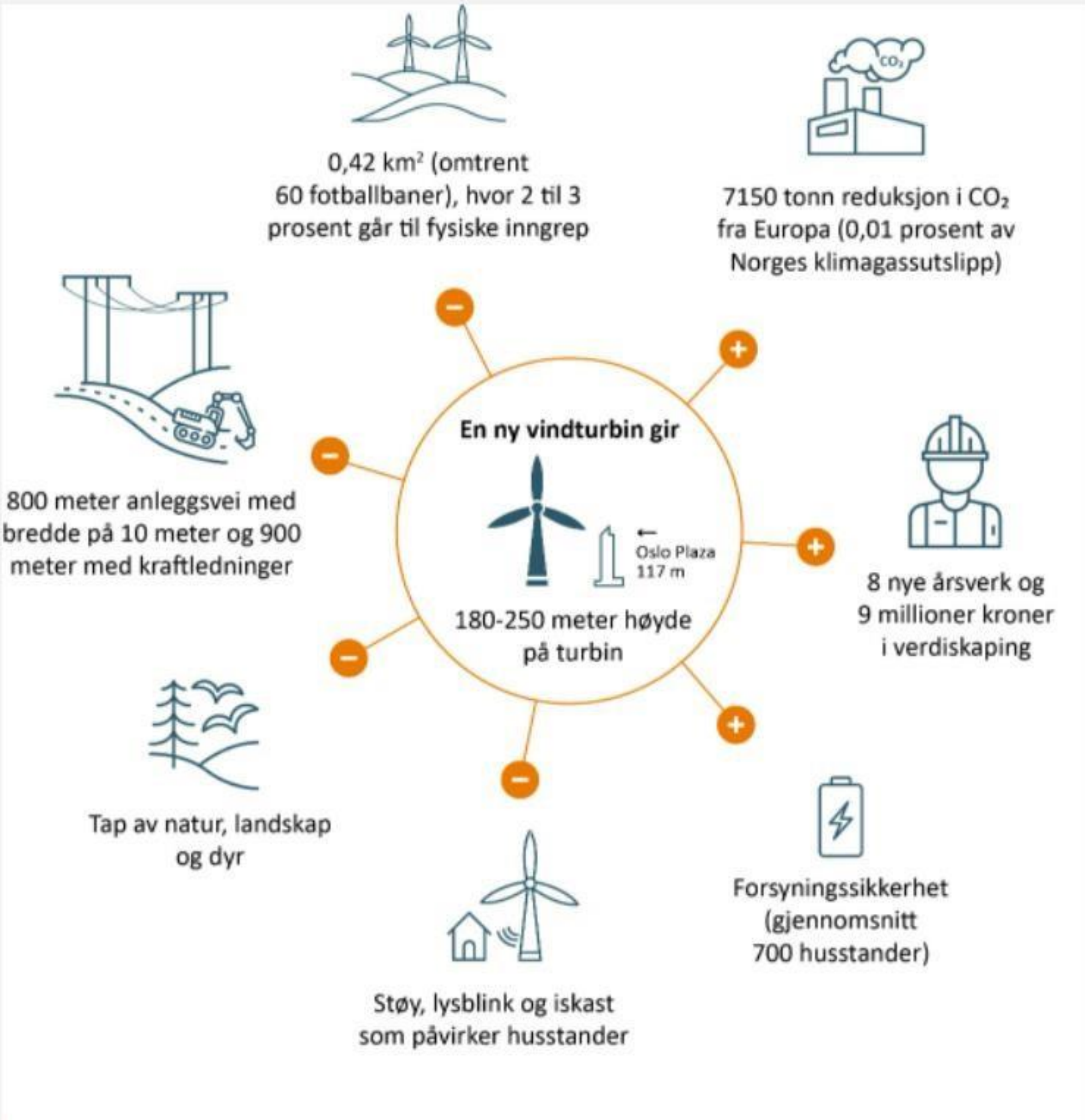
NORSK GALLUP

Test - v6

EGENSKAP 2:

Antall nye landbaserte vindturbiner i Norge

Se nøye på figuren nedenfor. Den oppsummerer både positive og negative effekter fra en typisk vindturbin i Norge.



Vennligst se nøye på bilde. Du kan trykke på bildet for å forstørre det.
Du vil få muligheten til å gå videre om 5 sekunder

NORSK GALLUP

Test - v6

EGENSKAP 2:

Antall nye landbaserte vindturbiner i Norge

Bildene nedenfor viser eksempler på hvordan vindkraft påvirker naturen i form av nye anleggsveier, flatehogst og skjæringer i fjellet.

Trykk på bildet for å forstørre.

NORSK GALLUP

VBR:

Test - v6

EGENSKAP 2:

Antall nye landbaserte vindturbiner i Norge

Har du noen gang vært inne på et vindkraftanlegg, det vil si inne på et område der vindturbiner er plassert?

- Ja
- Nei
- Vet ikke / Husker ikke

NORSK GALLUP

Test - v6

EGENSKAP 2:

Antall nye landbaserte vindturbiner i Norge

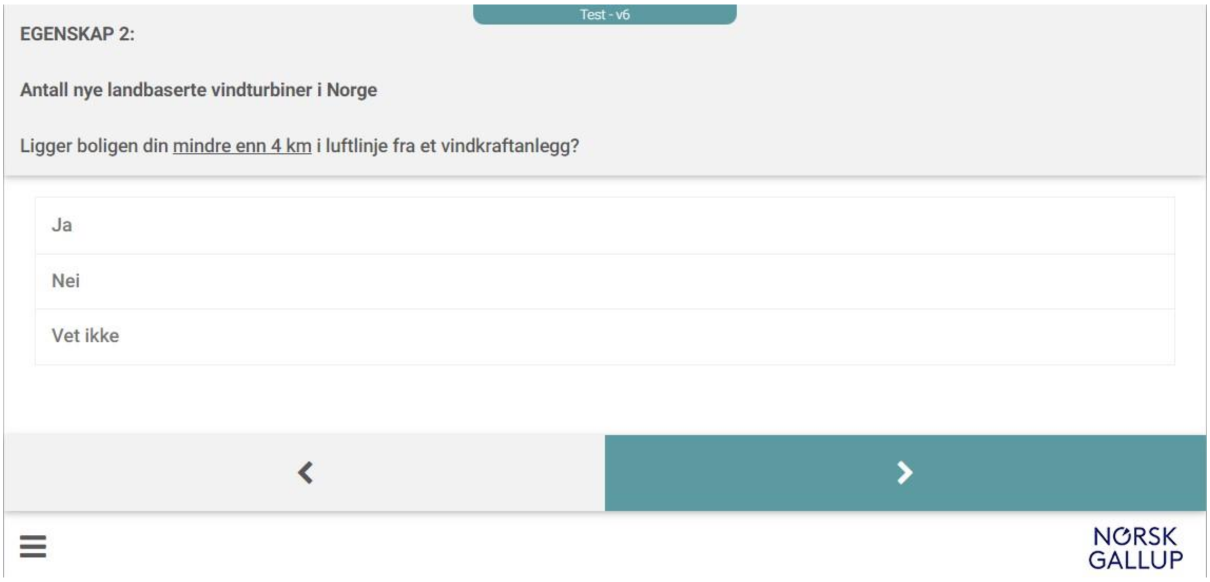
NVE har identifisert 13 geografiske områder for ytterligere utbygging av landbasert vindkraft. Disse 13 områdene er markert med grønn farge på kartet nedenfor.

Tenk deg at en ved eventuell videre utbygging tar utgangspunkt i disse områdene og fordeler nye vindkraftverk jevnt utover disse.

Trykk på bildet for å forstørre.

NORSK GALLUP

VBT:



Test - v6

EGENSKAP 2:

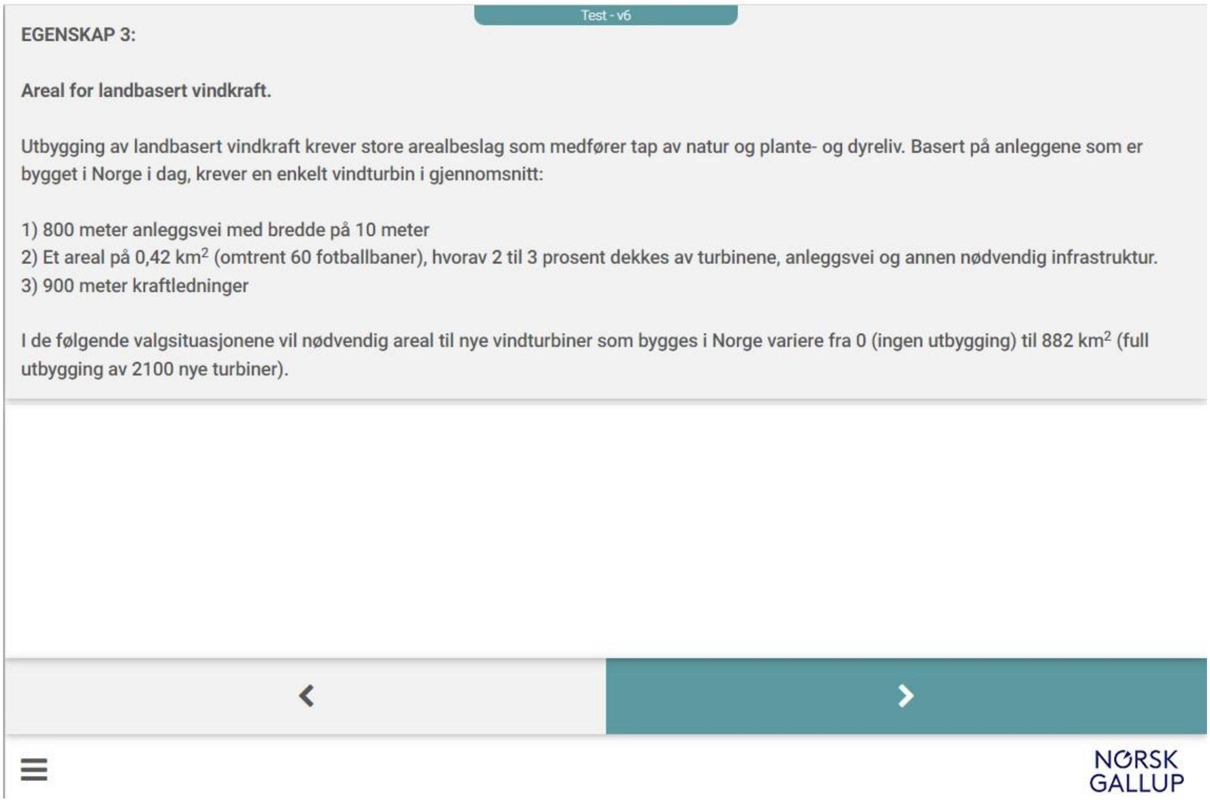
Antall nye landbaserte vindturbiner i Norge

Ligger boligen din mindre enn 4 km i luftlinje fra et vindkraftanlegg?

- Ja
- Nei
- Vet ikke

NORSK GALLUP

Baseline-utvalg:



Test - v6

EGENSKAP 3:

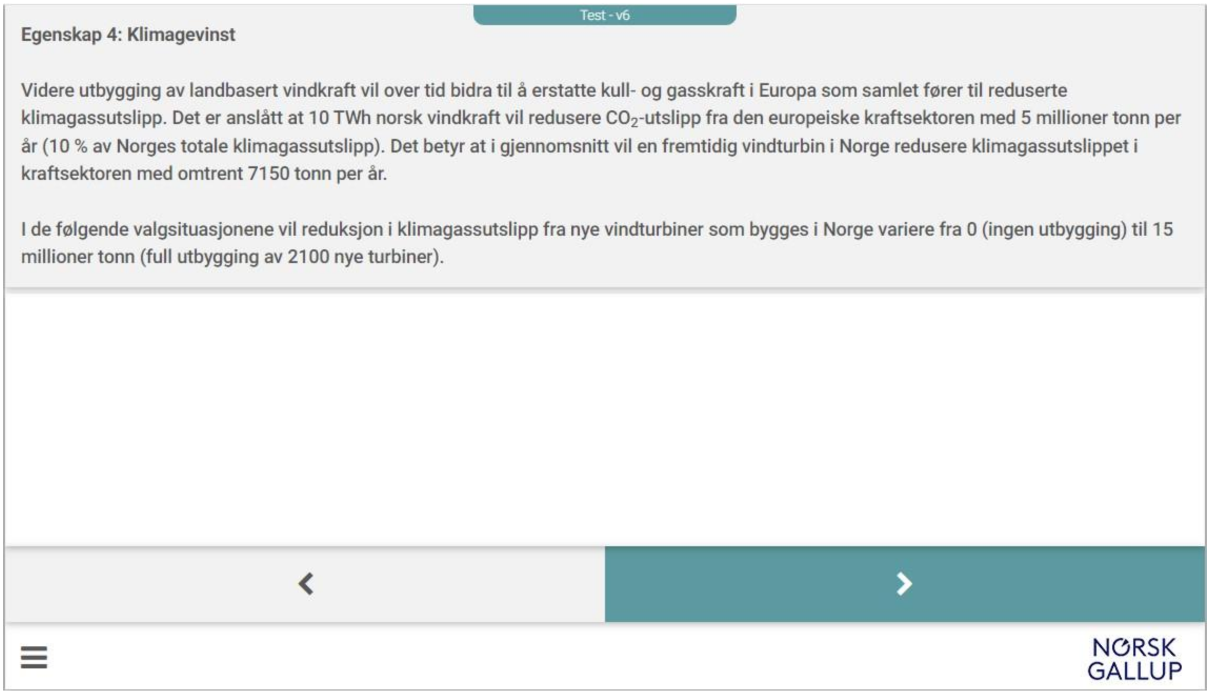
Areal for landbasert vindkraft.

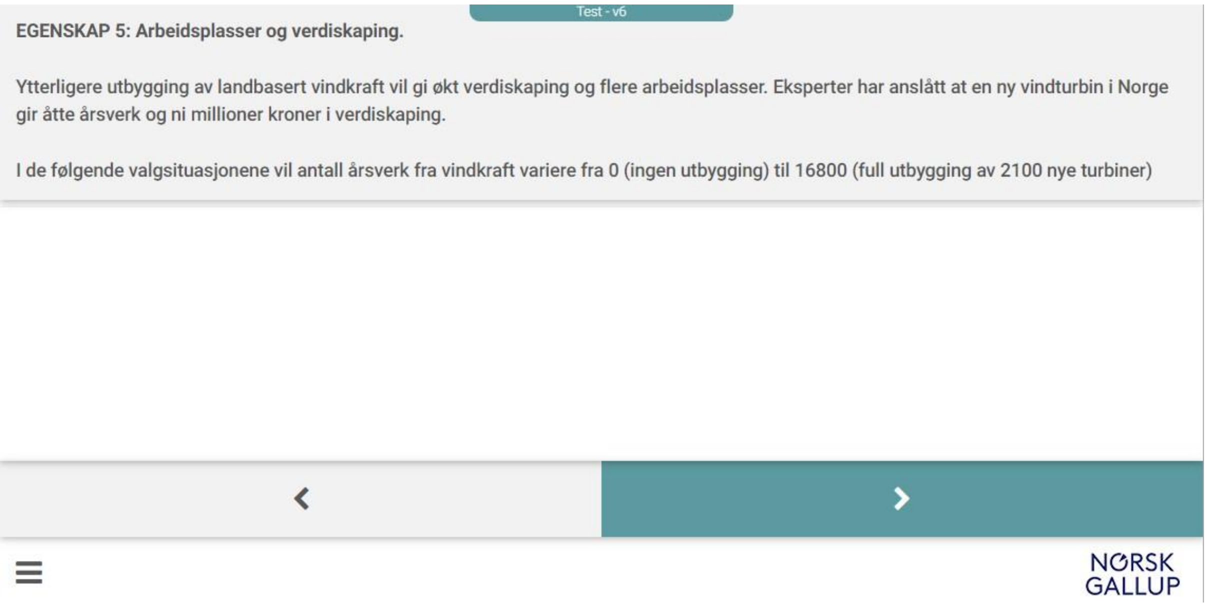
Utbygging av landbasert vindkraft krever store arealbeslag som medfører tap av natur og plante- og dyreliv. Basert på anleggene som er bygget i Norge i dag, krever en enkelt vindturbin i gjennomsnitt:

1) 800 meter anleggsvei med bredde på 10 meter
2) Et areal på 0,42 km^2 (omtrent 60 fotballbaner), hvorav 2 til 3 prosent dekkes av turbinene, anleggsvei og annen nødvendig infrastruktur.
3) 900 meter kraftledninger

I de følgende valgsituasjonene vil nødvendig areal til nye vindturbiner som bygges i Norge variere fra 0 (ingen utbygging) til 882 km^2 (full utbygging av 2100 nye turbiner).

NORSK GALLUP


Test - v6
Egenskap 4: Klimagevinst
Videre utbygging av landbasert vindkraft vil over tid bidra til å erstatte kull- og gasskraft i Europa som samlet fører til reduserte klimagassutslipp. Det er anslått at 10 TWh norsk vindkraft vil redusere CO2-utslipp fra den europeiske kraftsektoren med 5 millioner tonn per år (10 % av Norges totale klimagassutslipp). Det betyr at i gjennomsnitt vil en fremtidig vindturbin i Norge redusere klimagassutslippet i kraftsektoren med omtrent 7150 tonn per år.
I de følgende valgsituasjonene vil reduksjon i klimagassutslipp fra nye vindturbiner som bygges i Norge variere fra 0 (ingen utbygging) til 15 millioner tonn (full utbygging av 2100 nye turbiner).
NORSK GALLUP


Test - v6
EGENSKAP 5: Arbeidsplasser og verdiskaping.
Ytterligere utbygging av landbasert vindkraft vil gi økt verdiskaping og flere arbeidsplasser. Eksperter har anslått at en ny vindturbin i Norge gir åtte årsverk og ni millioner kroner i verdiskaping.
I de følgende valgsituasjonene vil antall årsverk fra vindkraft variere fra 0 (ingen utbygging) til 16800 (full utbygging av 2100 nye turbiner)
NORSK GALLUP

Test - v6

EGENSKAP 6: Endring i årlig nettleie for deg og husholdningen din.

Med økt fornybar kraftproduksjon må det norske strømnettet oppgraderes. Det er usikkert hvor mye dette kommer til å koste. Se for deg at oppgraderingen blir finansiert ved økt årlig nettleie blant norske husholdninger de neste fem årene. Det er da anslått at økningen vil være på mellom 1000 til 8000 kr per år per husholdning fra og med 2023.

NORSK GALLUP

Areal-utvalg:

Test - v6

EGENSKAP 3:

Areal for landbasert vindkraft.

Utbygging av landbasert vindkraft krever store arealbeslag som medfører tap av natur og plante- og dyreliv. Basert på anleggene som er bygget i Norge i dag, krever en enkelt vindturbin i gjennomsnitt:

1) 800 meter anleggsvei med bredde på 10 meter
2) Et areal på 0,42 km^2 (omtrent 60 fotballbaner), hvorav 2 til 3 prosent dekkes av turbinene, anleggsvei og annen nødvendig infrastruktur.
3) 900 meter kraftledninger

I de følgende valgsituasjonene vil nødvendig areal til nye vindturbiner som bygges i Norge variere fra 0 (ingen utbygging) til 882 km^2 (full utbygging av 2100 nye turbiner).

NORSK GALLUP

Test - v6

EGENSKAP 4: Endring i årlig nettleie for deg og husstanden din.

Med økt fornybar kraftproduksjon må det norske strømnettet oppgraderes. Det er usikkert hvor mye dette kommer til å koste. Se for deg at oppgraderingen blir finansiert ved økt årlig nettleie blant norske husholdninger de neste fem årene. Det er da anslått at økningen vil være på mellom 1000 til 8000 kr per år per husholdning fra og med 2023.

NORSK GALLUP

Klima-utvalg:

Test - v3

Egenskap 3: Klimagevinst

Videre utbygging av landbasert vindkraft vil over tid bidra til å erstatte kull- og gasskraft i Europa som samlet fører til reduserte klimagassutslipp. Det er anslått at 10 TWh norsk vindkraft vil redusere CO_2-utslipp fra den europeiske kraftsektoren med 5 millioner tonn per år (10 % av Norges totale klimagassutslipp). Det betyr at i gjennomsnitt vil en fremtidig vindturbin i Norge redusere klimagassutslippet i kraftsektoren med omtrent 7150 tonn per år.

I de følgende valgsituasjonene vil reduksjon i klimagassutslipp fra nye vindturbiner som bygges i Norge variere fra 0 (ingen utbygging) til 15 millioner tonn (full utbygging av 2100 nye turbiner).

NORSK GALLUP

Test - v6

EGENSKAP 4: Endring i årlig nettleie for deg og husstanden din.

Med økt fornybar kraftproduksjon må det norske strømnettet oppgraderes. Det er usikkert hvor mye dette kommer til å koste. Se for deg at oppgraderingen blir finansiert ved økt årlig nettleie blant norske husholdninger de neste fem årene. Det er da anslått at økningen vil være på mellom 1000 til 8000 kr per år per husholdning fra og med 2023.

NORSK GALLUP

Verdi-utvalg:

Test - v6

EGENSKAP 3: Arbeidsplasser og verdiskaping.

Ytterligere utbygging av landbasert vindkraft vil gi økt verdiskaping og flere arbeidsplasser. Eksperter har anslått at en ny vindturbin i Norge gir åtte årsverk og ni millioner kroner i verdiskaping.

I de følgende valgsituasjonene vil antall årsverk fra vindkraft variere fra 0 (ingen utbygging) til 16800 (full utbygging av 2100 nye turbiner)

NORSK GALLUP

Test - v6

EGENSKAP 4: Endring i årlig nettleie for deg og husstanden din.

Med økt fornybar kraftproduksjon må det norske strømnettet oppgraderes. Det er usikkert hvor mye dette kommer til å koste. Se for deg at oppgraderingen blir finansiert ved økt årlig nettleie blant norske husholdninger de neste fem årene. Det er da anslått at økningen vil være på mellom 1000 til 8000 kr per år per husholdning fra og med 2023.

NORSK GALLUP

General survey:

Test - v6

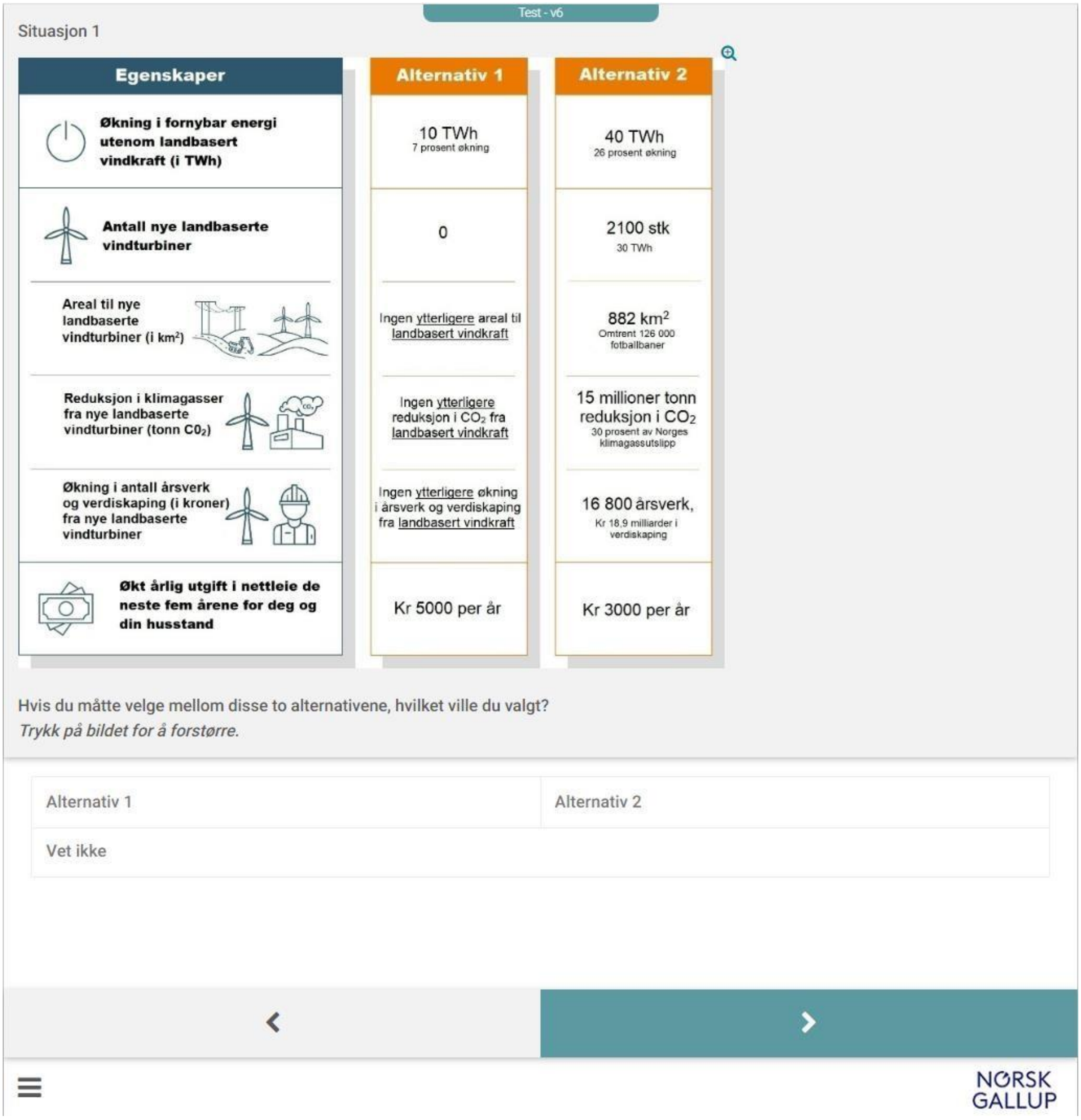
Du vil nå bli bedt om å velge det alternativet du foretrekker i totalt åtte situasjoner.

