How the Dutch evaluate CCS options in comparison with other CO_2 mitigation options. Results of a nationwide Information-Choice Questionnaire survey

Marjolein de Best-Waldhober
Dancker Daamen

Centre for Energy and Environmental Studies
Faculty of Social Sciences – Leiden University

Chris Hendriks
Erika de Visser

Ecofys

Andrea Ramírez Ramírez
André Faaij

Department of Science, Technology and Society
Copernicus Institute – Utrecht University

December 2008

This research project was cofinanced by the CATO program, the national program on CO_2 Capture, Transport and Storage in the Netherlands

Contact information:
Dr. Marjolein de Best-Waldhober, +31224564798, debest@ecn.nl
Dr. Dancker D. L. Daamen, +31715273802, daamen@fsw.leidenuniv.nl

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

The Dutch national research programme on CCS, named CATO, started in 2004. Within this programme, technical issues are addressed, but part of the programme focused not so much on the technology itself but on the communication of this technology to the general public. This report is a description of the work that has been done for the project: “Decision support NGO’s”.

We could not have done this without the combined effort of the many people that gave their time to support this research. Here, we would like to thank those people.

First, we would like to thank the representatives from the environmental NGO’s that contributed to this study. Drs Sible Schöne from WWF was essential for the start of this project, and has devoted a lot of time to help with the design of the study. Drs Hans Altevogt from Greenpeace has remained critical as well as helpful throughout the entire study. Drs Jasper Vis (SNM) was also a great (and critical) help during the first two years. We want to thank Barbera van der Hoek (WWF) and Drs Arjette Stevens (SNM) for their time improving the translation of the expert information and other parts of the study. Donald Pols (WWF) and Ir Erik Honig (SNM) were helpful with the interpretation of the results.

Second, we would like to thank the experts who gave so much of their valuable time to help us gather the information that was inserted in the Information-Choice Questionnaire. Their contributions have made this information state of the art. We are therefore greatly indebted to Dr Göran Berndes (Chalmers University), Prof Dr Kornelis Blok (UU/Ecofys), Dr Hans Cahen (EZ), Ir Ton van Dril (ECN), Drs Heleen de Coninck (ECN), Dr Wolfgang Eichhammer (FhG-ISI), Dr John Gale (IEA), Dr Andrew Garrad (Garrad Hassan and partners ltd), Dr Tim van der Hagen (TUD), Dr Carlo Hamelinck (Ecofys), Drs Mirjam Harmelink (Ecofys), Dr Ir Wilco Hazeleger (KNMI), Dr Kees van der Klein (ECN), Drs Ruud van Leeuwen (Evelop), Dr Jeroen van der Sluijs (UU), Dr Rianne Teule (Greenpeace), Drs Ing Chris Westra (ECN), Dr Victor Wichers (NRG), and Dr Bob van der Zwaan (ECN). Prof. Dr Cees Daey-Ouwens has also contributed his expertise to this study. His death saddens us deeply.

The members of the resonance committee (“klankbordgroep”) have supervised a great part of this research, by reviewing the information from the experts several times in several stages, up to the last translation for lay people. We are therefore much obliged to Prof Dr Kornelis Blok (ECN/Ecofys), Dr Ir Hans Gosselink (Shell Global Solutions International BV), Alexander Gijsen (MNP), Drs Jip Lenstra (VROM), Prof Dr Peter Neijens (UvA) and Dr Bob van der Zwaan (ECN).

Furthermore, we want to thank TNS-NIPO for the programming of the ICQ (twice!) and for coordinating the field work. We especially want to thank Henk Foekema, Drs Tom van der Horst and Patrice Weijer. We are also much obliged to Frank de Kort, Drs Wil van Tunen, and students of VMBOschool TRIAS, for their cooperation on the first test. Last but not least, we want to thank Marc de Best, for some rather impressive contributions to the statistical analyses.

Leiden, December 2008

Dr Marjolein de Best-Waldhober and Dr Dancker Daamen (Leiden University)
Dr Chris Hendriks and Drs Erika de Visser (Ecofys)
Dr Andrea Ramírez Ramírez and Dr André Faaij (Utrecht University)

SUMMARY

As the Dutch government as well as the European Union have set themselves clear goals for the reduction of CO_2 emissions into the atmosphere, significant efforts are being made by many to achieve the desired CO_2 emissions reduction targets (e.g. 50% reduction in 2050 at the EU level). For the actual implementation of new technologies such as CO_2 capture and storage the development of social support can be crucial. One of the goals of the CATO program was to learn more about the factors which affect societal support (or the lack of it) for CO_2 capture and storage technologies.