- Alternativ 1 viser økning i TWh fornybar kraft og endring i årlig nettleie uten ytterligere landbasert vindkraft.
- Alternativ 2 viser økning i TWh fornybar kraft og endring i årlig nettleie med ytterligere landbasert vindkraft.

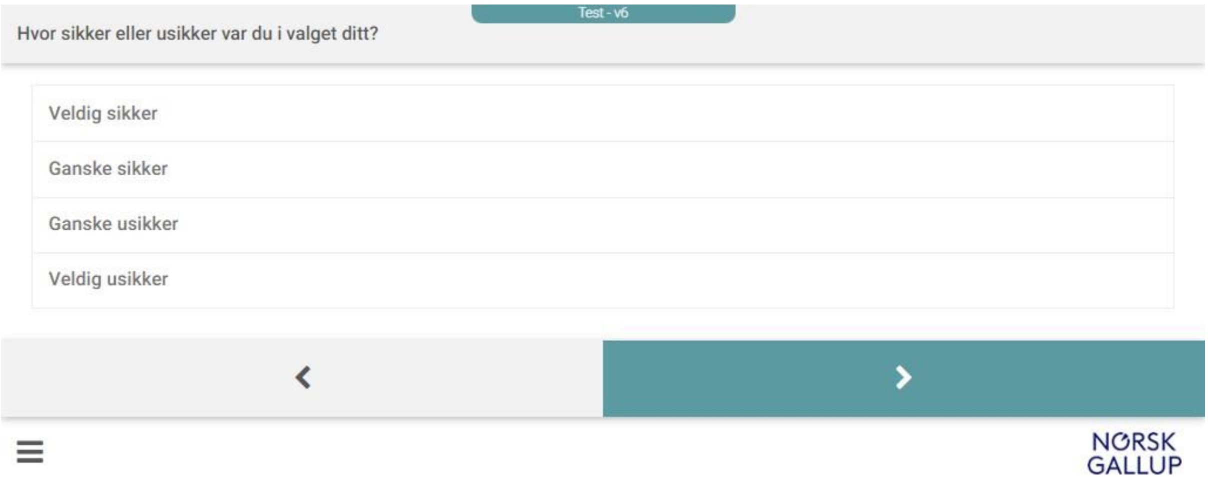
NORSK GALLUP

Baseline-utvalg (blokk 1, randomisert rekkefølge av valgkort):

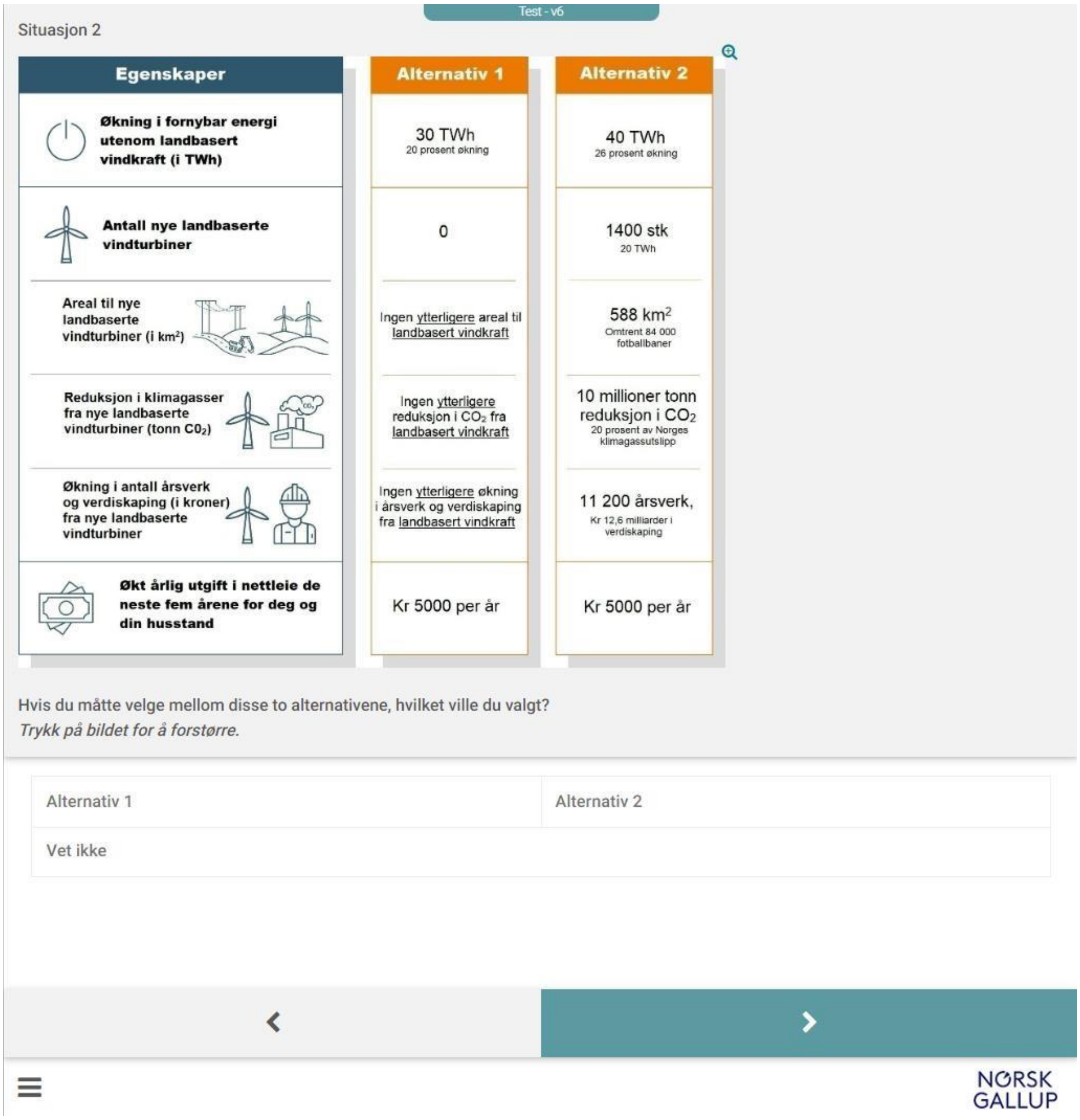
VCB:



VCL:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

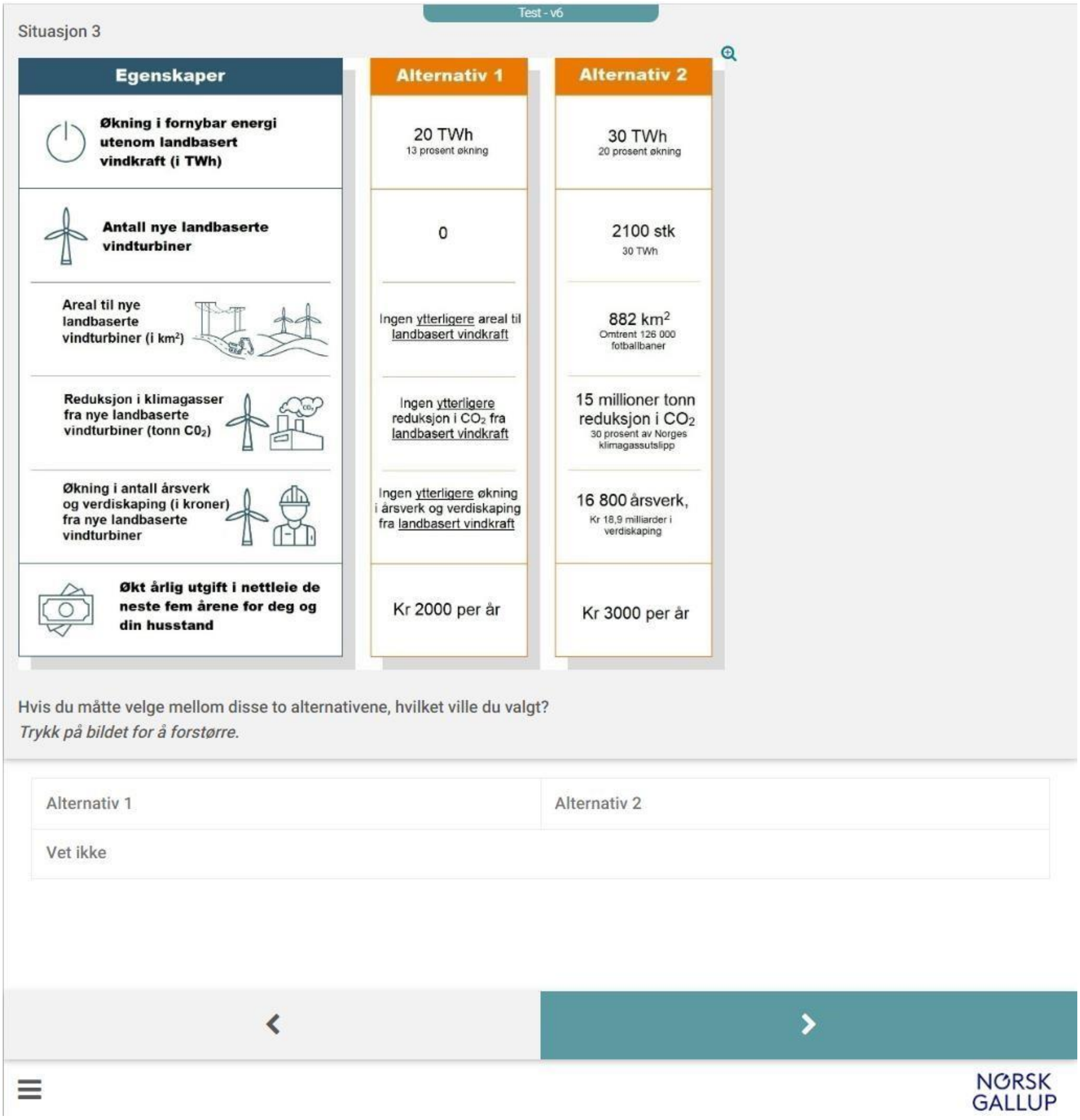
VCC:


Test - v6
Situasjon 2
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
30 TWh
20 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
1400 stk
20 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
588 km²
Omtrent 84 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO₂)
Ingen ytterligere reduksjon i CO₂ fra landbasert vindkraft
10 millioner tonn reduksjon i CO₂
20 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
11 200 årsverk,
Kr 12,6 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 5000 per år
Kr 5000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCM:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

VCD:


Test - v6
Situasjon 3
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
882 km²
Omtrent 126 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO₂)
Ingen ytterligere reduksjon i CO₂ fra landbasert vindkraft
15 millioner tonn reduksjon i CO₂
30 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
16 800 årsverk,
Kr 18,9 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 2000 per år
Kr 3000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCN:

Test - v6

Hvor sikker eller usikker var du i valget ditt?

- Veldig sikker
- Ganske sikker
- Ganske usikker
- Veldig usikker

NORSK GALLUP

VCF:

Test - v6

Situasjon 4

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	20 TWh 13 prosent økning	30 TWh 20 prosent økning
Antall nye landbaserte vindturbiner	0	2100 stk 30 TWh
Areal til nye landbaserte vindturbiner (i km^2)	Ingen ytterligere areal til landbasert vindkraft	882 km^2 Omtrent 126 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)	Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft	15 millioner tonn reduksjon i CO_2 30 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner	Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft	16 800 årsverk, Kr 18,9 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 3000 per år	Kr 4000 per år

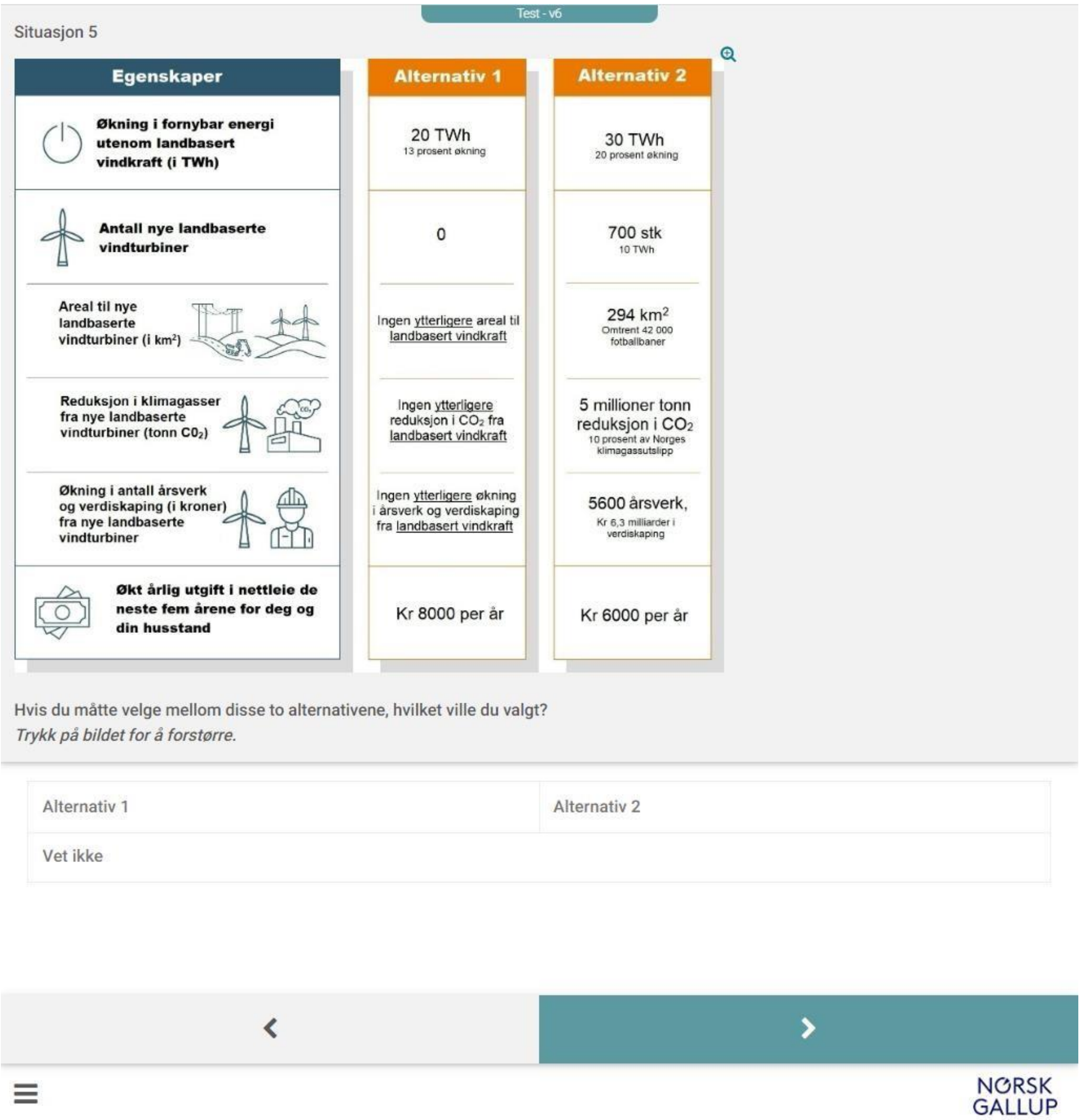
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.

- Alternativ 1
- Alternativ 2
- Vet ikke

NORSK GALLUP

VCP:

VCG:



Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	20 TWh 13 prosent økning	30 TWh 20 prosent økning
Antall nye landbaserte vindturbiner	0	700 stk 10 TWh
Areal til nye landbaserte vindturbiner (i km^2)	Ingen ytterligere areal til landbasert vindkraft	294 km^2 Omtrent 42 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)	Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft	5 millioner tonn reduksjon i CO_2 10 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner	Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft	5600 årsverk, Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 8000 per år	Kr 6000 per år

VCQ:

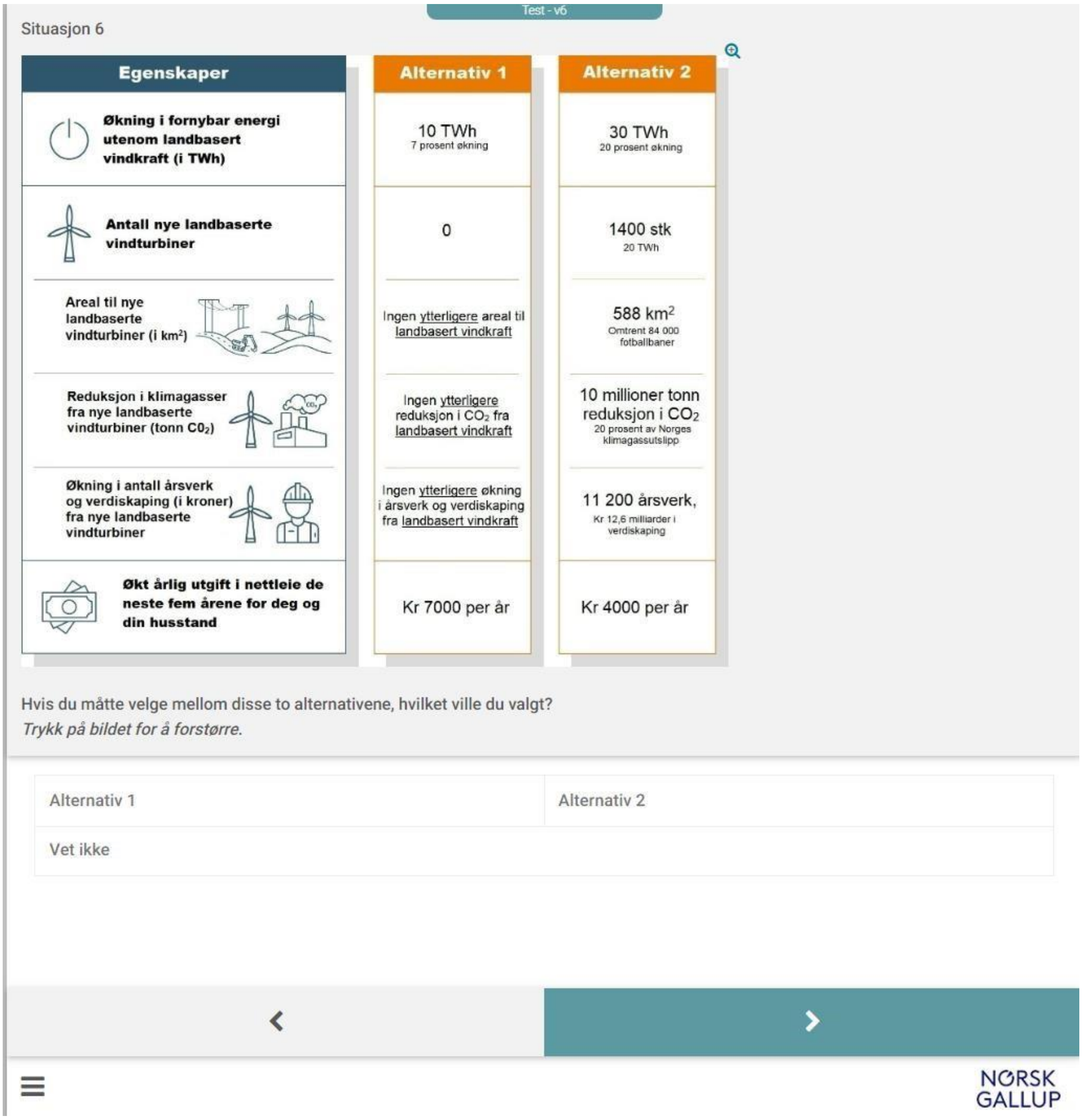
Test - v6

Hvor sikker eller usikker var du i valget ditt?

- Veldig sikker
- Ganske sikker
- Ganske usikker
- Veldig usikker

NORSK GALLUP

VCH:



Test - v6

Situasjon 6

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	10 TWh 7 prosent økning	30 TWh 20 prosent økning
Antall nye landbaserte vindturbiner	0	1400 stk 20 TWh
Areal til nye landbaserte vindturbiner (i km²)	Ingen ytterligere areal til landbasert vindkraft	588 km² Omtrent 84 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)	Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft	10 millioner tonn reduksjon i CO_2 20 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner	Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft	11 200 årsverk, Kr 12,6 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 7000 per år	Kr 4000 per år

Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?

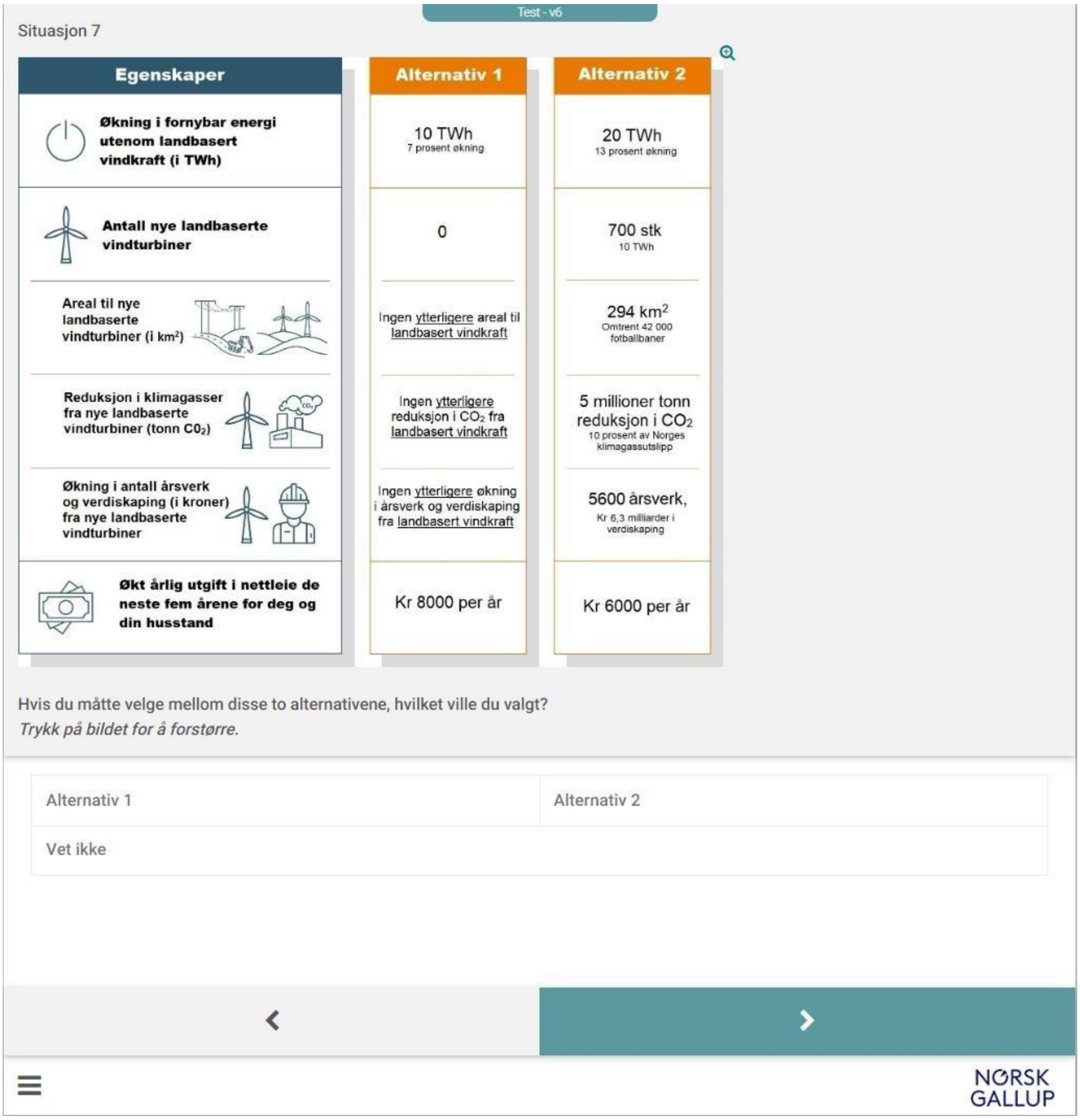
Trykk på bildet for å forstørre.

- Alternativ 1
- Alternativ 2
- Vet ikke

NORSK GALLUP

VCR:

VCJ:


Test - v6

Situasjon 7

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	10 TWh 7 prosent økning	20 TWh 13 prosent økning
Antall nye landbaserte vindturbiner	0	700 stk 10 TWh
Areal til nye landbaserte vindturbiner (i km²)	Ingen ytterligere areal til landbasert vindkraft	294 km² Omtrent 42 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)	Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft	5 millioner tonn reduksjon i CO_2 10 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner	Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft	5600 årsverk, Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 8000 per år	Kr 6000 per år

Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.