This study has investigated the choices the general public would make after having received and evaluated expert information on the consequences pertaining to these choices. The choice to study informed opinions and choices was made for several reasons. Earlier research in the Netherlands (Huijts, Midden & Meijnders, 2007; De Best-Waldhober, Daamen & Faaij, 2006, 2009) as well as outside the Netherlands (Ashworth, Pisarski & Littleboy, 2006; Ashworth et al., 2008; Ha-Duong, Nadaï & Campos, 2008; Itaoka et al., 2008; Reiner et al, 2006; Sharp, Jaccard & Keith, 2006, see Section 1.1) showed that the majority of the general public has no knowledge of CCS. Several studies furthermore show that people are inclined to give their opinion when asked, even if they have no knowledge whatsoever on the topic at hand (Bishop, Oldendick & Tuchfarber, 1986; Schuman & Presser, 1981). These opinions proof to be easily influenced (Strack, Schwarz & Wänke, 1991) and highly unstable (Daamen et al, 2006) and thus very unreliable as predictors for future public opinion. The current study therefore aimed at collecting informed as well as uninformed opinions (Section 1.2).

Earlier research in the Netherlands regarding the Dutch public perceptions of CCS focused on six CCS technologies (De Best-Waldhober, Daamen & Faaij, 2006, 2009) (Section 1.1). This research showed that most people know little about the process of global warming and even less about the possibility of using carbon capture and storage technologies to reduce CO_2 emissions. But after processing valid and balanced information regarding the consequences of six specific CCS technologies, most respondents evaluated the technologies as adequate. However, an important reservation of this study concerned the context of the choice problem that was presented to respondents. Because little was known about public perceptions of CCS, the choice problem restricted the choice of respondents for energy options to CCS technologies. This was useful to assess public perceptions of specific CCS technologies and their consequences. But although this gives us insight into the evaluation of specific consequences, it does not show how public perception of CCS overall compares to other CO_2 mitigation options. When the CCS options are compared with other CO_2 reduction options, usually the case in real life, overall evaluations might change. The current study therefore addresses a broader choice problem.

When informing lay people about such complex matter as CO_2 reduction options via an ICQ, several precautions are needed to guarantee that the public is presented with a relevant policy problem and with valid and balanced information regarding a restricted set of viable options to solve this problem. First, it is essential to define a clearly specified and policy relevant choice problem that is not overly demanding for respondents. Furthermore, only policy relevant options to solve the problem should be presented, that is, options which are according to experts viable and not unlikely to be implemented. (Section 1.3) Diverse groups of stakeholders, including NGO (Greenpeace, WWF, SNM) representatives as well as experts in CCS, were consulted to establish the most probable policy problem regarding CO_2 emission reduction in the Netherlands. (Section 1.4)

Information-Choice Questionnaire
The method used to collect the informed preferences is called the Information-Choice Questionnaire (ICQ) (see e.g. Neijens, 1987; Neijens et al., 1992). The aim of the ICQ is not only to provide respondents with the necessary information to reach an informed opinion, but also to help them make use of this information to form opinions about different policy options: part of its' aim is to guide respondents' information processing. Before respondents choose between policy options, they receive information to make a more informed choice. First, the choice is explicitly framed as a decision problem and respondents are informed about the background of the decision problem (e.g. they are told why these specific options are included in the decision problem). Second, respondents are provided with information about the consequences of the different policy options. To stimulate information processing and to help respondents reach a decision, they are requested to give a quantitative evaluation of each consequence (a rating on a scale with nineteen response categories ranging from -9 "a very big disadvantage" via 0 "totally irrelevant" to +9 "a very big advantage"). On the basis of these quantitative evaluations, the subjective utility of each option may be determined, to evaluate each option overall and to choose which option is preferred (e.g. pick 3 out of 7 options) and which option (s) is (are) unacceptable.