Alternativ 1
Alternativ 2
Vet ikke

NORSK GALLUP

VCS:

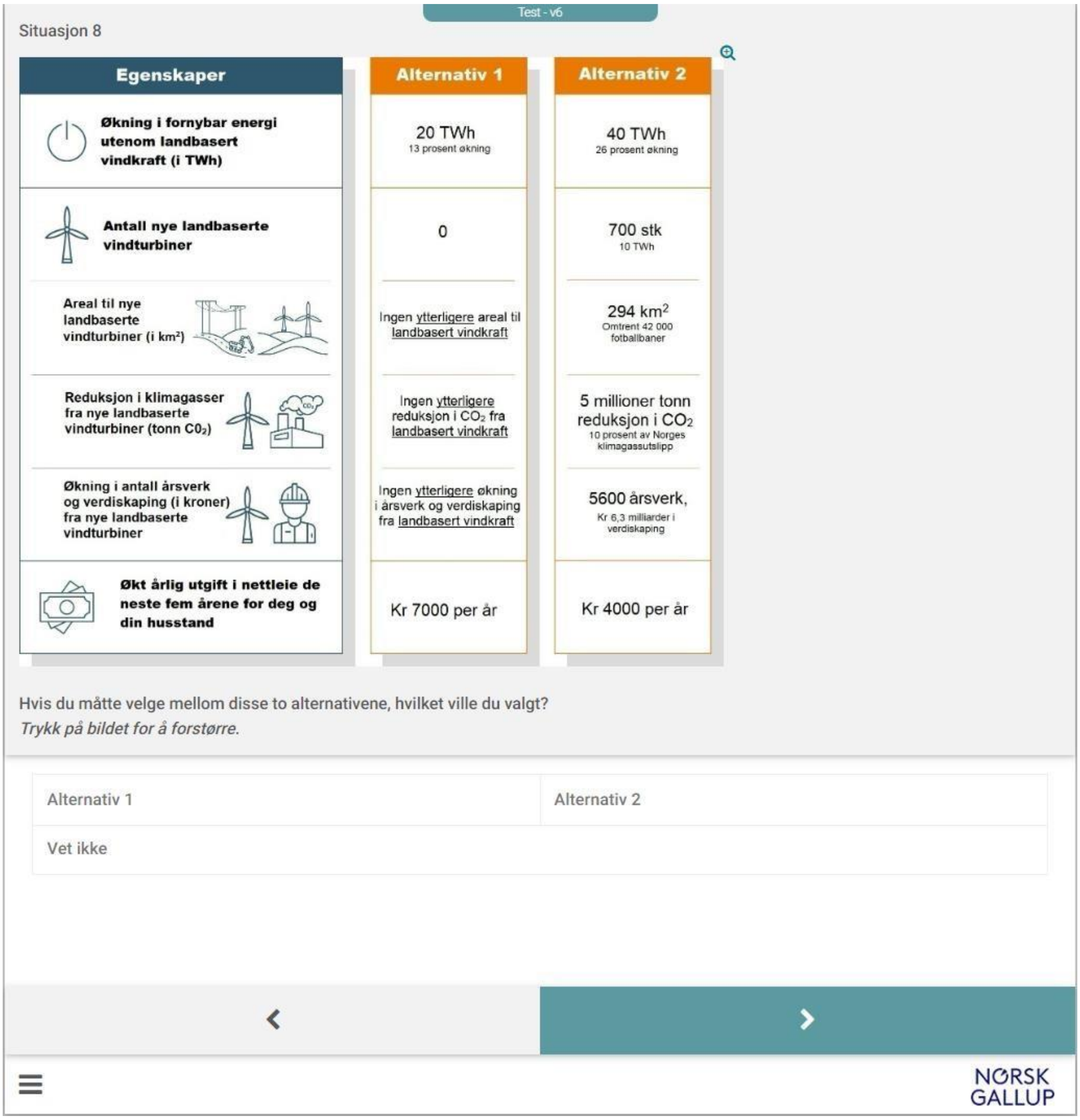
Test - v6

Hvor sikker eller usikker var du i valget ditt?

- Veldig sikker
- Ganske sikker
- Ganske usikker
- Veldig usikker

NORSK GALLUP

VCK:



Test - v6

Situasjon 8

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	20 TWh 13 prosent økning	40 TWh 26 prosent økning
Antall nye landbaserte vindturbiner	0	700 stk 10 TWh
Areal til nye landbaserte vindturbiner (i km²)	Ingen ytterligere areal til landbasert vindkraft	294 km² Omtrent 42 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)	Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft	5 millioner tonn reduksjon i CO_2 10 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner	Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft	5600 årsverk, Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 7000 per år	Kr 4000 per år

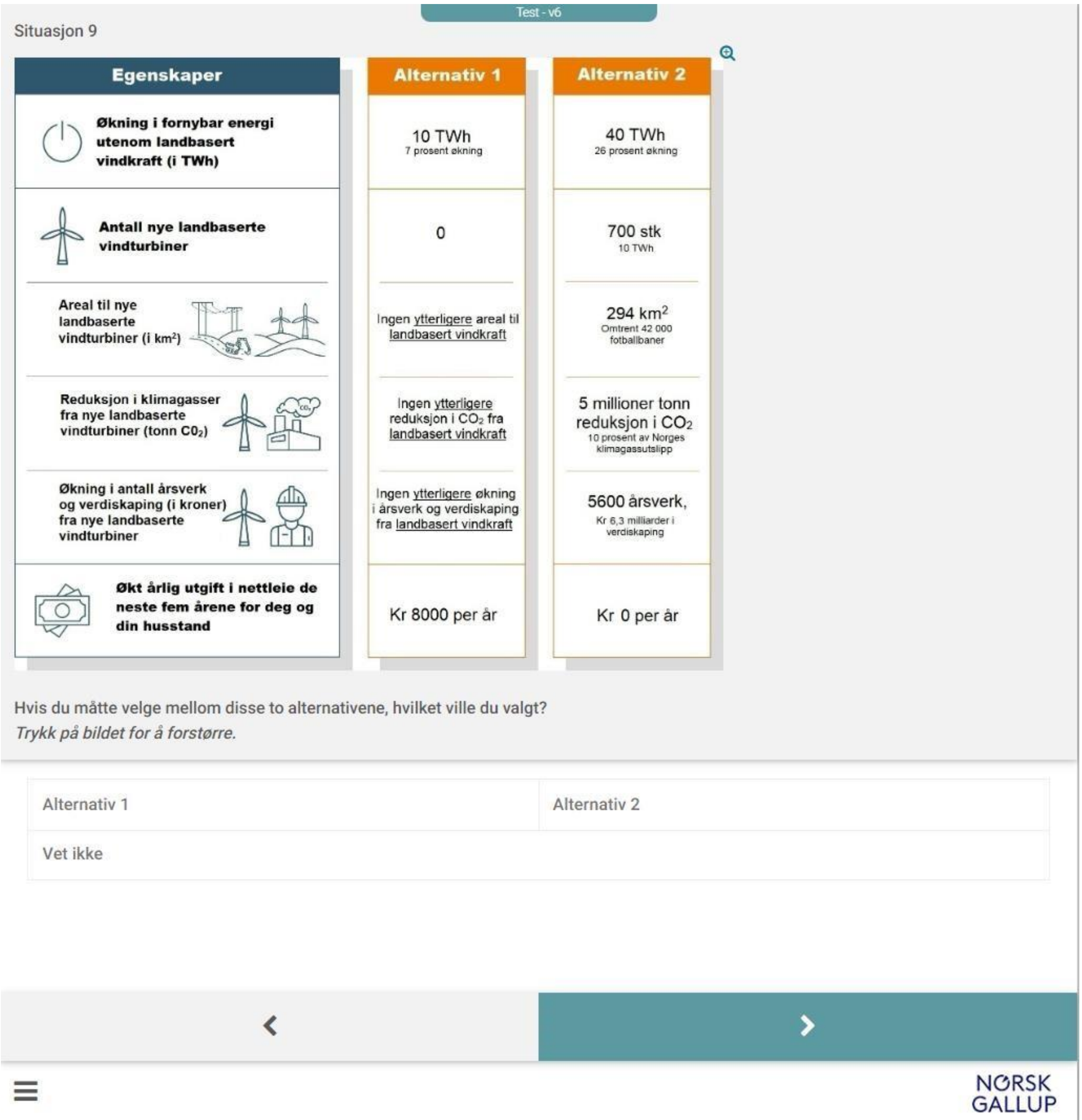
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.

- Alternativ 1
- Alternativ 2
- Vet ikke

NORSK GALLUP

VCT:

VCK9, hvis svarte Alternativ 1 i hver valgsituasjon:


Test - v6

Situasjon 9

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	10 TWh 7 prosent økning	40 TWh 26 prosent økning
Antall nye landbaserte vindturbiner	0	700 stk 10 TWh
Areal til nye landbaserte vindturbiner (i km^2)	Ingen ytterligere areal til landbasert vindkraft	294 km^2 Omtrent 42 000 fotballbaner
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)	Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft	5 millioner tonn reduksjon i CO_2 10 prosent av Norges klimagassutslipp
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner	Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft	5600 årsverk, Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 8000 per år	Kr 0 per år

Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.

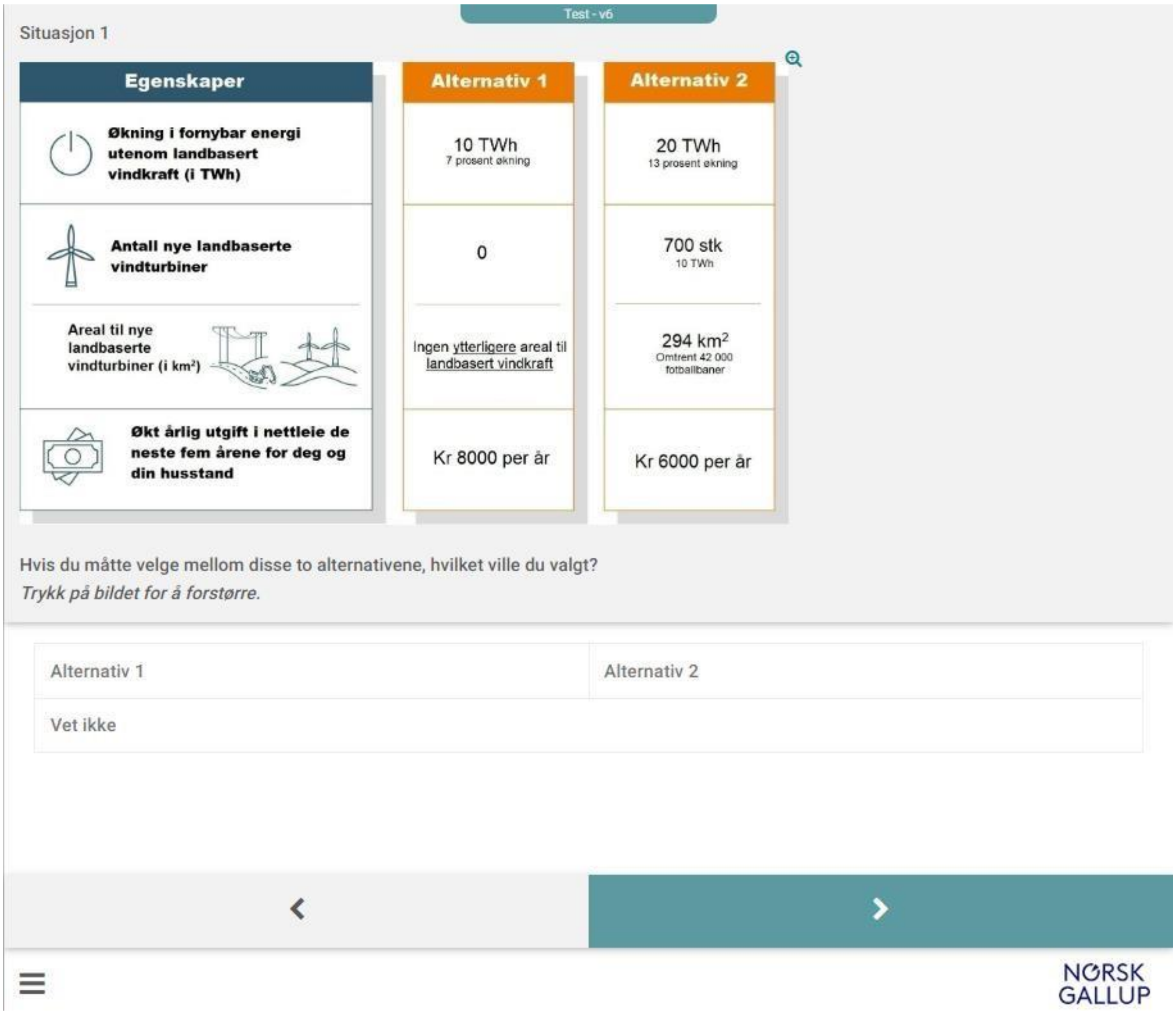
Alternativ 1 | Alternativ 2
Vet ikke

NORSK GALLUP

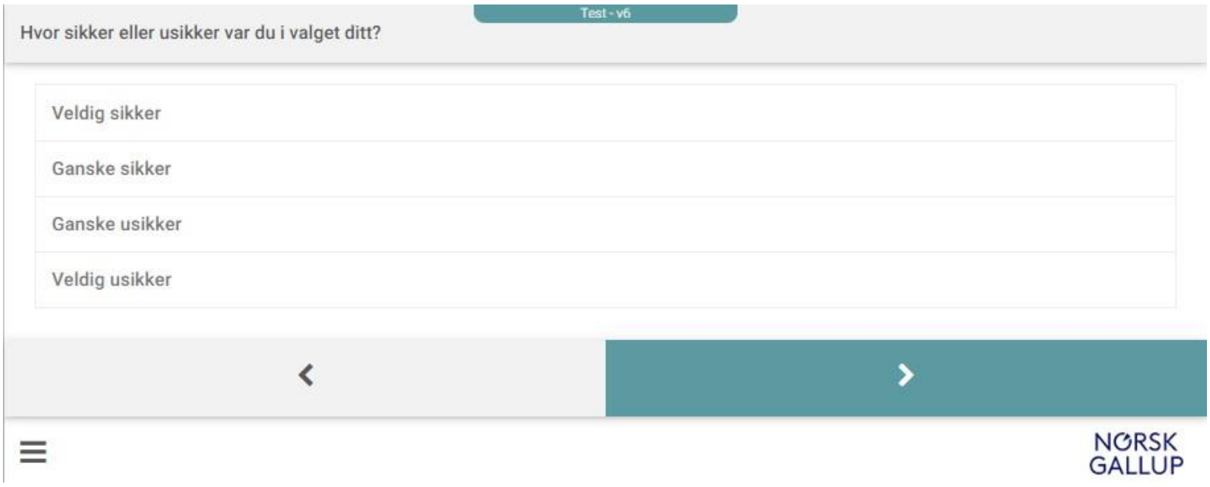
VCT9, hvis svarte Alternativ 1 i hver valgsituasjon:

Areal-utvalg (blokk 1, randomisert rekkefølge av valgkort):

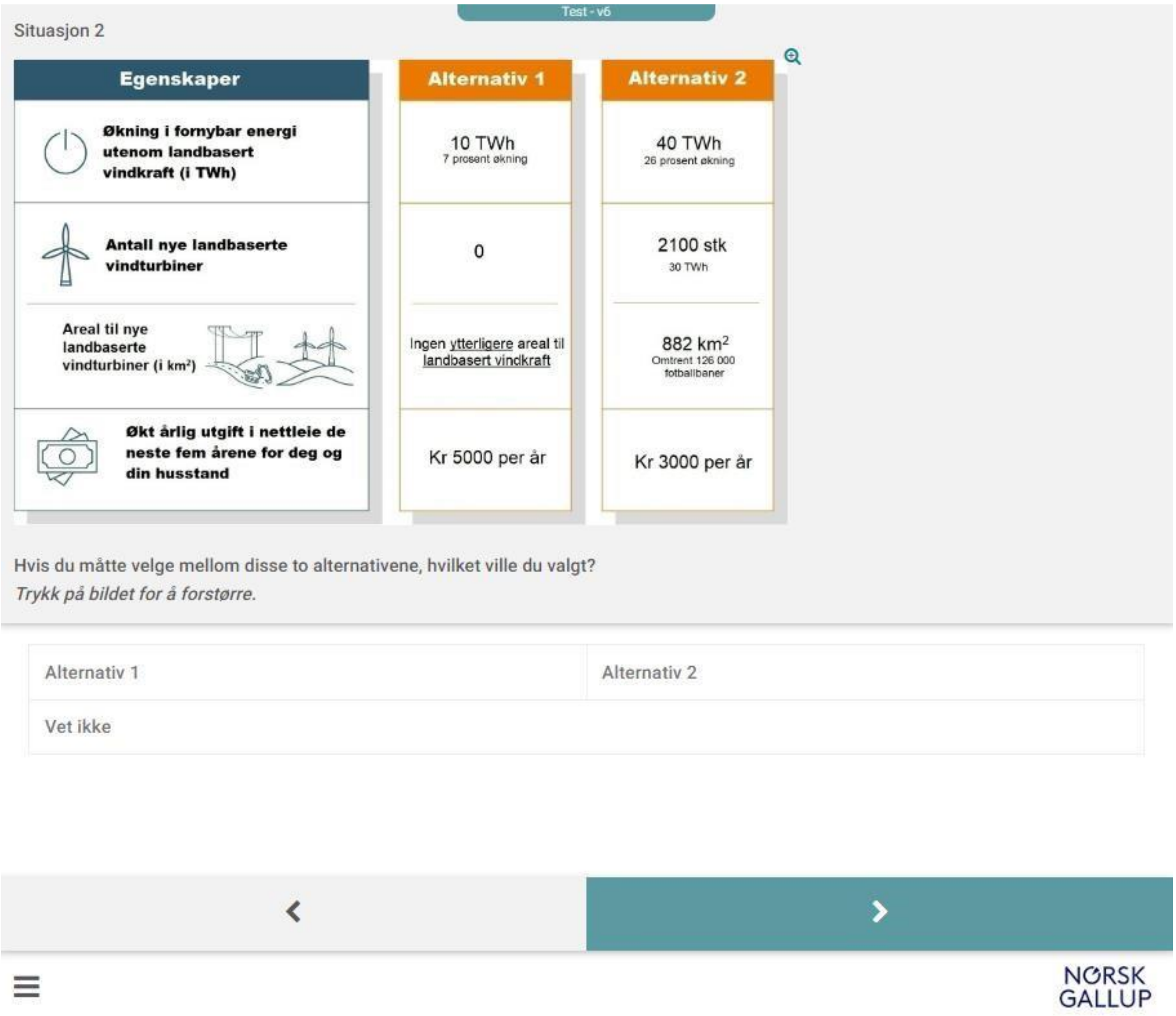
VCB:



VCL:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

VCC:


Test - v6
Situasjon 2
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
882 km²
Omtrent 126 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 5000 per år
Kr 3000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCM:

Test - v6

Hvor sikker eller usikker var du i valget ditt?

- Veldig sikker
- Ganske sikker
- Ganske usikker
- Veldig usikker

NORSK GALLUP

VCD:

Test - v6

Situasjon 3

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	20 TWh 13 prosent økning	30 TWh 20 prosent økning
Antall nye landbaserte vindturbiner	0	2100 stk 30 TWh
Areal til nye landbaserte vindturbiner (i km²)	Ingen ytterligere areal til landbasert vindkraft	882 km² Omtrent 126 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 2000 per år	Kr 3000 per år

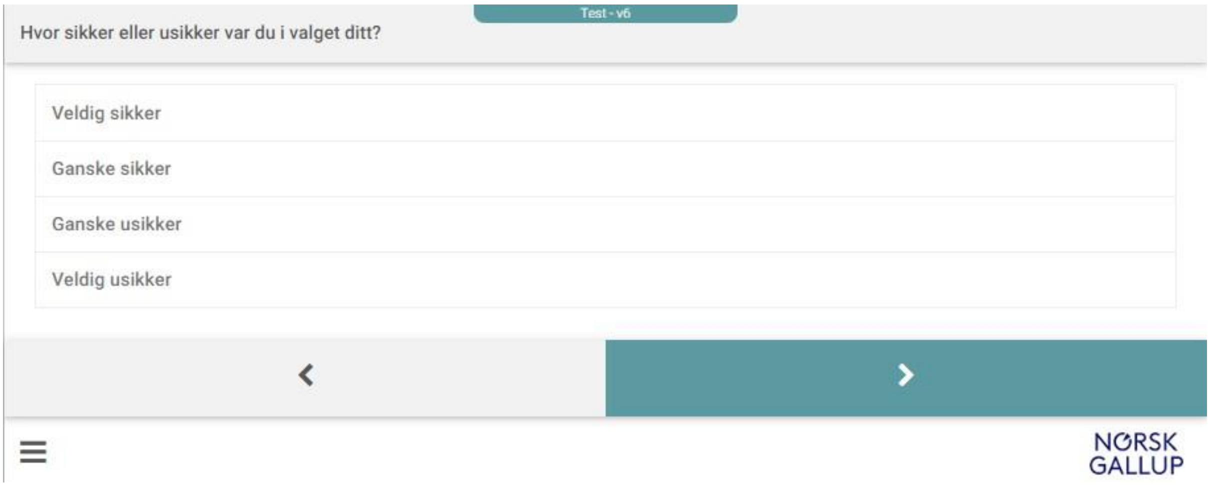
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?

Trykk på bildet for å forstørre.

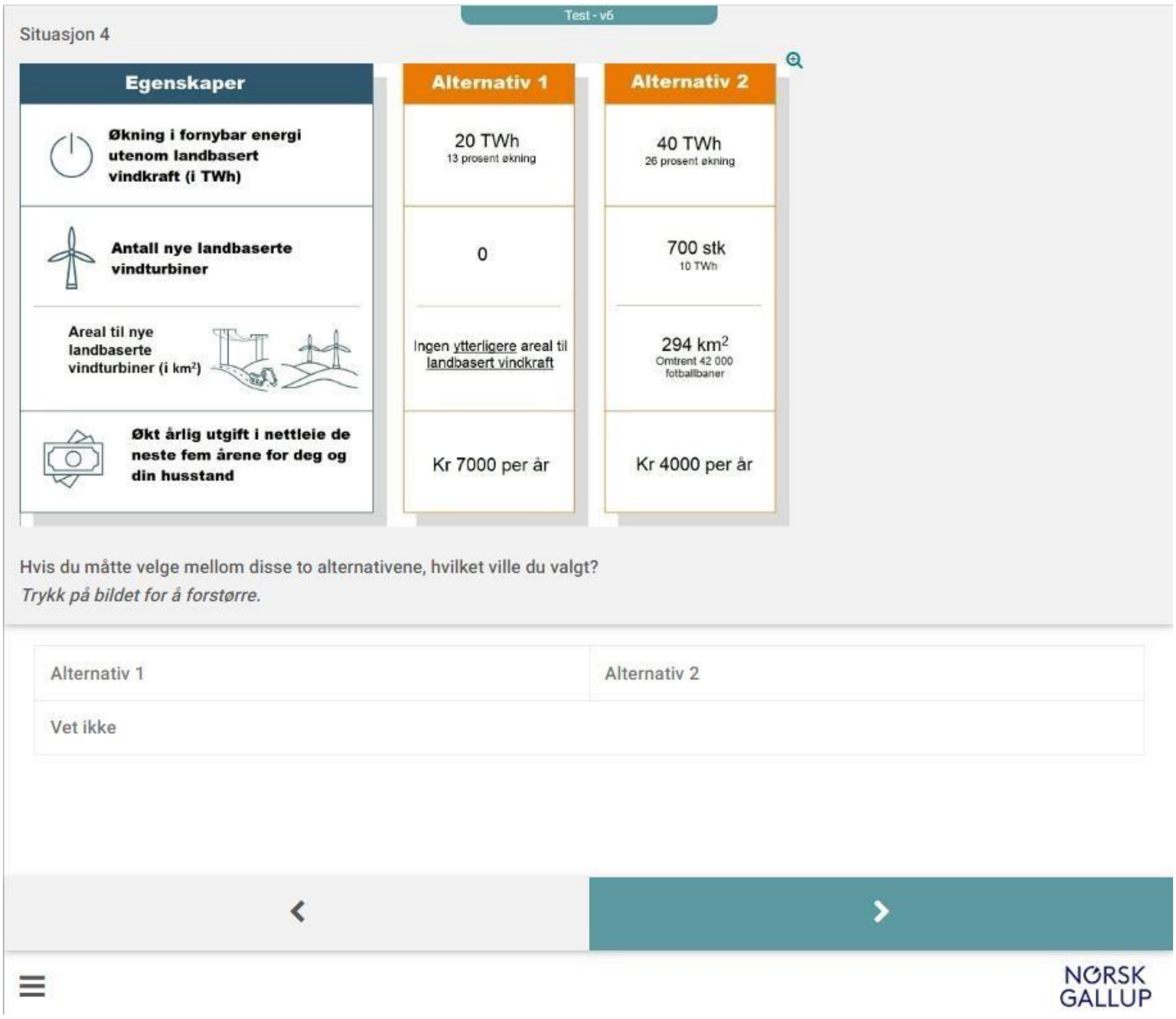
- Alternativ 1
- Alternativ 2
- Vet ikke

NORSK GALLUP

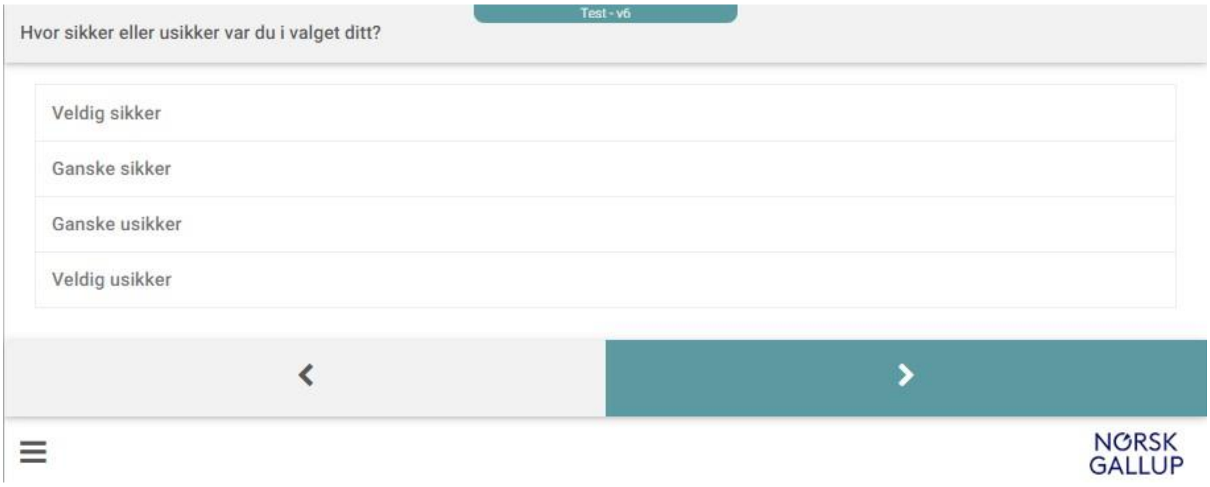
VCN:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