This was finally defined as "*How can the Dutch demand for energy be satisfied in 2030 in such a way that emissions of carbon dioxide will be reduced by 50%?"*. A group of researchers and stakeholders selected seven options. Three[1] of these seven options have to be employed fully to achieve a reduction of 50%:

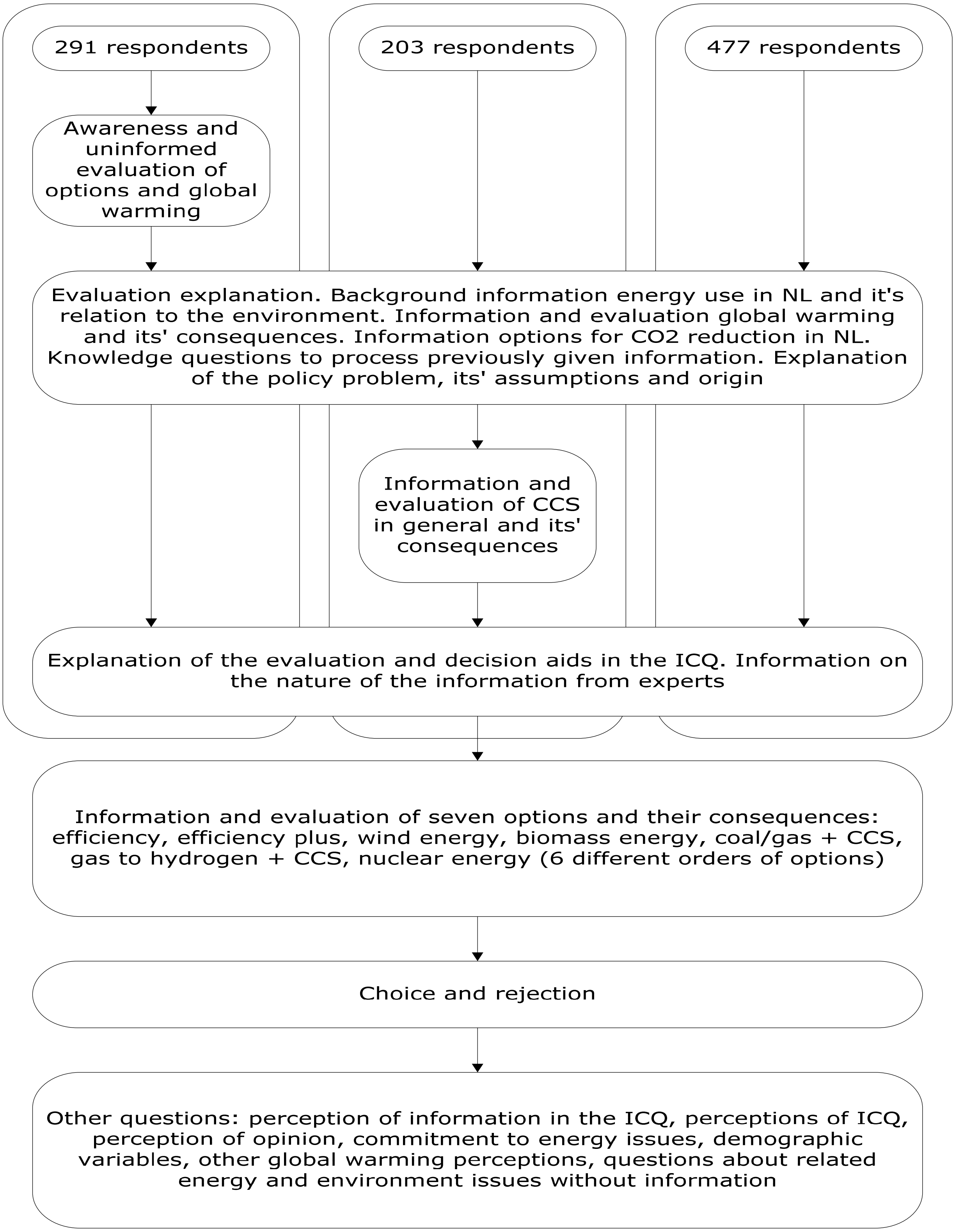
1. Improvement of energy efficiency;
2. Improvement of energy efficiency and decreased use of material and energy;
3. Electricity from wind turbines at sea;
4. Conversion of biomass to car fuel and electricity;
5. Large plants where coal or gas is converted into electricity with CCS
6. Large plants where natural gas is converted into hydrogen with CCS;
7. Electricity from nuclear plants

To gather recent, accurate and balanced information about the consequences of these seven options, a literature study as well as consultation of many experts in each technological field was done (Section 1.5). These experts were affiliated with Chalmers University, ECN, Ecofys, FhG-ISI, Garrad Hassan and partners ltd, Greenpeace, IEA, KNMI, NRG, Technical University Delft, or Utrecht University. Furthermore, when informing people about the defined policy problem and about the consequences of the options that can solve this problem, it is essential that this information is valid, relevant, balanced and comprehensible. In the case of complex topics this means that in order to keep the amount of information manageable for all respondents, one must make a selection of the available expert information, as well as translate the information to lay language. (Section 1.6) During this process of improving the translation of the expert information into lay language, we were advised by the resonance committee.