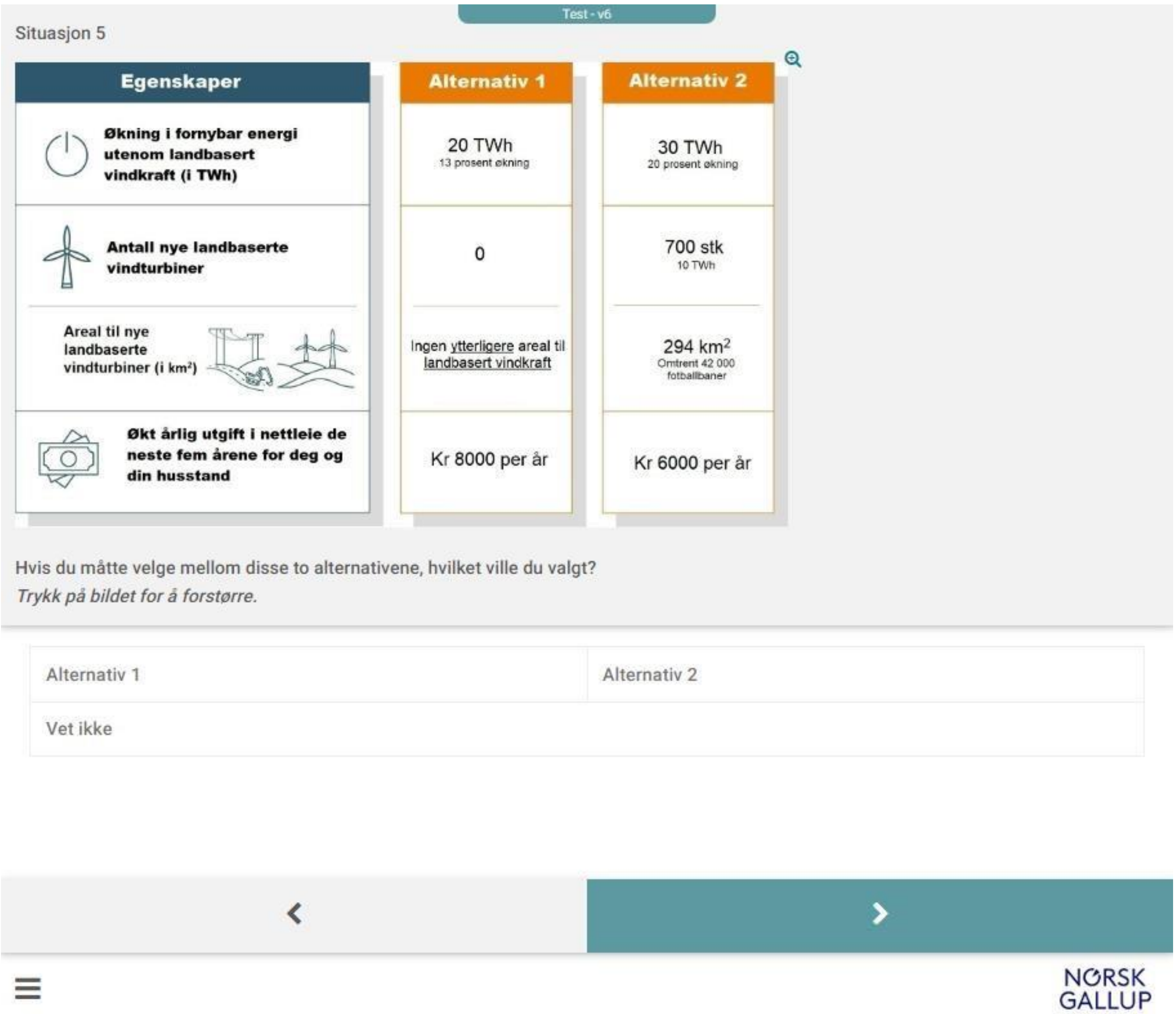
VCF:


Test - v6
Situasjon 4
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
294 km²
Omtrent 42 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 7000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

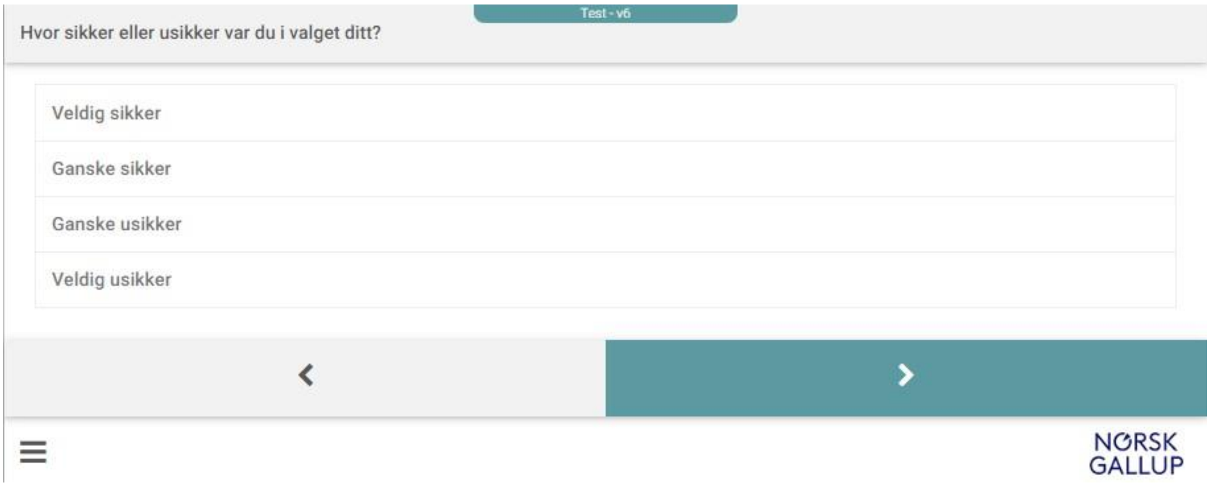
VCP:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

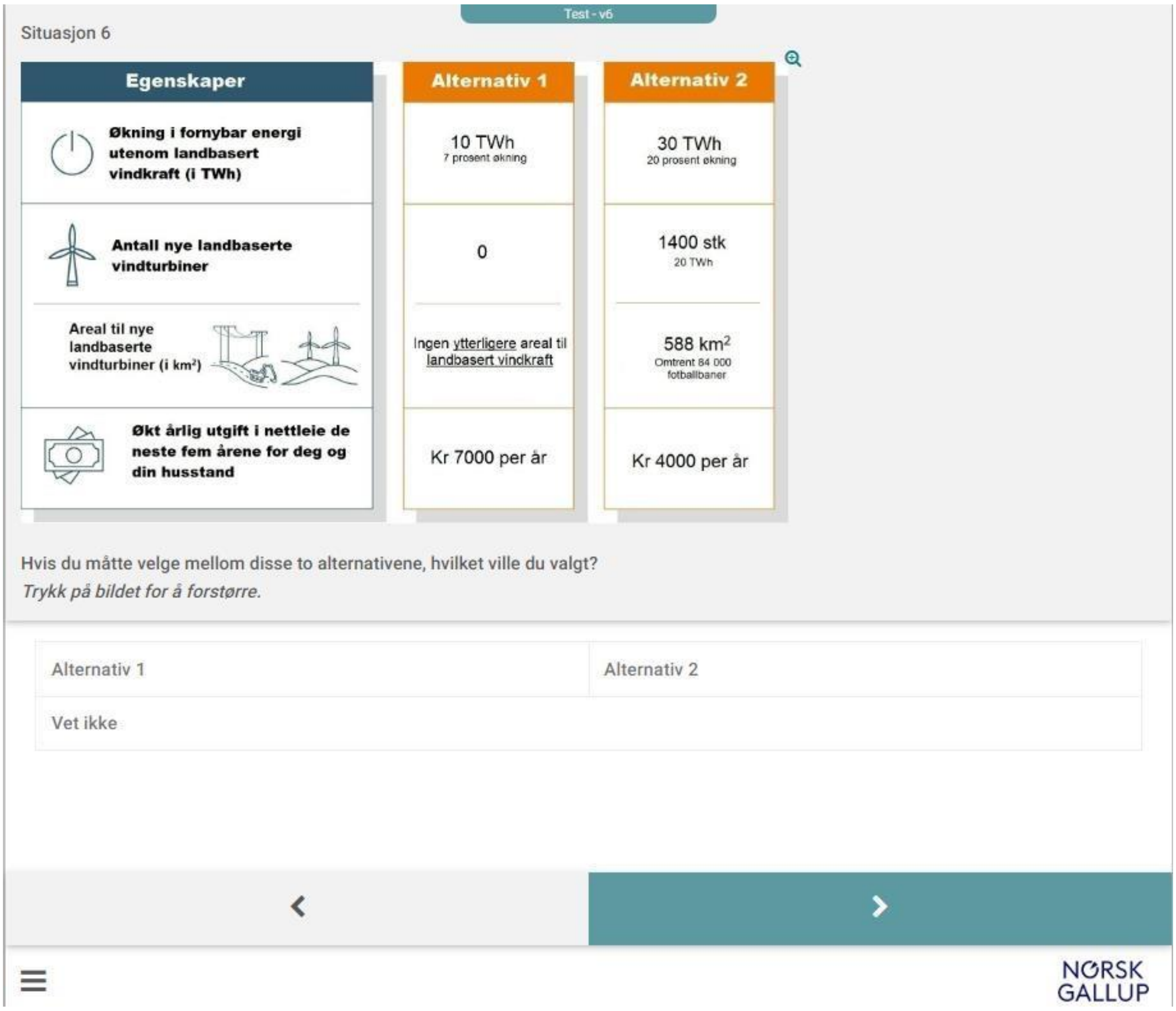
VCG:


Test - v6
Situasjon 5
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
294 km²
Omtrent 42 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 6000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCQ:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

VCH:


Test - v6
Situasjon 6
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
1400 stk
20 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
588 km²
Omtrent 84 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 7000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCR:

Test - v6

Hvor sikker eller usikker var du i valget ditt?

- Veldig sikker
- Ganske sikker
- Ganske usikker
- Veldig usikker

NORSK GALLUP

VCJ:

Test - v6

Situasjon 7

Egenskaper	Alternativ 1	Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)	20 TWh 13 prosent økning	30 TWh 20 prosent økning
Antall nye landbaserte vindturbiner	0	2100 stk 30 TWh
Areal til nye landbaserte vindturbiner (i km²)	Ingen ytterligere areal til landbasert vindkraft	882 km² Omtrent 126 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand	Kr 3000 per år	Kr 4000 per år

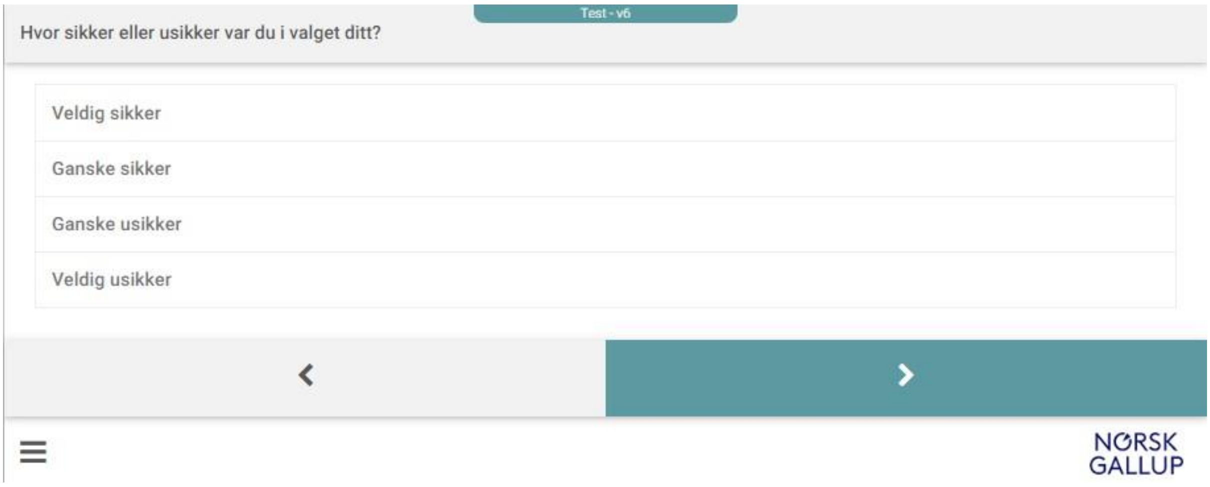
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?

Trykk på bildet for å forstørre.

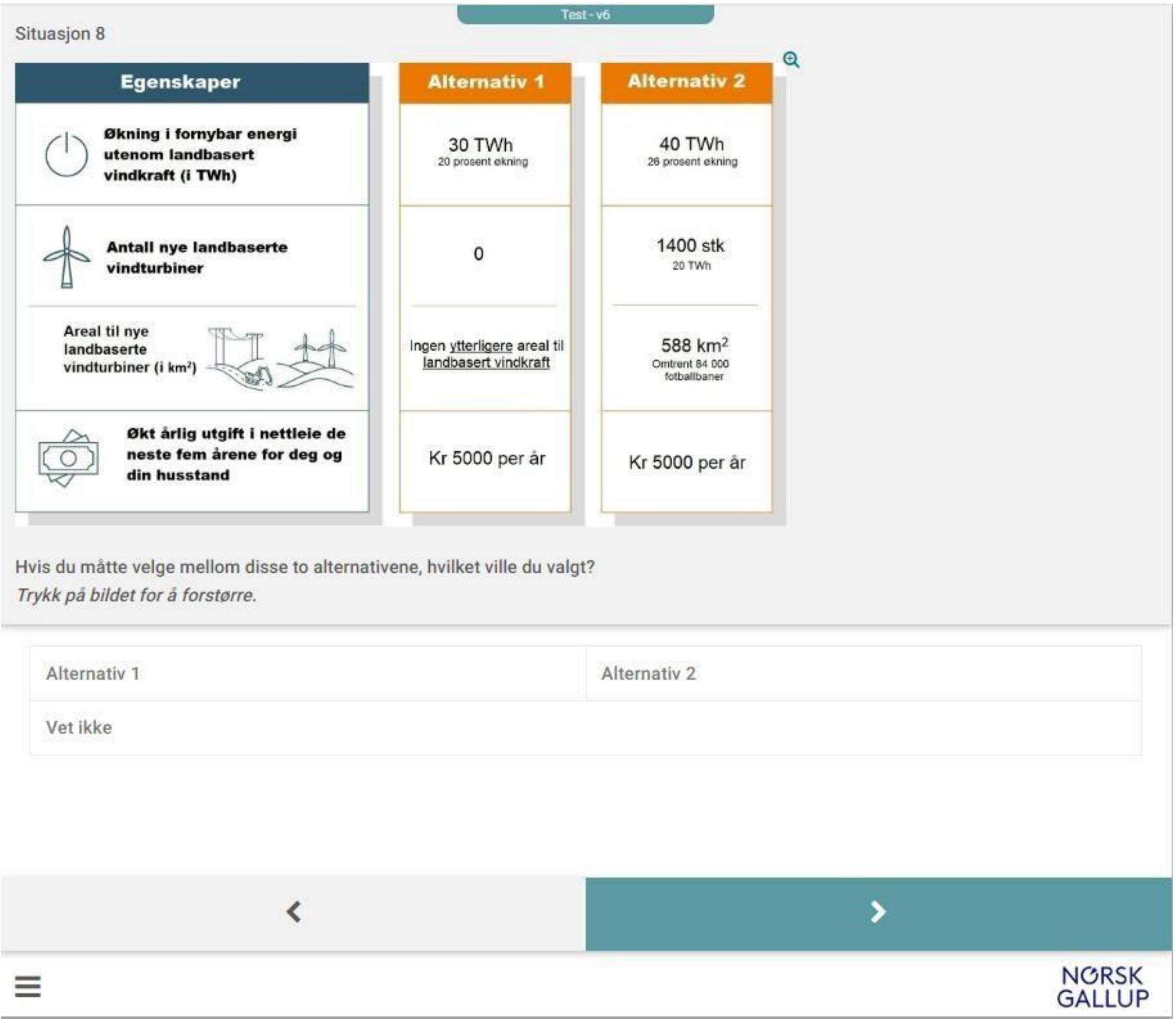
- Alternativ 1
- Alternativ 2
- Vet ikke

NORSK GALLUP

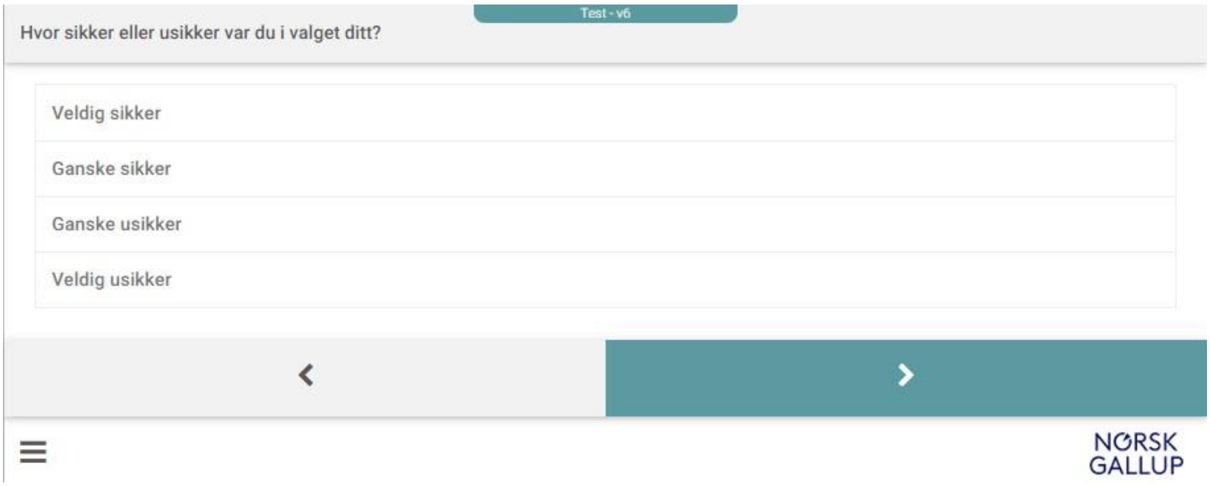
VCS:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

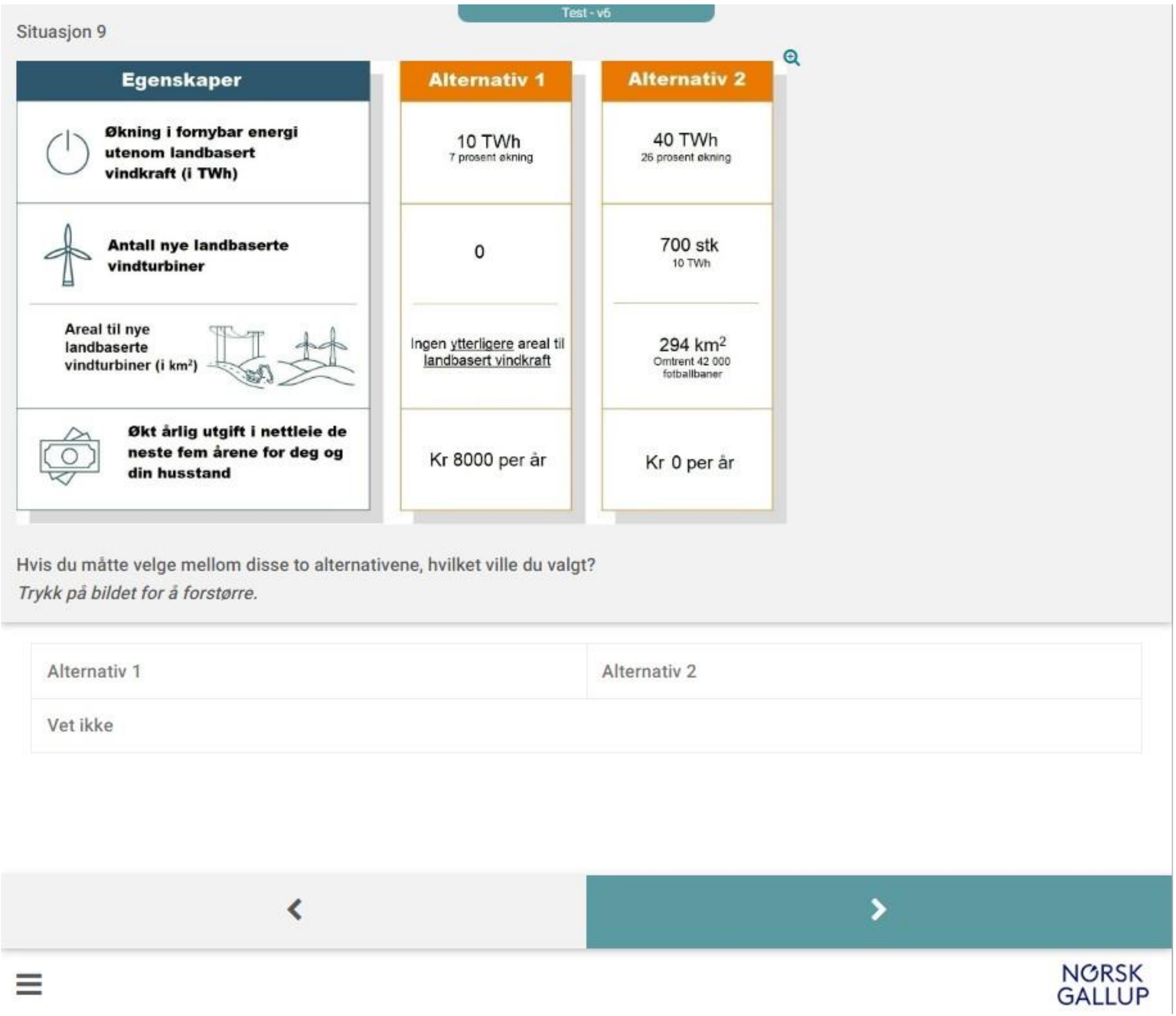
VCK:


Test - v6
Situasjon 8
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
30 TWh
20 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
1400 stk
20 TWh
Areal til nye landbaserte vindturbiner (i km²)
Ingen ytterligere areal til landbasert vindkraft
588 km²
Omtrent 84 000 fotballbaner
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 5000 per år
Kr 5000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

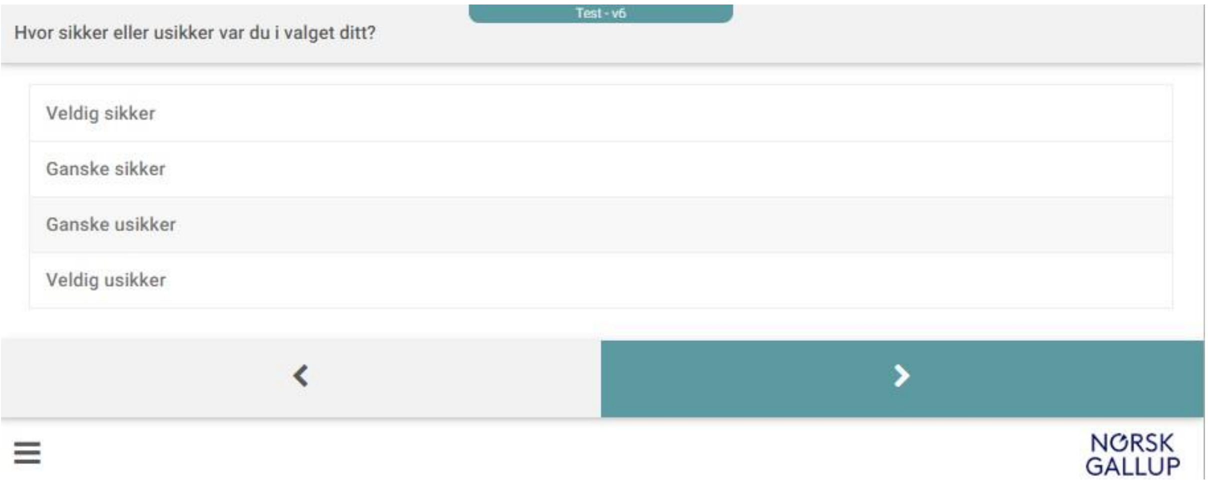
VCT:



VCK9, hvis svarte Alternativ 1 i hver valgsituasjon:

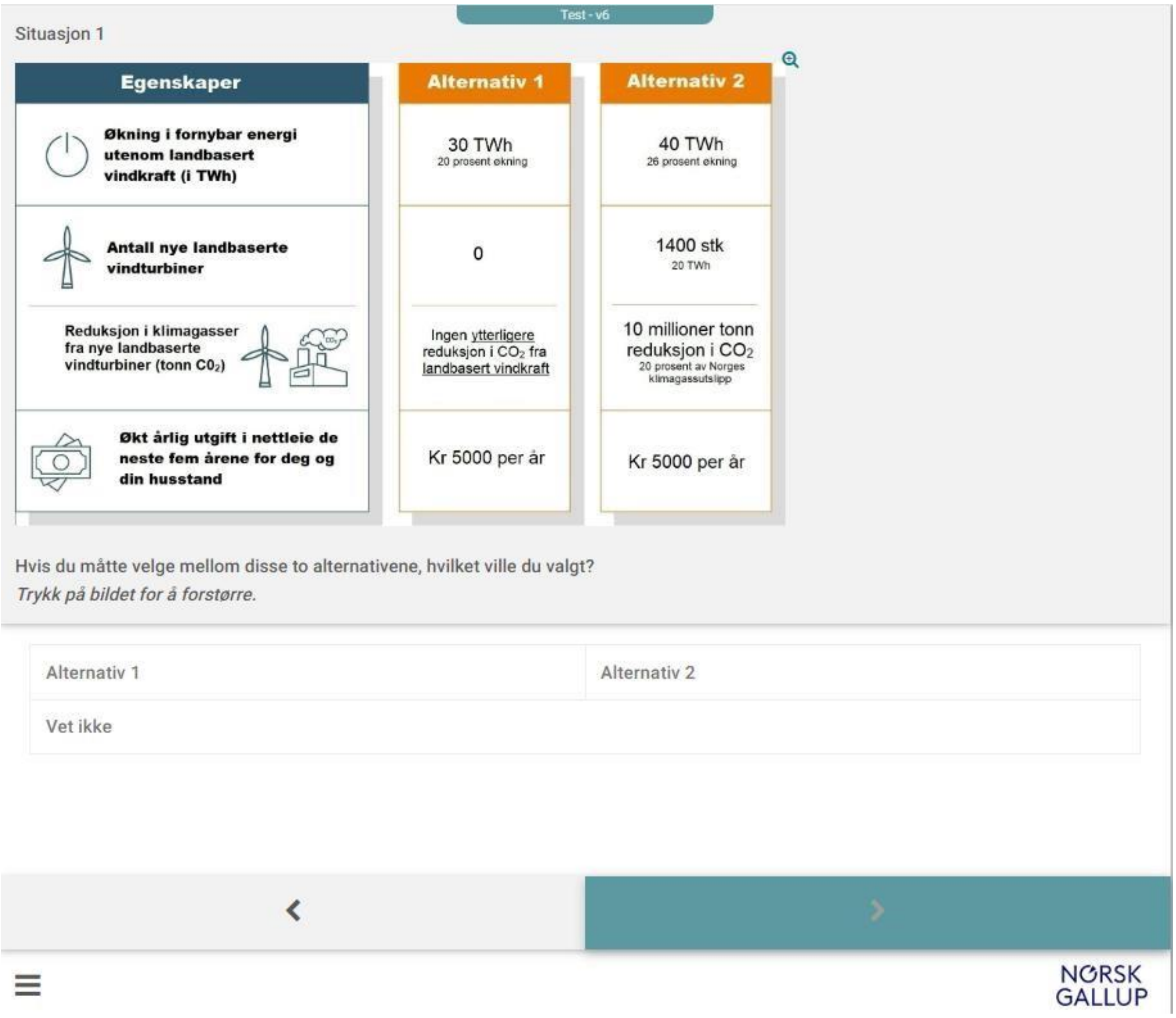


VCT9, hvis svarte Alternativ 1 i hver valgsituasjon:

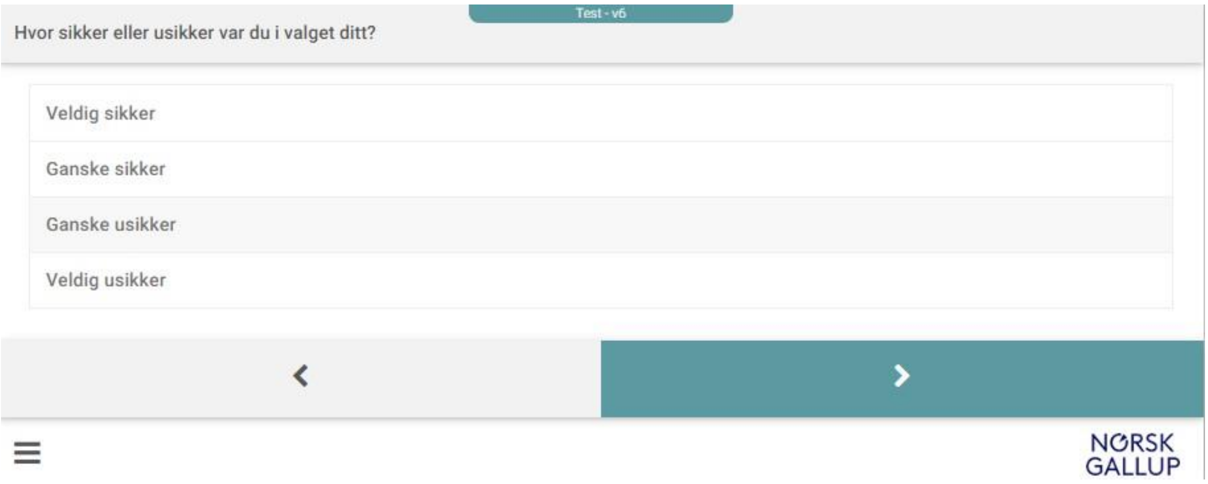


Klima-utvalg (blokk 1, randomisert rekkefølge av valgkort):

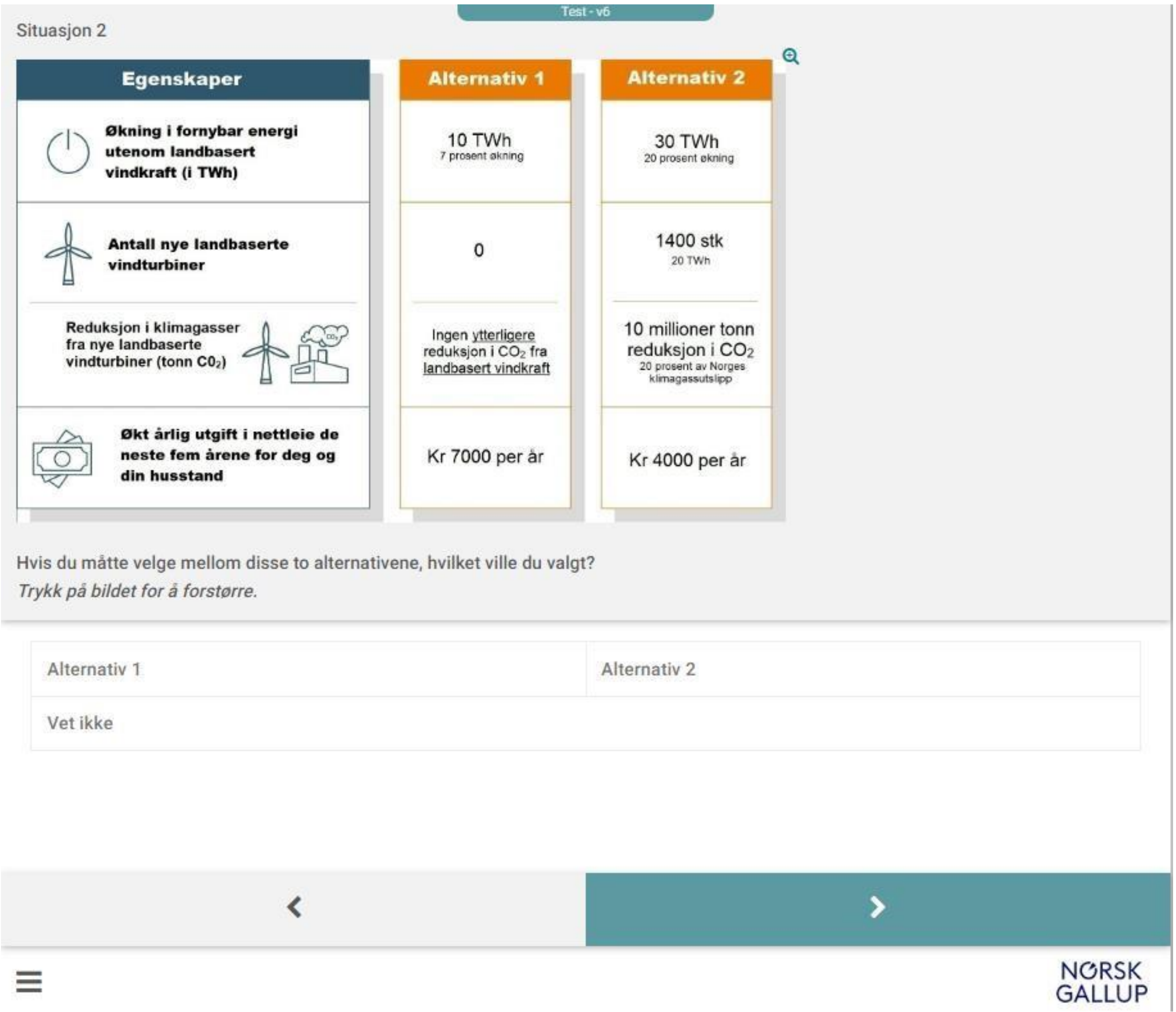
VCB:



VCL:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

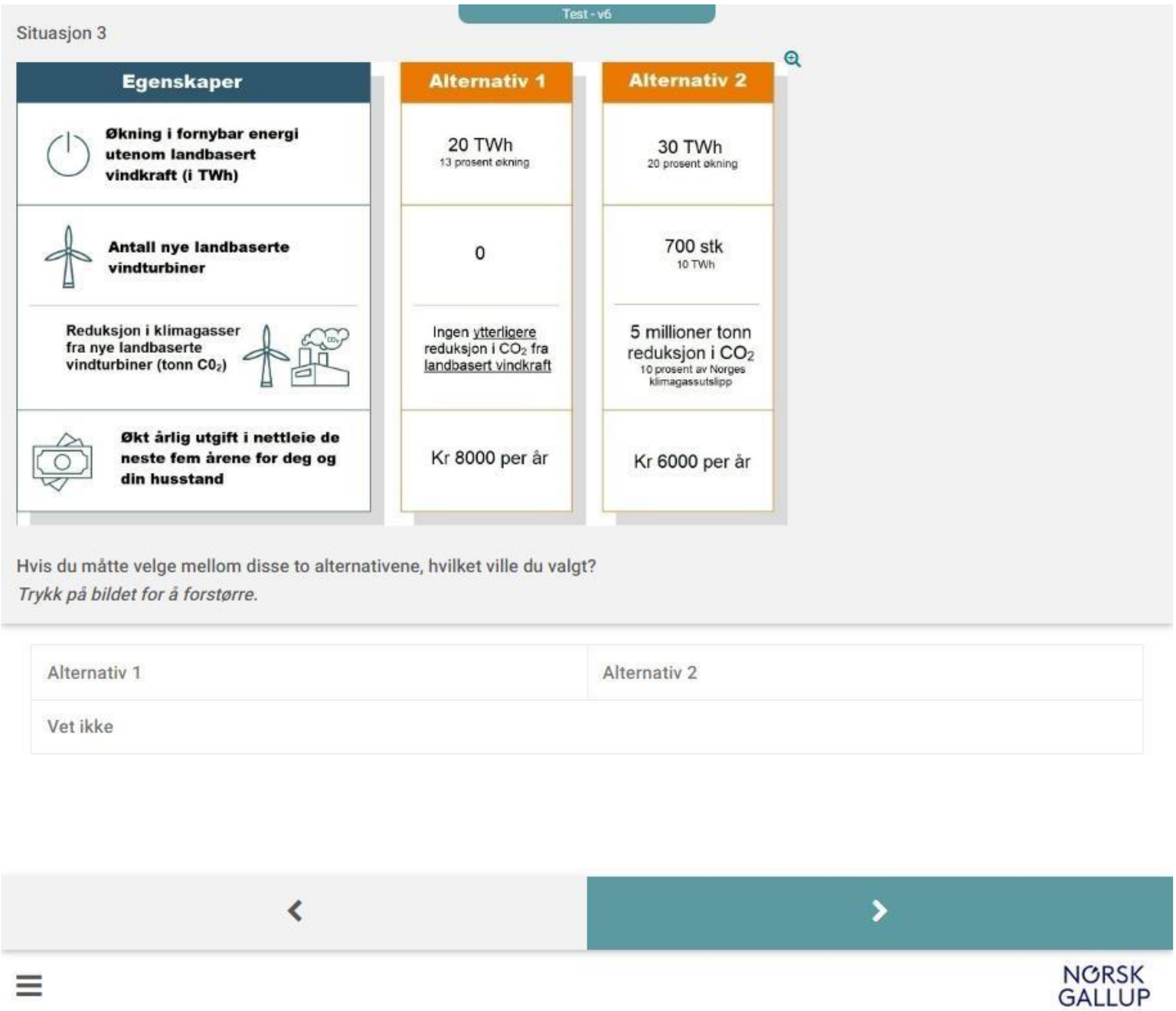
VCC:


Test - v6
Situasjon 2
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
1400 stk
20 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)
Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft
10 millioner tonn reduksjon i CO_2
20 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 7000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCM:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

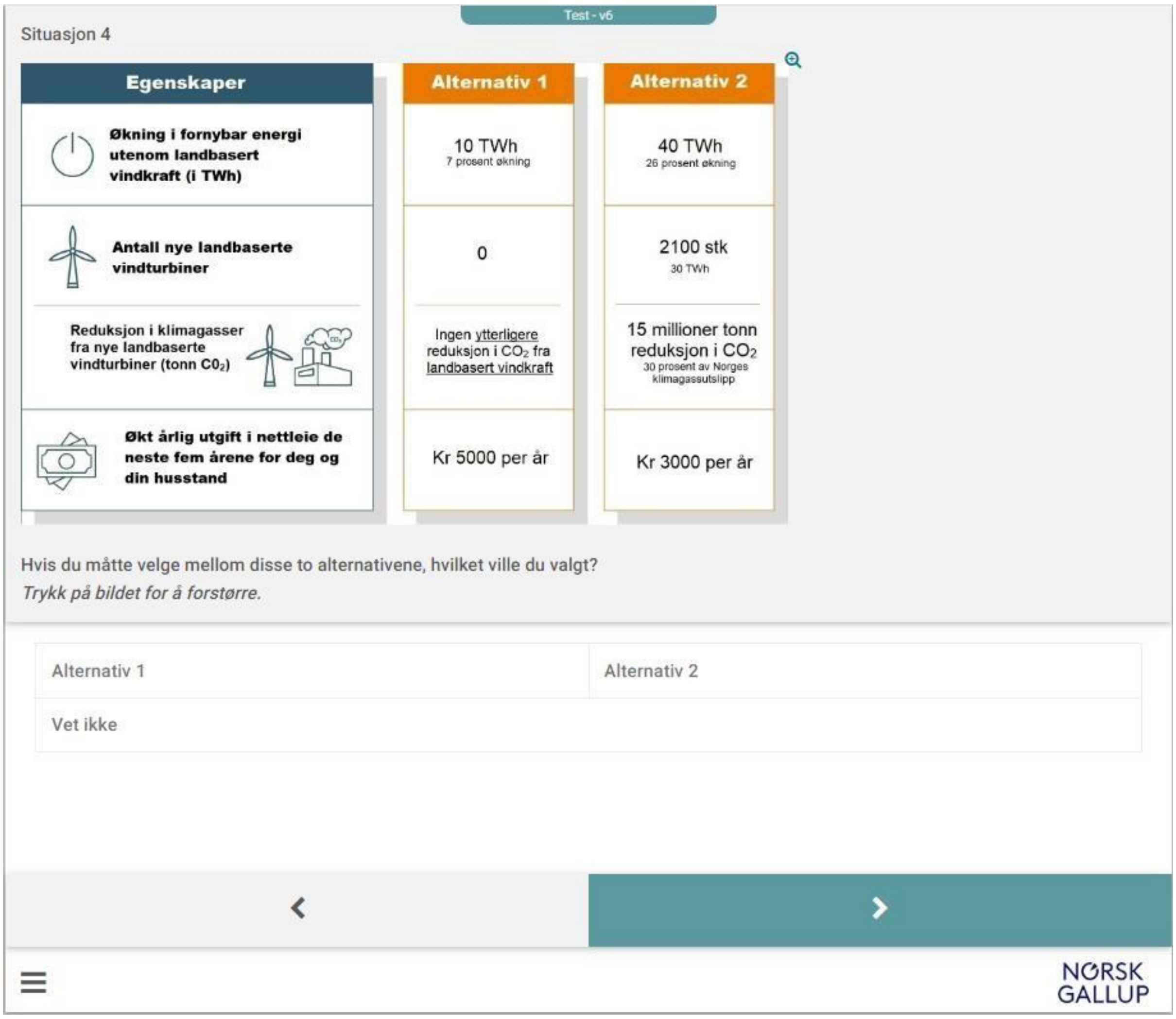
VCD:


Test - v6
Situasjon 3
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn C0₂)
Ingen ytterligere reduksjon i CO₂ fra landbasert vindkraft
5 millioner tonn reduksjon i CO₂
10 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 6000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCN:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

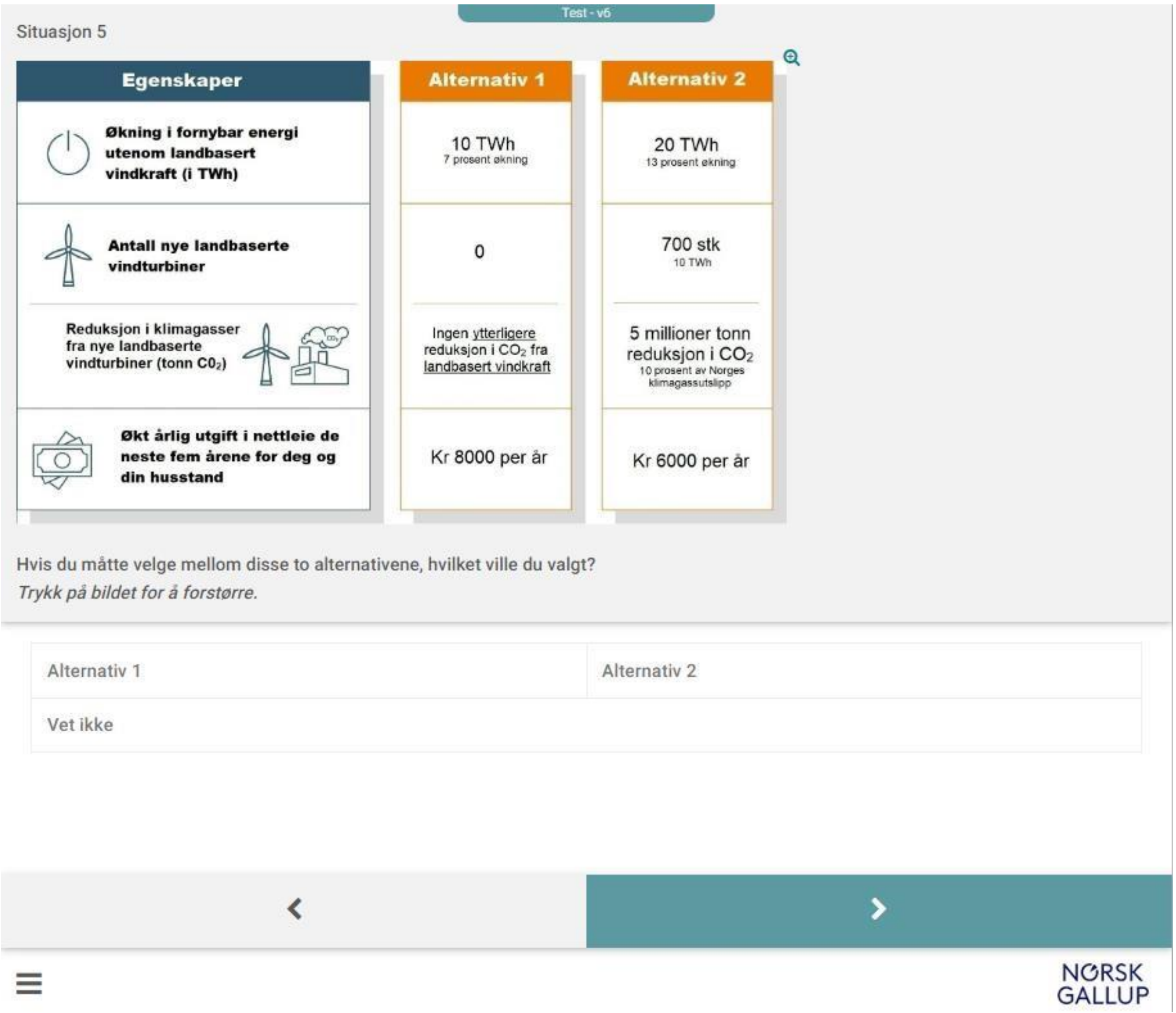
VCF:


Test - v6
Situasjon 4
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)
Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft
15 millioner tonn reduksjon i CO_2
30 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 5000 per år
Kr 3000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCP:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

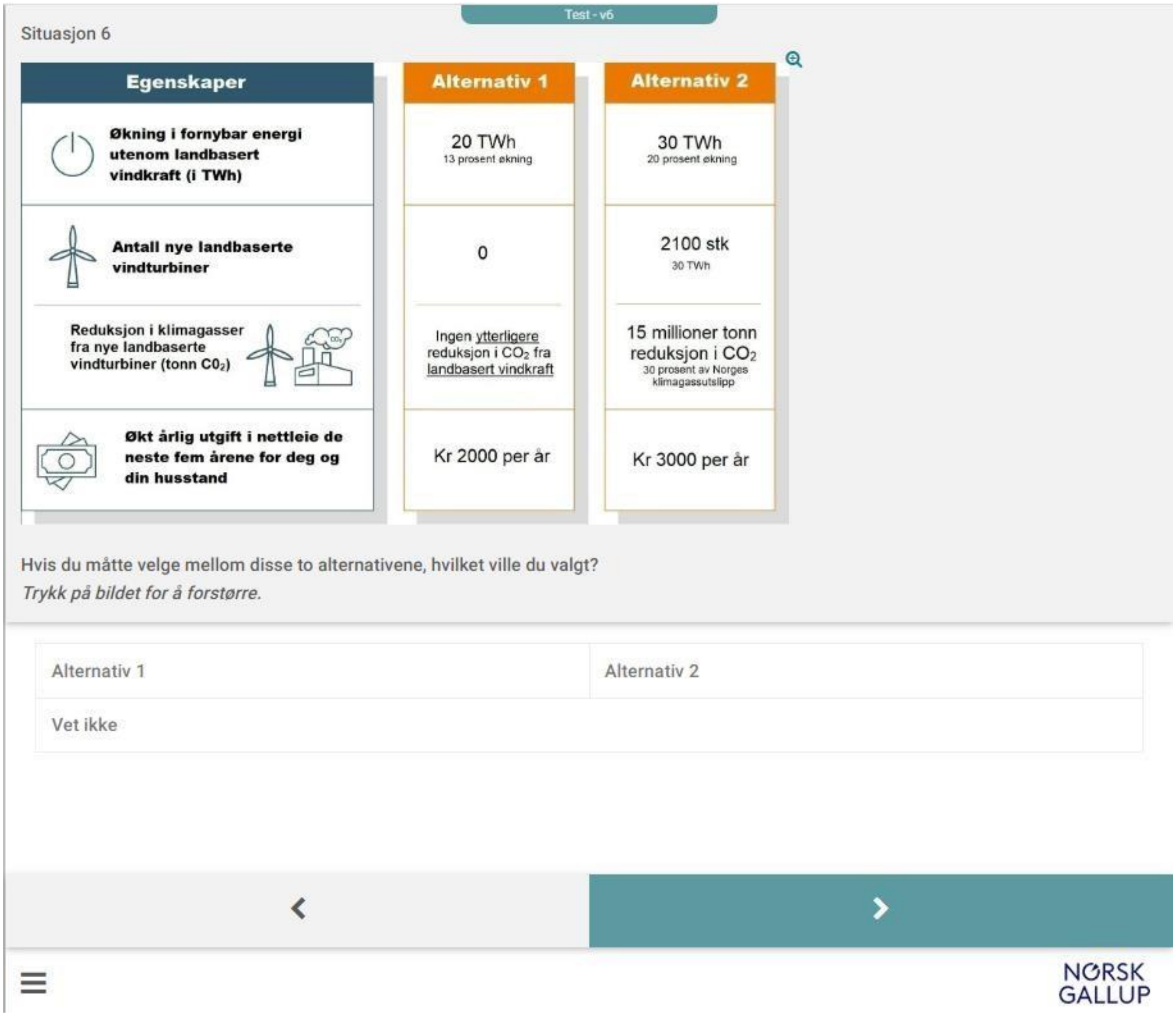
VCG:


Test - v6
Situasjon 5
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
20 TWh
13 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO2)
Ingen ytterligere reduksjon i CO2 fra landbasert vindkraft
5 millioner tonn reduksjon i CO2
10 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 6000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCQ:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

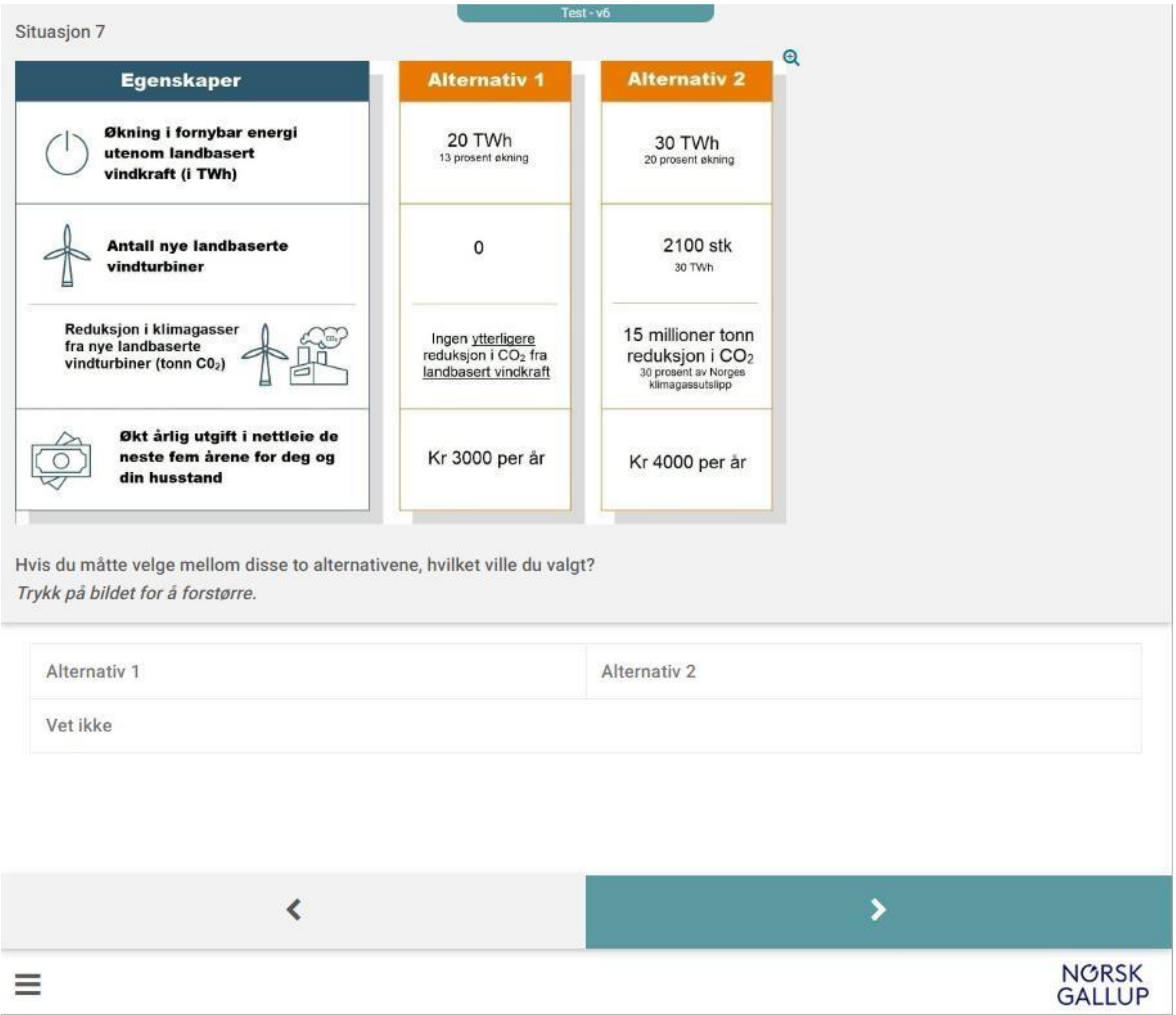
VCH:


Test - v6
Situasjon 6
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn C0₂)
Ingen ytterligere reduksjon i CO₂ fra landbasert vindkraft
15 millioner tonn reduksjon i CO₂
30 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 2000 per år
Kr 3000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCR:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

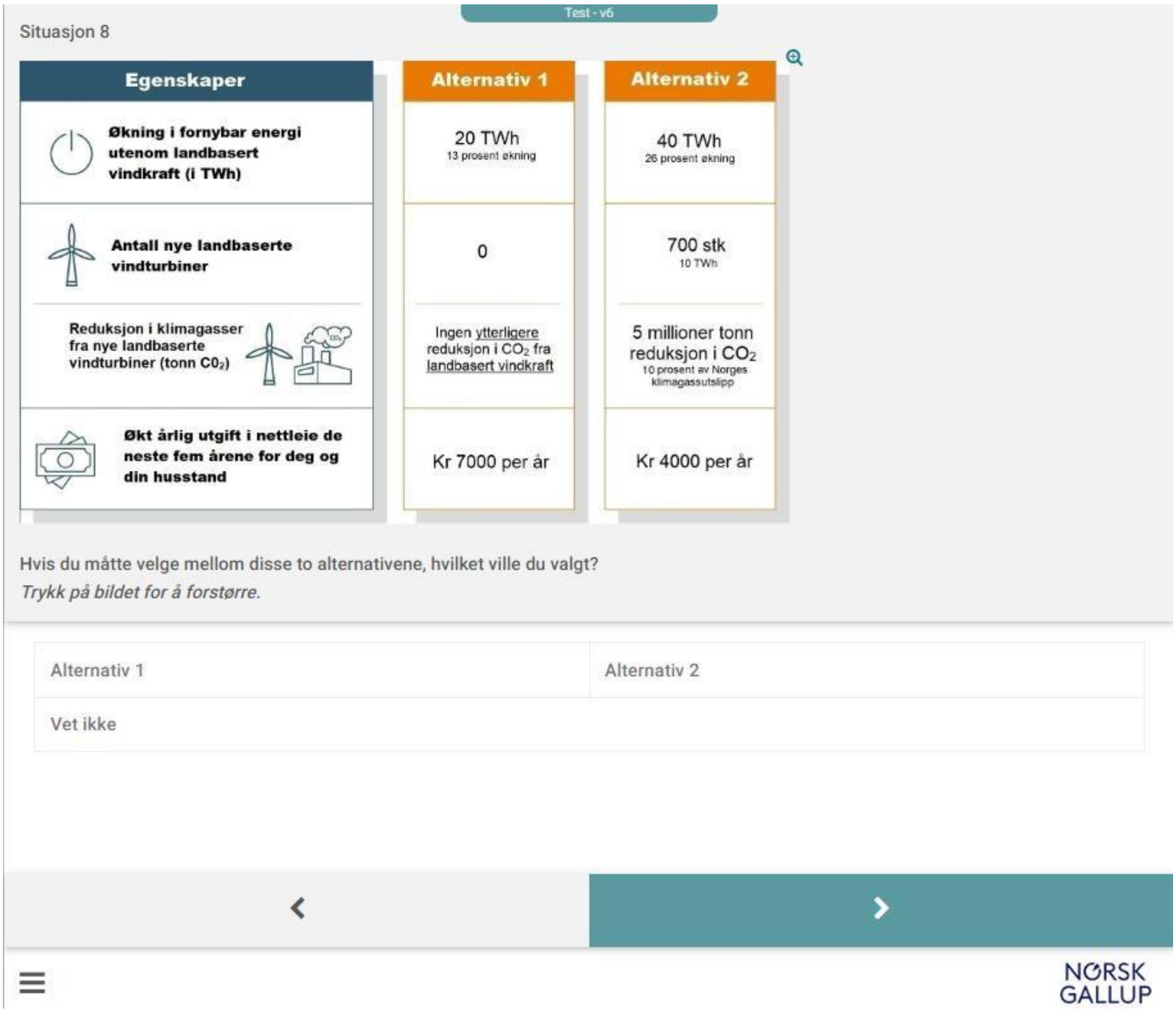
VCJ:


Test - v6
Situasjon 7
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO₂)
Ingen ytterligere reduksjon i CO₂ fra landbasert vindkraft
15 millioner tonn reduksjon i CO₂
30 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 3000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCS:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

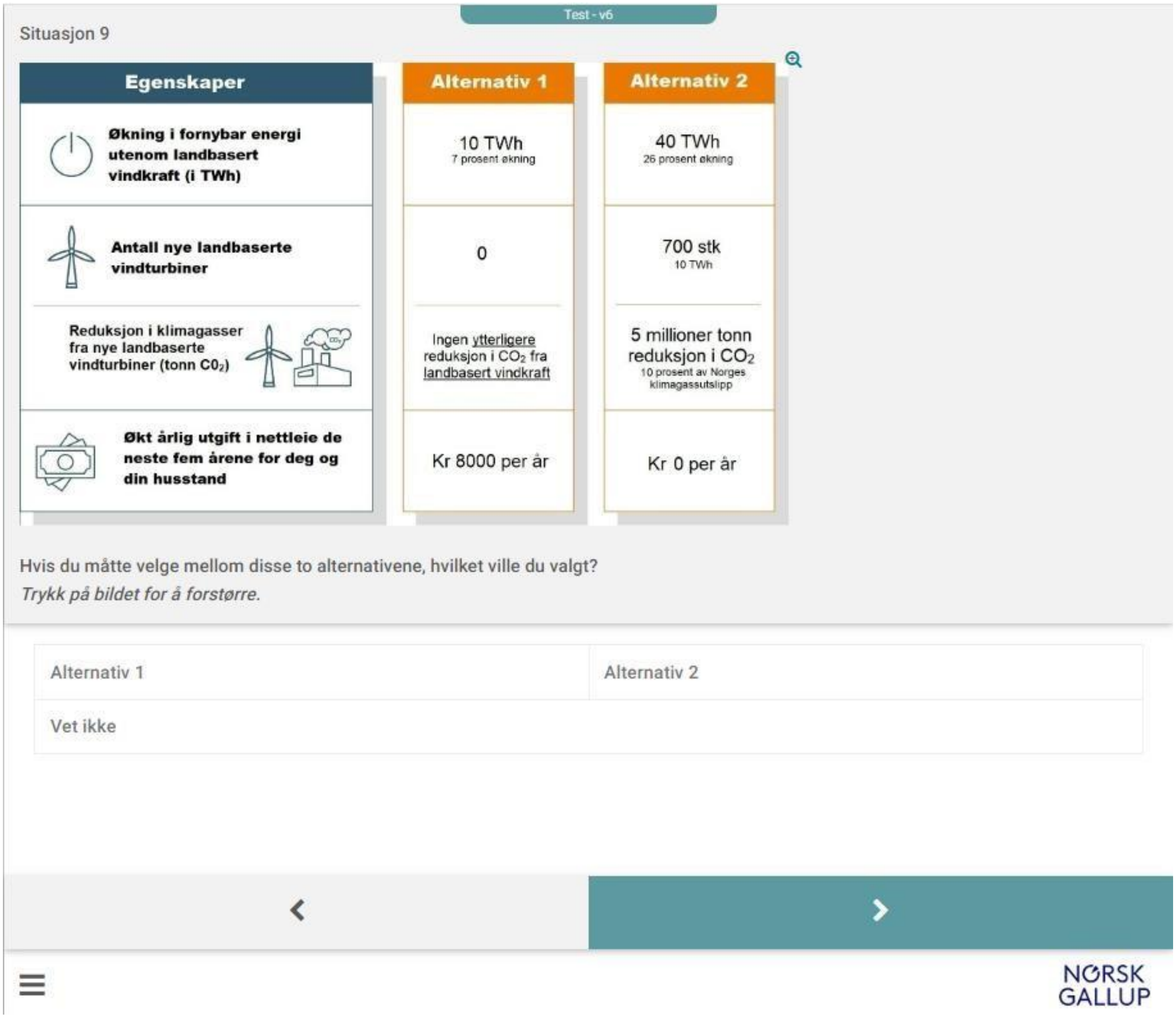
VCK:


Test - v6
Situasjon 8
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO₂)
Ingen ytterligere reduksjon i CO₂ fra landbasert vindkraft
5 millioner tonn reduksjon i CO₂
10 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 7000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCT:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

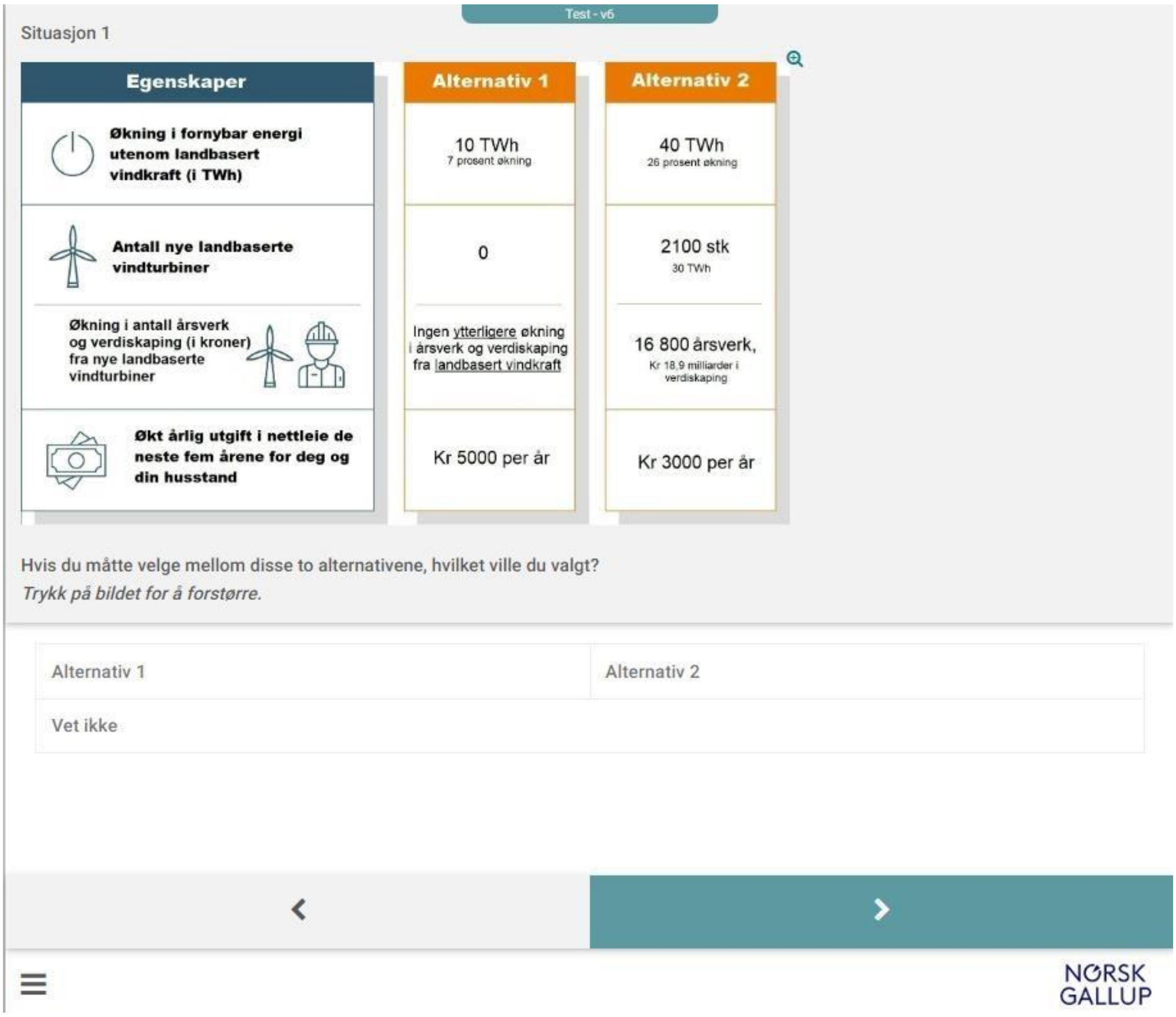
VCK9:


Test - v6
Situasjon 9
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Reduksjon i klimagasser fra nye landbaserte vindturbiner (tonn CO_2)
Ingen ytterligere reduksjon i CO_2 fra landbasert vindkraft
5 millioner tonn reduksjon i CO_2
10 prosent av Norges klimagassutslipp
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 0 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCT9:

Verdi-utvalg (blokk 1, randomisert rekkefølge av valgkort):

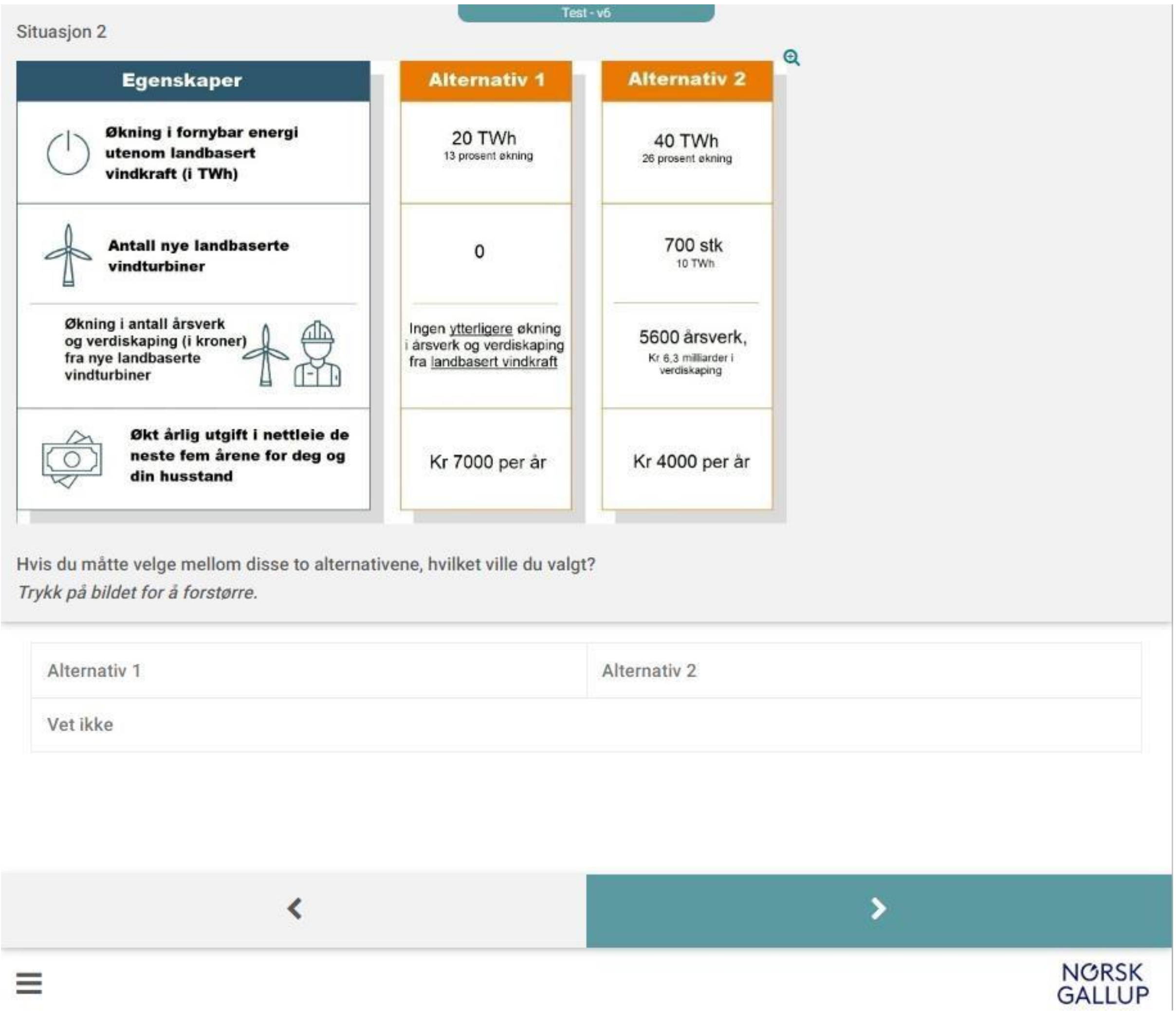
VCB:



VCL:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

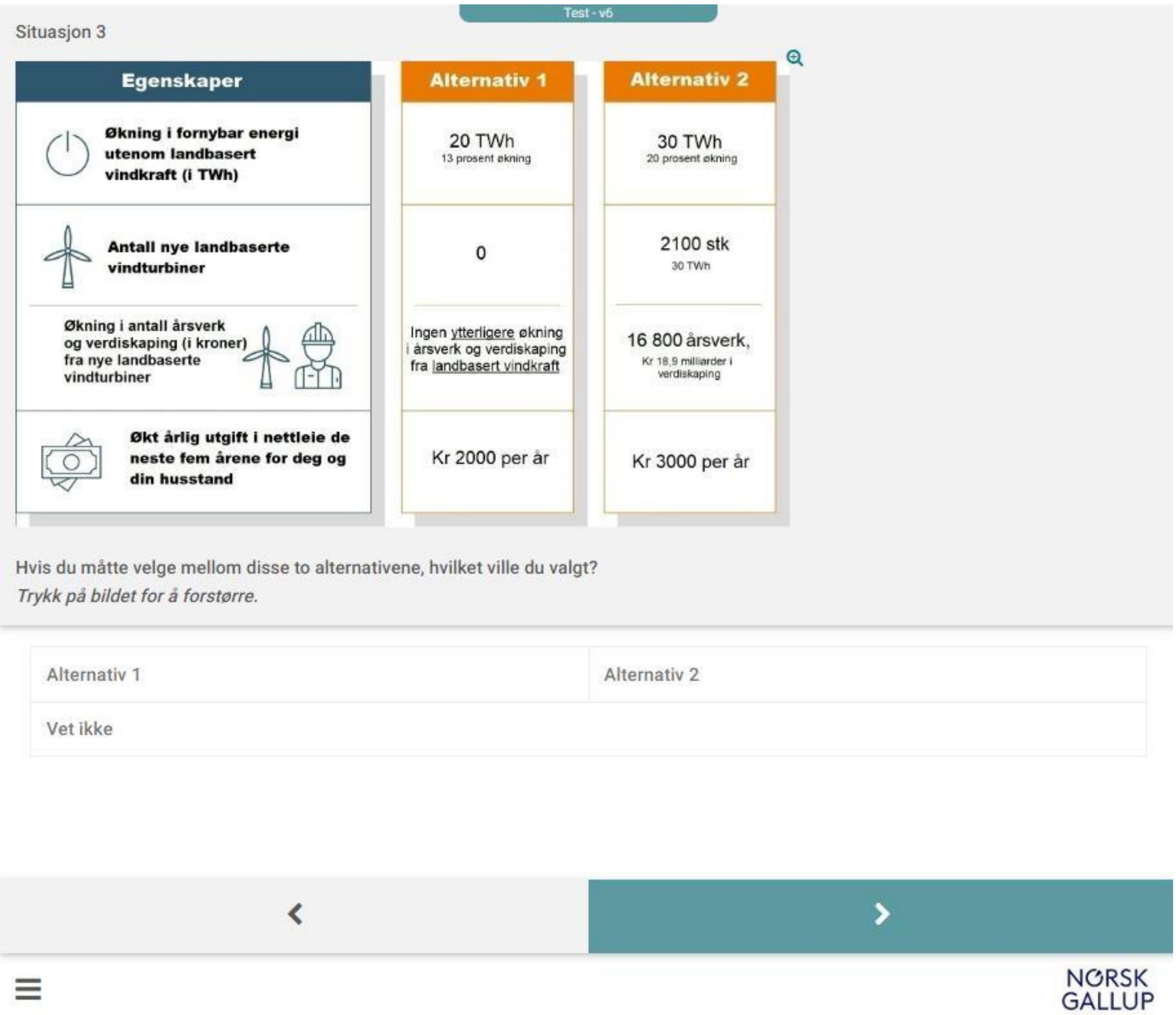
VCC:


Test - v6
Situasjon 2
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
5600 årsverk,
Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 7000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCM:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

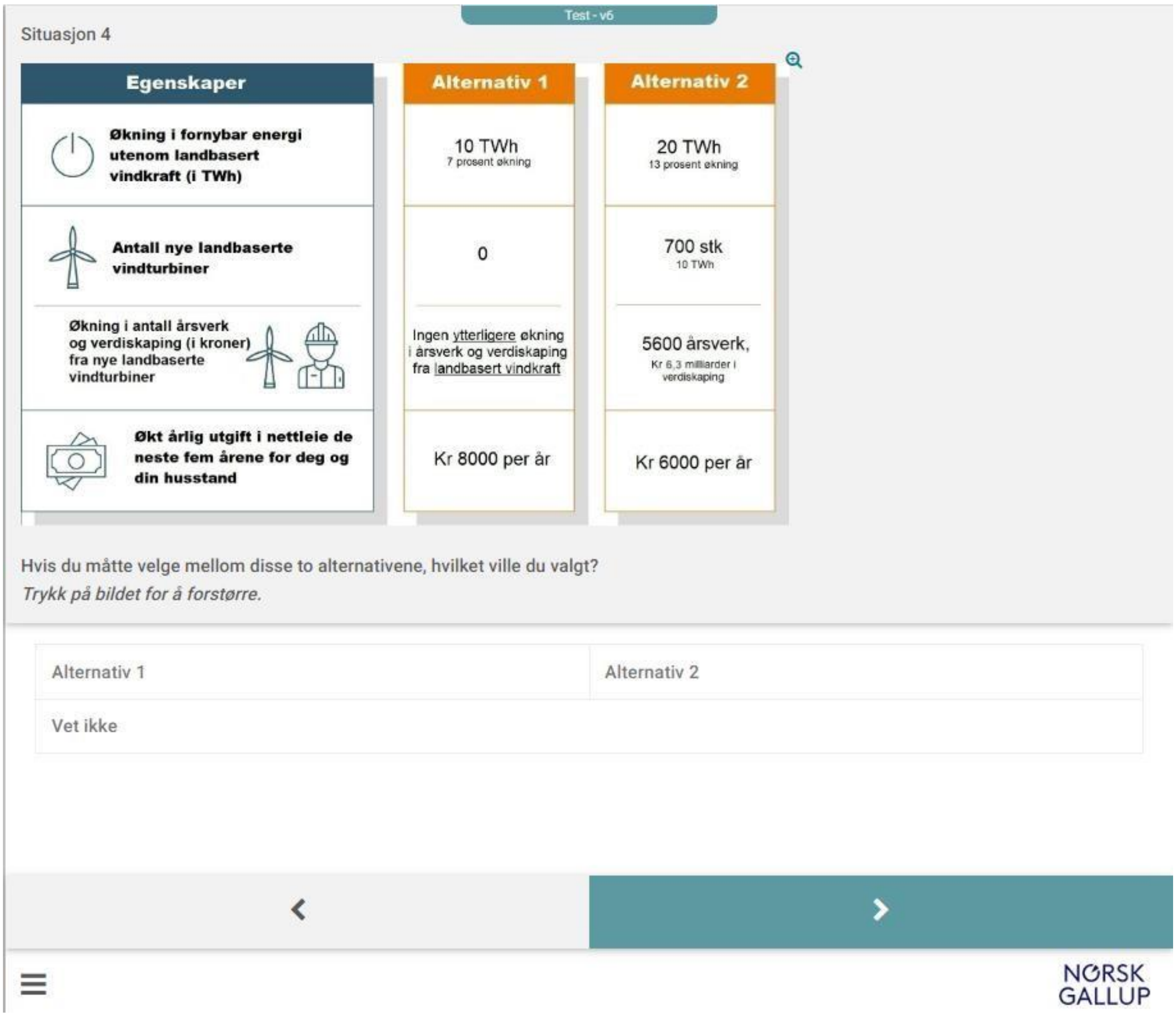
VCD:


Test - v6
Situasjon 3
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
16 800 årsverk,
Kr 18,9 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 2000 per år
Kr 3000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCN:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK
GALLUP

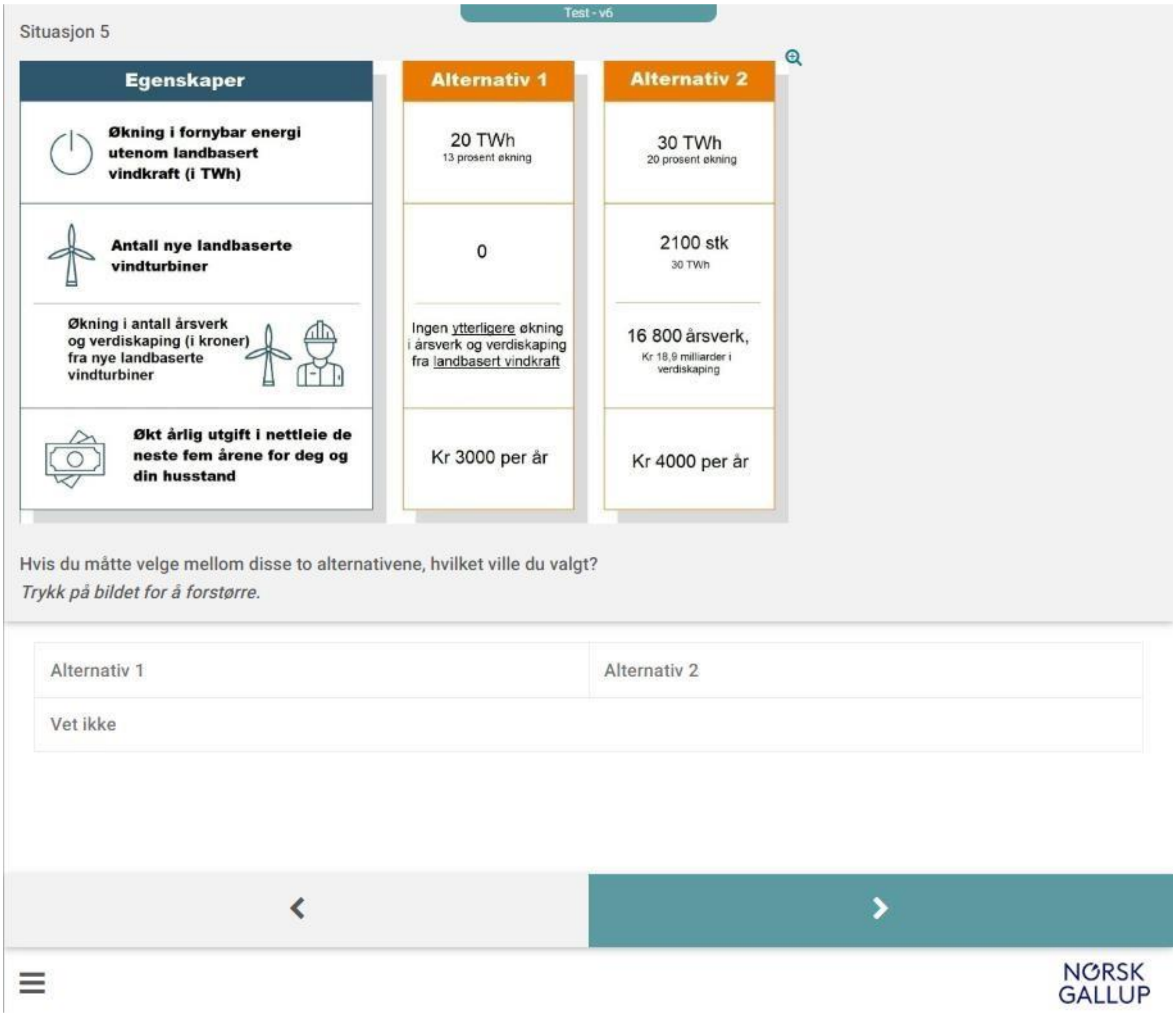
VCF:


Test - v6
Situasjon 4
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
20 TWh
13 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
5600 årsverk,
Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 6000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK
GALLUP

VCP:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

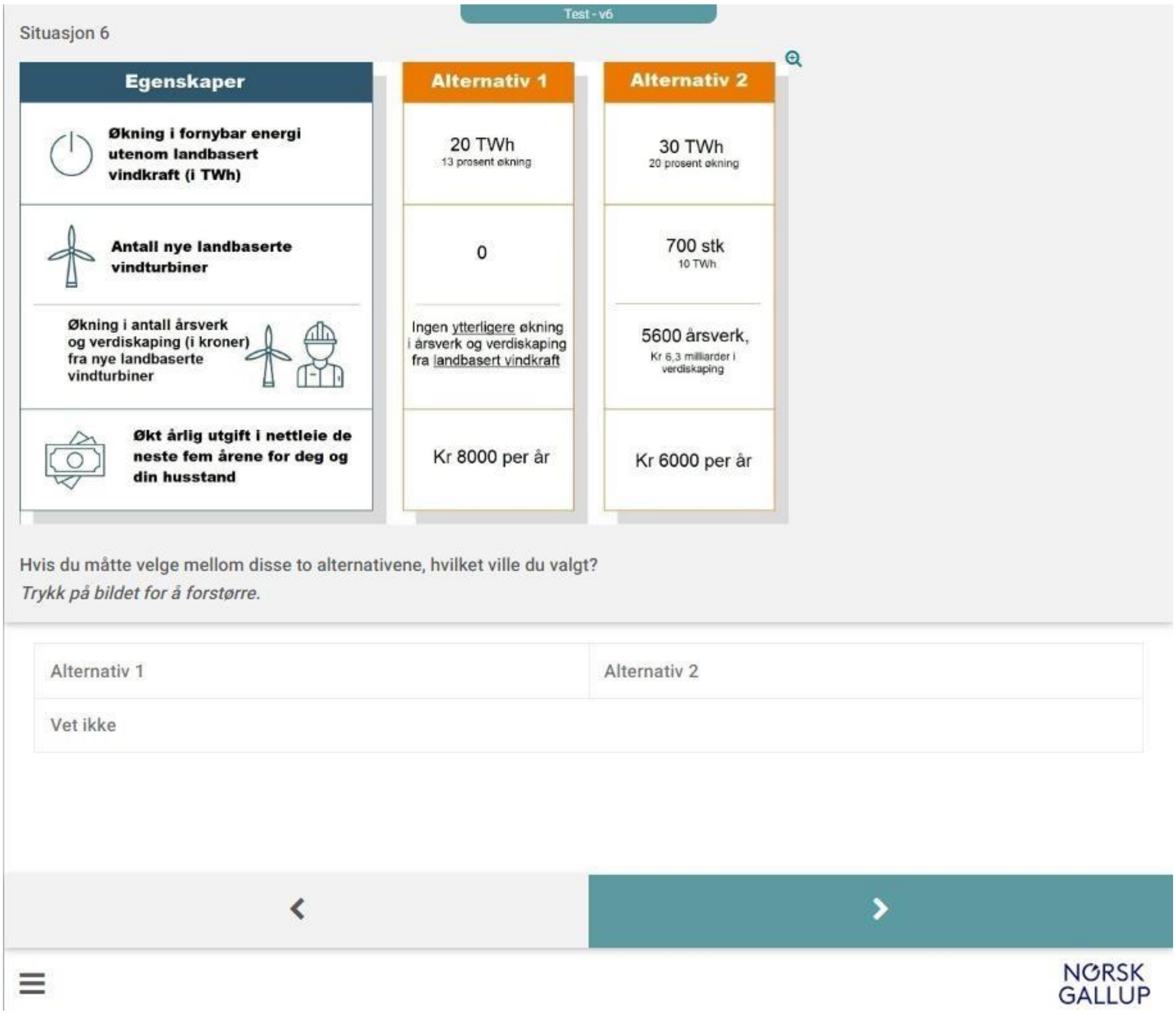
VCG:


Test - v6
Situasjon 5
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
2100 stk
30 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
16 800 årsverk,
Kr 18,9 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 3000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCQ:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

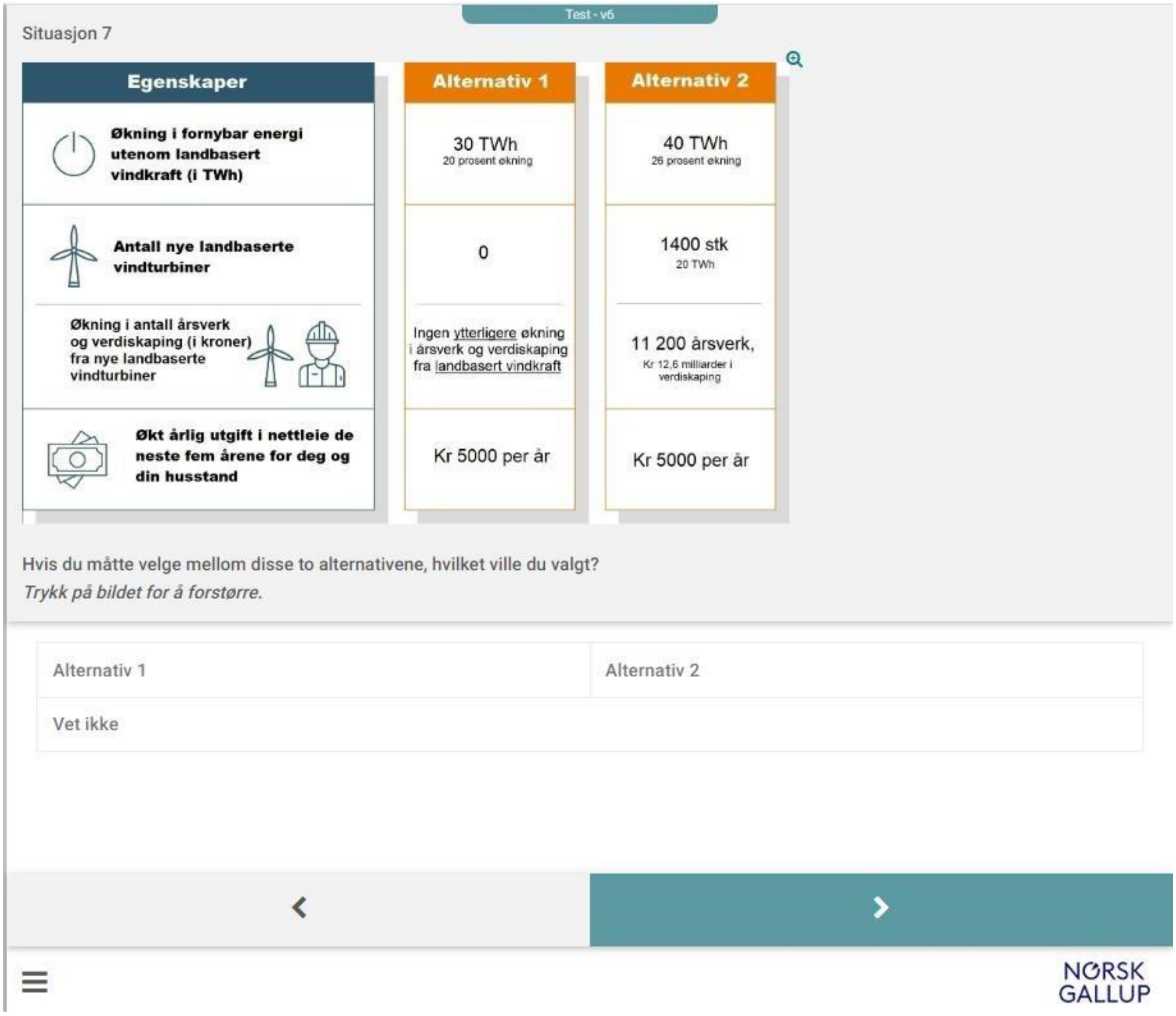
VCH:


Test - v6
Situasjon 6
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
20 TWh
13 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
5600 årsverk,
Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 6000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCR:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK
GALLUP

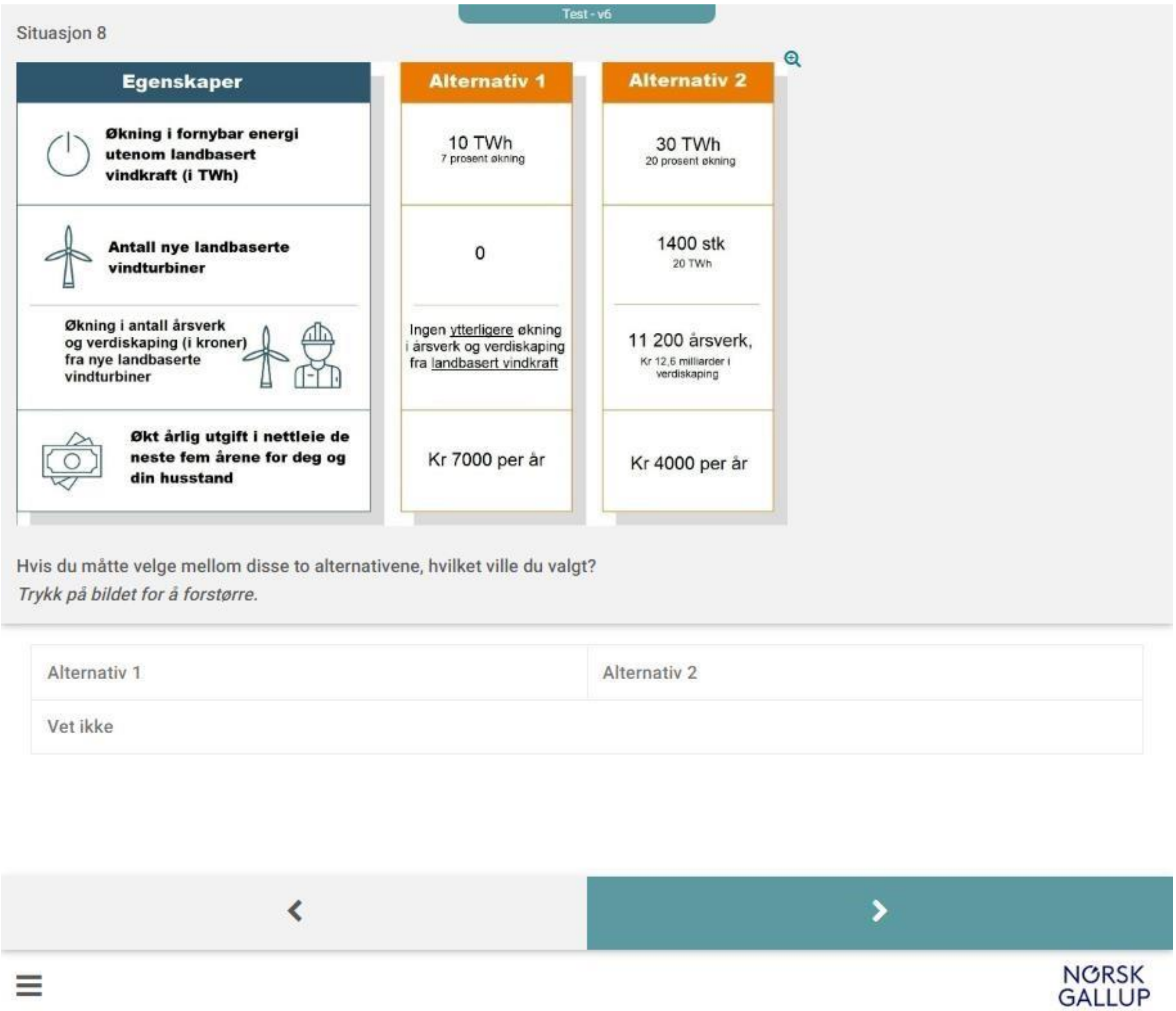
VCJ:


Test - v6
Situasjon 7
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
30 TWh
20 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
1400 stk
20 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
11 200 årsverk,
Kr 12,6 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 5000 per år
Kr 5000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK
GALLUP

VCS:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

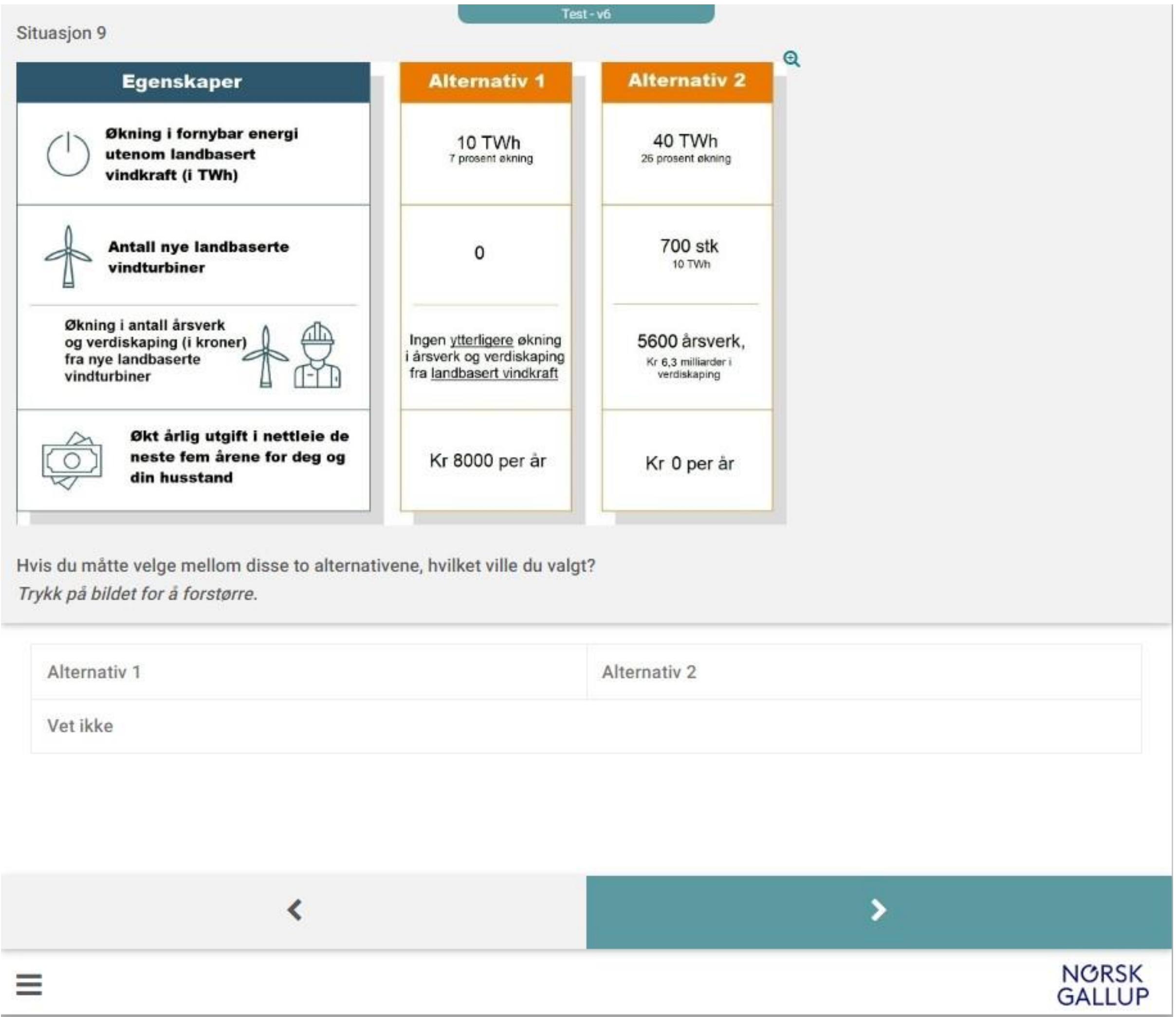
VCK:


Test - v6
Situasjon 8
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
30 TWh
20 prosent økning
Antall nye landbaserte vindturbiner
0
1400 stk
20 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
11 200 årsverk,
Kr 12,6 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 7000 per år
Kr 4000 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCT:


Test - v6
Hvor sikker eller usikker var du i valget ditt?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

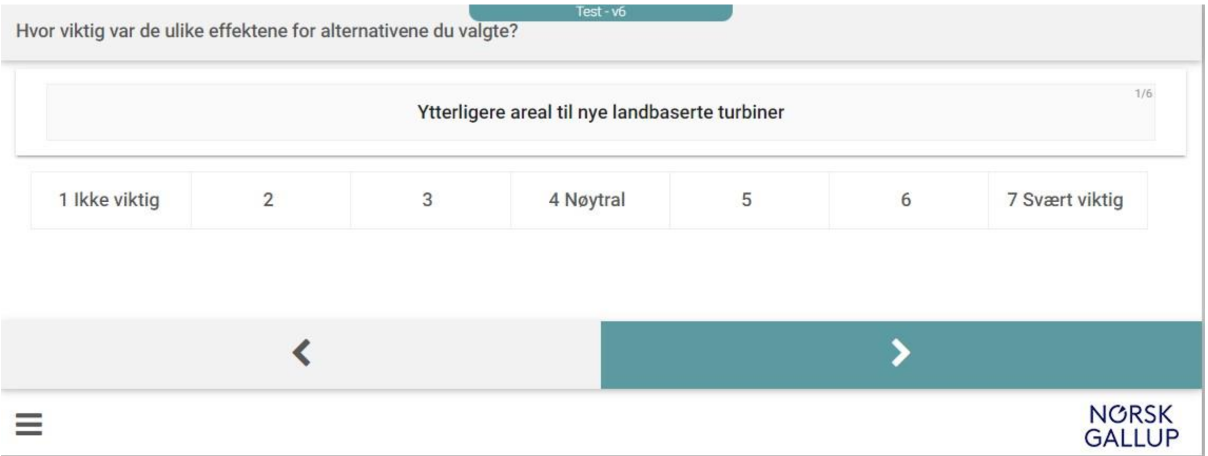
VCK9:


Test - v6
Situasjon 9
Egenskaper
Alternativ 1
Alternativ 2
Økning i fornybar energi utenom landbasert vindkraft (i TWh)
10 TWh
7 prosent økning
40 TWh
26 prosent økning
Antall nye landbaserte vindturbiner
0
700 stk
10 TWh
Økning i antall årsverk og verdiskaping (i kroner) fra nye landbaserte vindturbiner
Ingen ytterligere økning i årsverk og verdiskaping fra landbasert vindkraft
5600 årsverk,
Kr 6,3 milliarder i verdiskaping
Økt årlig utgift i nettleie de neste fem årene for deg og din husstand
Kr 8000 per år
Kr 0 per år
Hvis du måtte velge mellom disse to alternativene, hvilket ville du valgt?
Trykk på bildet for å forstørre.
Alternativ 1
Alternativ 2
Vet ikke
NORSK GALLUP

VCT9:

General survey:

VCV*, randomisert rekkefølge:



Test - v6

Hvor viktig var de ulike effektene for alternativene du valgte?

3/6

Ytterligere økning i arbeidsplasser og verdiskapning fra ny landbasert vindkraft

1 Ikke viktig	2	3	4 Nøytral	5	6	7 Svært viktig

NORSK GALLUP

Test - v6

Hvor viktig var de ulike effektene for alternativene du valgte?

4/6

Økning i nettleie

1 Ikke viktig	2	3	4 Nøytral	5	6	7 Svært viktig

NORSK GALLUP

Test - v6

Hvor viktig var de ulike effektene for alternativene du valgte?

5/6

Antall nye vindturbiner

1 Ikke viktig	2	3	4 Nøytral	5	6	7 Svært viktig

NORSK GALLUP

Test - v6

Hvor viktig var de ulike effektene for alternativene du valgte?

6/6

Økning i fornybar kraft utenom landbasert vindkraft

1 Ikke viktig	2	3	4 Nøytral	5	6	7 Svært viktig

NORSK GALLUP

VCW, hvis svarte Alternativ 1 i de åtte valgsituasjonene:

Test - v6

Hva var den viktigste grunnen til at du valgte Alternativ 1 i hver valgsituasjon?

- Jeg synes ikke Norge skal være et grønt batteri for Europa
- Jeg visste ikke hvilket alternativ jeg skulle velge
- Valgene var for vanskelige
- Det burde ikke bygges mer landbasert vindkraft i Norge
- Det vil ikke bidra tilstrekkelig i kampen mot klimaendringer
- Jeg tror ikke det andre alternativet vil fungere etter sin hensikt
- Det andre alternativet hadde for store landskapskostnader, fordelene tatt i betraktning
- Å forsyne Europe med fornybar energi fra Norge skal ikke gå på bekostning av norsk natur
- Jeg synes ikke det andre alternativet er verdt å finansieres
- Kraften blir uansett eksportert som gir oss høyere strømpriser
- Annen årsak, nemlig: ____
- Vet ikke

NORSK GALLUP

VCX, hvis svarte Alternativ 2 i de åtte valgsituasjonene:

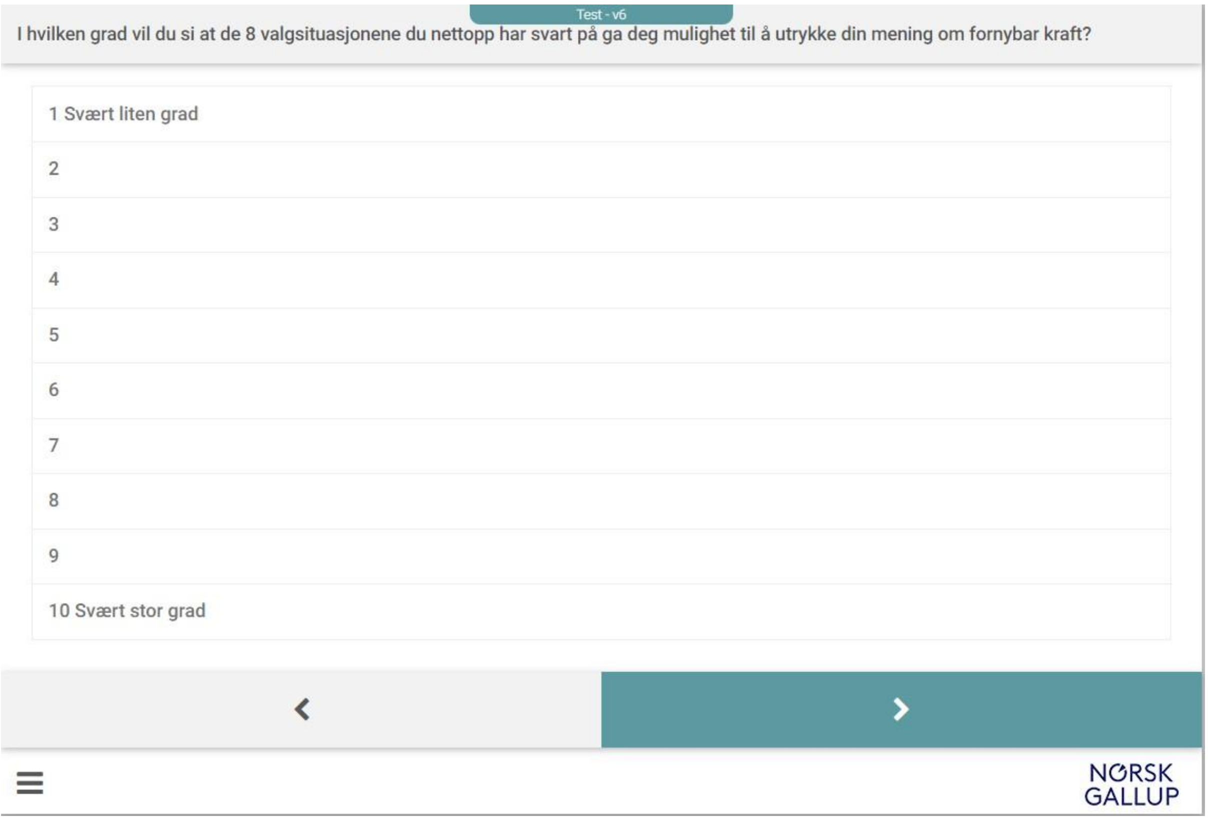
Test - v3

Hva var den viktigste grunnen til at du valgte Alternativ 2 i hver valgsituasjon?

- Jeg tror ikke det første alternativet vil fungere etter sin hensikt
- Økningen i strømregningen var for høy i det første alternativet
- Det første alternativet hadde for lite økning i fornybar kraftproduksjon
- Det burde bygges mer landbasert vindkraft i Norge
- Det første alternativet vil ikke bidra tilstrekkelig i kampen mot klimaendringer
- Valgene var for vanskelige
- Kraften blir bare uansett eksportert som gir oss høyere strømpriser
- Jeg visste ikke hvilket alternativ jeg skulle velge
- Jeg vil ha minst mulig økning i strømpris
- Annen årsak, nemlig: ____
- Vet ikke

NORSK GALLUP

VCY:


Test - v6

I hvilken grad vil du si at de 8 valgsituasjonene du nettopp har svart på ga deg mulighet til å utrykke din mening om fornybar kraft?

1 Svært liten grad
2
3
4
5
6
7
8
9
10 Svært stor grad

NORSK GALLUP

VCZ*:


Test - v6

Hvor ofte kjenner du deg igjen i følgende påstander?

1/8

Tanken på klimaendringer gjør det vanskelig for meg å konsentrere meg

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
2/8
Tanken på klimaendringer gjør det vanskelig for meg å sove
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
3/8
Jeg har mareritt om klimaendringer
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
4/8
Jeg tar meg selv i å gråte på grunn av klimaendringer
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
5/8
Jeg tenker «hvorfor takler jeg ikke klimaendringer bedre?»
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
6/8
Jeg tenker for meg selv «hvorfor føler jeg det slik om klimaendringer?»
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
7/8
Jeg skriver ned mine tanker om klimaendringer og analyserer dem
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v6
Hvor ofte kjenner du deg igjen i følgende påstander?
8/8
Jeg tenker «hvorfor reagerer jeg på klimaendringer på denne måten?»
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP

VBYC*:


Test - v3
Hvor ofte kjenner du deg igjen i følgende påstander?
1/10
Jeg bekymrer meg mer over klimaendringer enn andre folk
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP


Test - v3
Hvor ofte kjenner du deg igjen i følgende påstander?
2/10
Tanker om klimaendringer får meg til å bekymre meg over hvordan fremtiden vil være
Aldri
Sjelden
Av og til
Ofte
(Nesten) alltid
Vet ikke
NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

3/10

Jeg pleier å søke etter informasjon om klimaendringer i media (som TV, aviser, internett)

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

4/10

Jeg pleier å bli bekymret når jeg hører om klimaendringer, selv om effektene av klimaendringene er et stykke frem i tid

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

5/10

Jeg bekymrer meg for at ekstremvær vil bli en konsekvens av klimaendringer

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

6/10

Jeg bekymrer meg så mye over klimaendringer at jeg føler jeg ikke kan gjøre noe med det

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

7/10

Jeg er bekymret for om jeg klarer å håndtere klimaendringene

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

8/10

Jeg merker at jeg bekymrer meg over klimaendringer

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

9/10

Når jeg først begynner å bekymre meg for klimaendringer så finner jeg det vanskelig å slutte

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

NORSK GALLUP

Test - v3

Hvor ofte kjenner du deg igjen i følgende påstander?

10/10

Jeg bekymrer meg for hvordan klimaendringer vil påvirke folk jeg bryr meg om

Aldri	Sjelden	Av og til	Ofte	(Nesten) alltid	Vet ikke

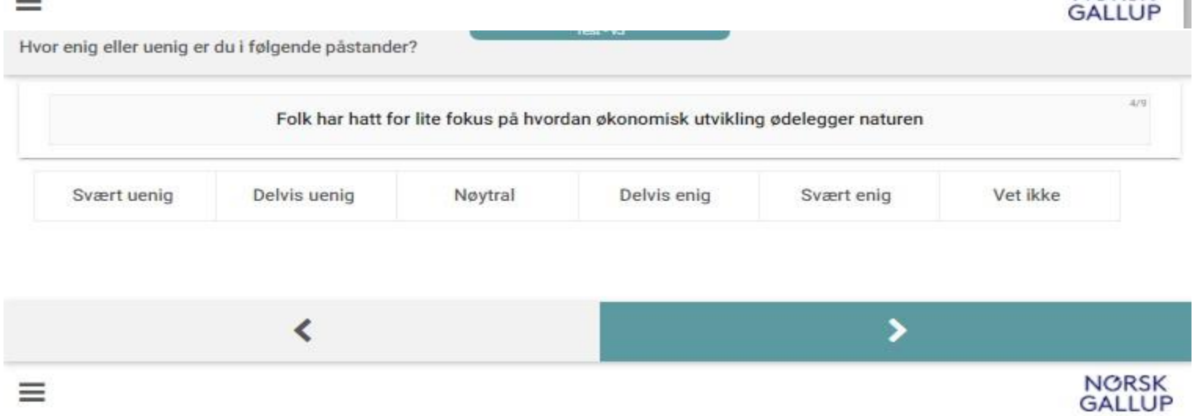
NORSK GALLUP

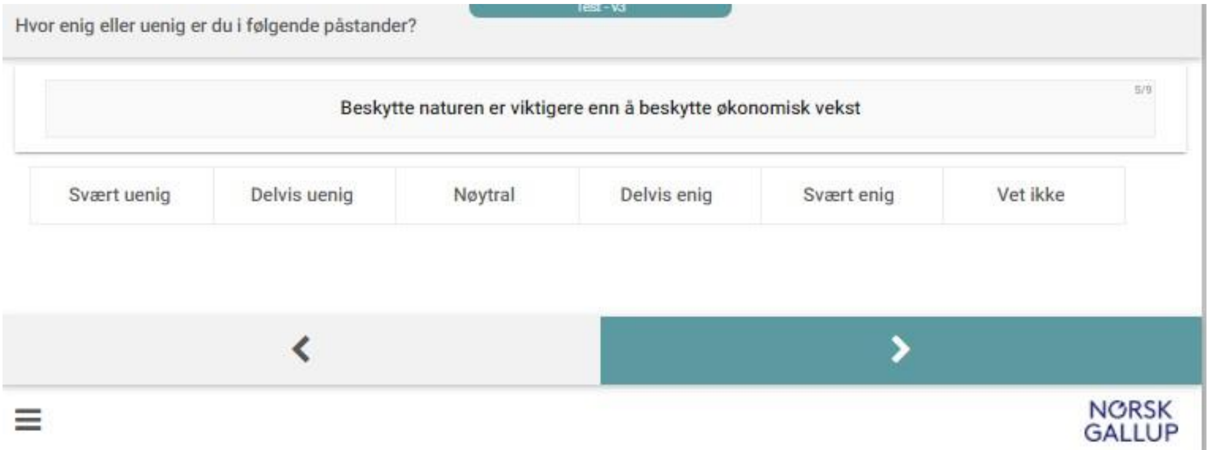
VDW:


Hvor enig eller uenig er du i følgende påstander?
Test - v3
Det er greit at mennesker bruker naturen som en ressurs for økonomisk aktivitet
1/9
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP


Hvor enig eller uenig er du i følgende påstander?
Test - v3
Beskytte folk sine jobber er mer viktig enn å beskytte naturen
2/9
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP


Hvor enig eller uenig er du i følgende påstander?
Test - v3
Mennesker har IKKE rett til å ødelegge naturen kun for å få høyere økonomisk vekst
3/9
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP


Hvor enig eller uenig er du i følgende påstander?
Folk har hatt for lite fokus på hvordan økonomisk utvikling ødelegger naturen
4/9
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP



Test - v3

Hvor enig eller uenig er du i følgende påstander?

5/9

Beskytte naturen er viktigere enn å beskytte økonomisk vekst

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP

Test - v3

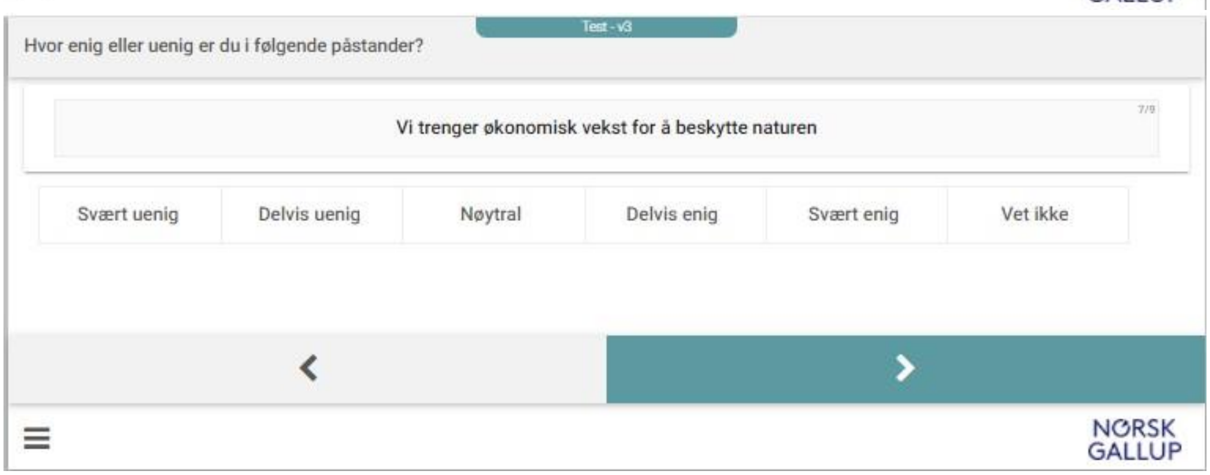
Hvor enig eller uenig er du i følgende påstander?

6/9

Vi burde ikke lenger bruke naturen for økonomisk virksomhet

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP



Test - v3

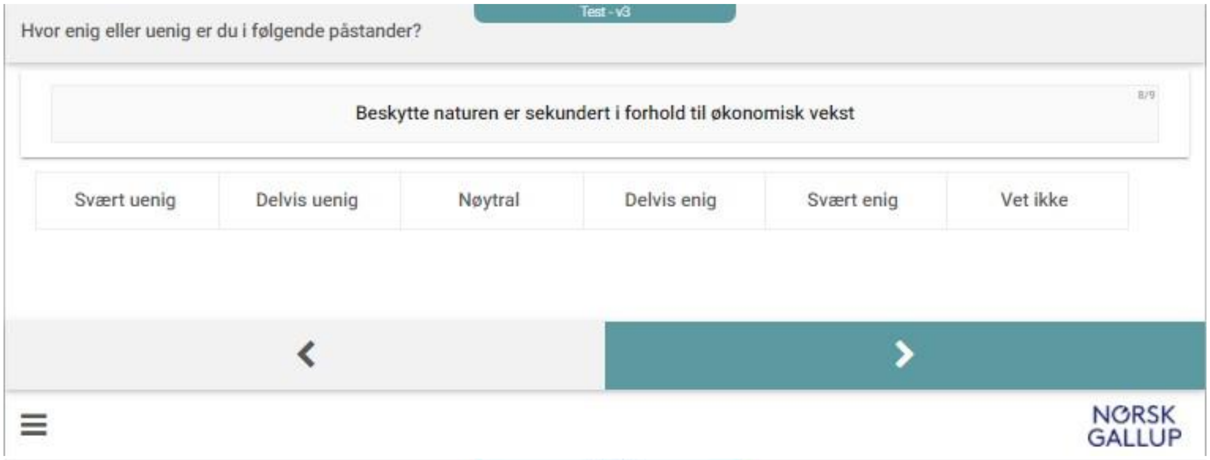
Hvor enig eller uenig er du i følgende påstander?

7/9

Vi trenger økonomisk vekst for å beskytte naturen

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP


Test - v3

Hvor enig eller uenig er du i følgende påstander?

8/9

Beskytte naturen er sekundert i forhold til økonomisk vekst

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP


Test - v3

Hvor enig eller uenig er du i følgende påstander?

9/9

Beskytte naturen er viktigere enn å beskytte folk sine jobber

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP

VDB:


Hvor enig eller uenig er du i følgende utsagn?
Test - v3
1/7
Norsk natur føles som en del av meg
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP


Hvor enig eller uenig er du i følgende utsagn?
Test - v3
2/7
Å oppholde seg i norsk natur sier mye om hvem jeg er
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP


Hvor enig eller uenig er du i følgende utsagn?
Test - v3
3/7
Jeg identifiserer meg sterkt med norsk natur
Svært uenig
Delvis uenig
Nøytral
Delvis enig
Svært enig
Vet ikke
NORSK GALLUP

Test - v3

Hvor enig eller uenig er du i følgende utsagn?

4/7

Norsk natur er VÅR

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP

Test - v3

Hvor enig eller uenig er du i følgende utsagn?

5/7

Jeg føler at norsk natur tilhører OSS

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP

Test - v3

Hvor enig eller uenig er du i følgende utsagn?

6/7

VI eier norsk natur

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP

Test - v3

Hvor enig eller uenig er du i følgende utsagn?

7/7

Jeg føler at norsk natur er VÅR

Svært uenig	Delvis uenig	Nøytral	Delvis enig	Svært enig	Vet ikke

NORSK GALLUP

VDC*:

Test - v6

Ved planlegging av videre utbygging av landbasert vindkraft er det mange faktorer som spiller en viktig rolle, for eksempel naturbevaring, verdiskaping, og reduksjon i klimagassutslipp.
Vennligst gi din mening om viktigheten av de ulike sammenlikningene nedenfor

1/2

Sammenliknet med å bevare norsk natur, er det å redusere globale klimagassutslipp fra norsk landbasert vindkraft...

Generelt mindre viktig	Like viktig	Generelt mer viktig

NORSK GALLUP

Test - v6

Ved planlegging av videre utbygging av landbasert vindkraft er det mange faktorer som spiller en viktig rolle, for eksempel naturbevaring, verdiskaping, og reduksjon i klimagassutslipp.
Vennligst gi din mening om viktigheten av de ulike sammenlikningene nedenfor

2/2

Sammenliknet med å bevare norsk natur, er det å øke verdiskaping og antall arbeidsplasser i Norge...

Generelt mindre viktig	Like viktig	Generelt mer viktig

NORSK GALLUP

VDD:

Test - v6

Omtrent hvor ofte har du foretatt fritidsaktiviteter der du har sett vindkraftanlegg de siste 12 månedene?
Tell alle aktiviteter som varte mer enn én time per dag som én dag.

- Ikke i det hele tatt
- 1 dag
- 2-12 dager
- 13-24 dager
- 25 eller flere dager
- Vet ikke

NORSK GALLUP

VBYb:

Test - v6

Omtrent hvor mye betalte din husholdning i strømregning (inkludert nettleie) i gjennomsnitt per måned i 2021?

- Husholdningen min betaler ikke for strøm
- Inntil 399 kroner
- 400-799 kroner
- 800-1199 kroner
- 1200-1599 kroner
- 1600-1999 kroner
- 2000-2399 kroner
- 2400-2799 kroner
- 2800-2999 kroner
- 3000-3999 kroner
- 4000 kroner eller mer
- Vet ikke

NORSK GALLUP

VDX:

Test - v6

I 2021 har strømprisen vært rekordhøy på Sørlandet, Østlandet og Vestlandet. Tror du dette vil vedvare i år 2022/2023?

- Ja
- Nei
- Vet ikke

NORSK GALLUP

VDF:

Test - v6

Hva er din høyeste fullførte utdanning?

- Grunnskole (7-10 år)
- Videregående skole / gymnas
- Fagbrev
- 3-4 årig universitetsutdanning (bachelor/cand.mag)
- 5-årig universitetsutdanning (mastergrad / profesjonsutdanning)
- Doktorgrad / PhD
- Usikker / Vet ikke

NORSK GALLUP

VDG:

Test - v6

Hvordan vurderer du dine kunnskaper i matematikk?

- 1 Svært dårlige
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 Svært gode

NORSK GALLUP

VDH*:

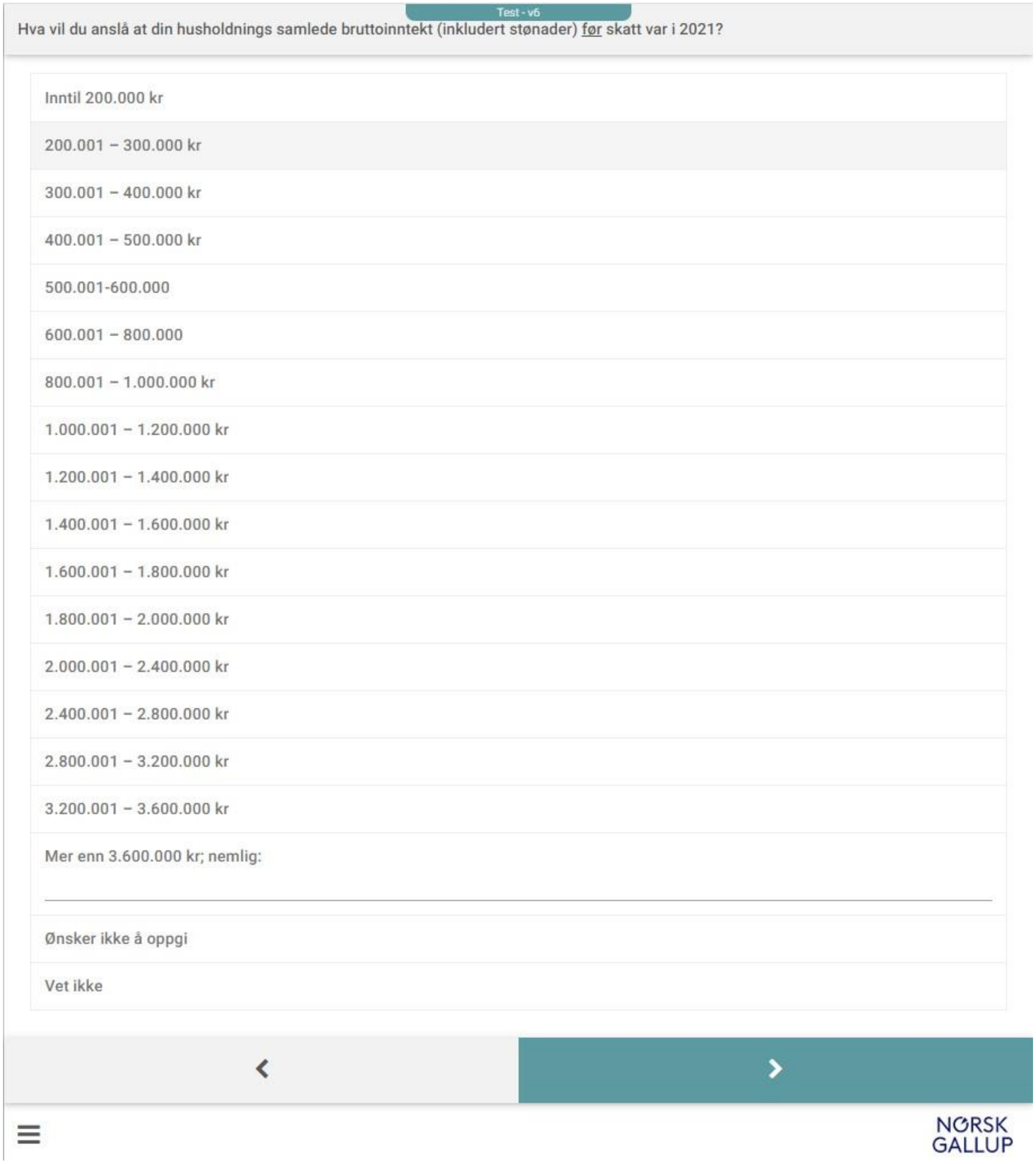
Test - v6

Er du eller noen i husholdningen din direkte påvirket av vindkraftproduksjon?
Merk alle som passer

- Ja, vi disponerer bolig hvor man kan se vindturbiner
- Ja, vi disponerer fritidsbolig/hytte hvor man kan se vindturbiner
- Ja, vi eier arealer der det er eller kan bli aktuelt å bygge vindkraft
- Ja, vi kan bli påvirket gjennom jobb i turistnæringen
- Ja, vi bor i nærheten av arealer der det er eller kan bli aktuelt å bygge vindkraft
- Ja, vi jobber innen fornybar energi
- Nei, verken jeg selv eller noen i husstanden er direkte påvirket
- Vet ikke

NORSK GALLUP

VDJ:



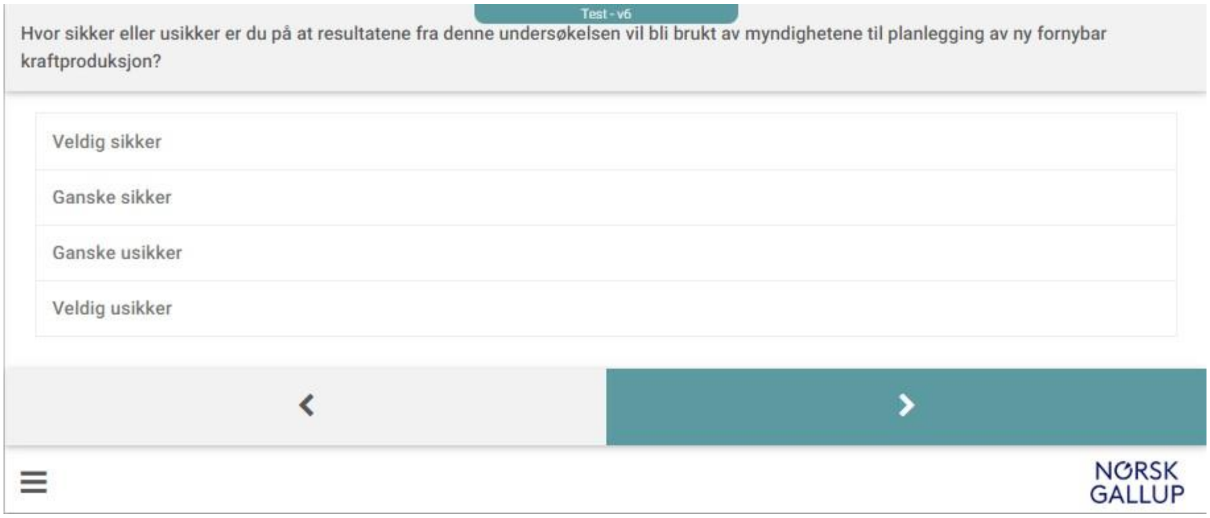
Test - v6

Hva vil du anslå at din husholdnings samlede bruttoinntekt (inkludert stønader) før skatt var i 2021?

- Inntil 200.000 kr
- 200.001 – 300.000 kr
- 300.001 – 400.000 kr
- 400.001 – 500.000 kr
- 500.001-600.000
- 600.001 – 800.000
- 800.001 – 1.000.000 kr
- 1.000.001 – 1.200.000 kr
- 1.200.001 – 1.400.000 kr
- 1.400.001 – 1.600.000 kr
- 1.600.001 – 1.800.000 kr
- 1.800.001 – 2.000.000 kr
- 2.000.001 – 2.400.000 kr
- 2.400.001 – 2.800.000 kr
- 2.800.001 – 3.200.000 kr
- 3.200.001 – 3.600.000 kr
- Mer enn 3.600.000 kr; nemlig:
- Ønsker ikke å oppgi
- Vet ikke

NORSK GALLUP

VDK:


Test - v6
Hvor sikker eller usikker er du på at resultatene fra denne undersøkelsen vil bli brukt av myndighetene til planlegging av ny fornybar kraftproduksjon?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

VDL:


Test - v6
Hvor sikker eller usikker er du på at du og din husholdning må betale mer i nettleie de neste ti årene for å finansiere oppgradering av det norske kraftnettverket?
Veldig sikker
Ganske sikker
Ganske usikker
Veldig usikker
NORSK GALLUP

VDN:

Test - v6

Tenk deg at det skulle bygges et nytt vindkraftanlegg i det området der du bor. Hva er den minste avstanden i luftlinje mellom vindkraftanlegget og din bolig du ville kunne akseptere?

- 0-1 kilometer
- 2-5 kilometer
- Mer enn 5 kilometer
- Jeg ville være imot, uansett avstand
- Vet ikke

NORSK GALLUP

Test - v6

Har du noen synspunkter eller kommentarer til undersøkelsen?

Registrer svaret her

NORSK GALLUP

Norges miljø- og biovitenskapelige universitet
Noregs miljø- og biovitskapelege universitet
Norwegian University of Life Sciences

Postboks 5003
NO-1432 Ås
Norway