[1] There are some restrictions in the possibilities of combinations. A more elaborate explanation can be found in Section 1.4

Summary figure 1: Schematic representation of the current ICQ design

The ICQ was administered in May 2007 to a representative sample of the Dutch population (971 respondents). The questionnaire was send to respondents as a computer program by TNS-NIPO to complete at home (Chapter 2: procedure, Appendix 3: questionnaire).



CCS in comparison with other energy options: Public perceptions

This group consisted of 6 experts from different backgrounds (ECN, Ecofys, MNP, Ministry of VROM, Shell Global Solutions International BV, University of Amsterdam) most of whom had not participated during the gathering of information. Before the information was tested, the resonance committee checked the information on accuracy, relevance and balance. With their help, the text on all options was improved, as was the text regarding the consequences of global warming. After two tests, on VMBO students and on a sample of the Dutch public (n=109), the resonance committee reviewed the researchers' improvements again. At this point, the resonance committee approved the ICQ information as being valid, relevant, impartial, and even-handed. (Section 1.7) See Summary Figure 2 and 3 for the information on the consequences of the two CCS options.

Results: Evaluation of the options

After respondents had processed all information regarding the consequences of an option, they were asked to grade the option on a scale of 1 to 10. In the Dutch school system, grades are on a scale of 1 to 10, with 1 meaning the lowest possible score and 10 meaning the highest possible score. A "6" (grades between 5.51 and 5.99 are rounded to "6") is considered a just acceptable score ("adequate"). **The first CCS option ("Large plants where coal or gas are converted into electricity with CCS") was graded clearly below 6 on average (5.34). The second CCS option ("Large plants where gas is converted into hydrogen with CCS") was graded just below 6 on average (5.92). Apparently, many respondents are not that enthusiastic regarding the two CCS options.** In comparison, respondents evaluated most of the other options in the questionnaire rather positively (Table summary). The first efficiency option was evaluated 7.33 on average, the wind energy option was evaluated 7.15 on average and the biomass option was evaluated 7.41 on average. Respondents were also less positive about the second efficiency option and the nuclear energy option, which on average were evaluated 5.84 and 5.29 respectively. Nuclear energy was also the option that respondents were most divided about, as a substantial percentage of respondents evaluated this option very negatively, whereas an only slightly less substantial percentage evaluated this option very positively.

Table summary: Overall evaluations of seven options in the ICQ: percentages for grades, average grades options, percentages of choice and rejection

Option	1-3	4-5	6-7	8-10	Mean	Choice %	Reject %
Efficiency	0.7	5.5	47.7	46.0	7.33	90.2	0.4
Efficiency plus	7.1	32.3	47.9	12.8	5.84	24.0	5.9
Wind	1.7	8.7	46.5	43.2	7.15	75.4	1.9
Biomass	1.3	5.0	42.2	51.4	7.41	70.0	1.5
Powerplants + CCS	11.2	41.0	41.3	6.4	5.34	6.9	11.0
Hydrogen + CCS	6.1	28.8	53.1	12.1	5.92	10.6	6.8
Nuclear	19.4	31.1	36.9	12.7	5.29	22.9	20.0

Each respondent was asked to choose three options, therefore the choice percentages must amount to 300%, not 100%.

The overall evaluations of options were quite consistent with choice and rejection behaviour for these options. The options that were evaluated less positively, were chosen by significantly less respondents than the options that were evaluated more positively. Nearly all respondents chose the first efficiency package as one of their three preferred options. The majority of respondents furthermore choose the wind energy option and the biomass option. The nuclear energy option was chosen by more than a fifth of respondents, but it was also deemed unacceptable by a similar percentage of people. Contrary to the divided evaluation of nuclear energy, the CCS options were neither chosen nor rejected by many people. The first CCS option ("Large plants where coal or gas is converted into electricity with CCS") is chosen as one of three preferred options by 6.9 percent of respondents. When asked if large scale implementation of this option is so unacceptable to the respondent that he or she considers taking action if this was planned, 11 percent of respondents state to find this option that unacceptable. The second CCS option ("Large plants where natural gas is converted into hydrogen with CCS") is chosen as one of three preferred options by 10.6 percent of respondents. Large scale implementation of this option is not acceptable to 6.8 percent**. On the one hand, the large majority of respondents does not prefer either of the CCS options, but on the other hand, a large majority does not reject these options either.**

These evaluations of CCS are slightly less positive than evaluations found in a Dutch study with similar methodology, two and half years earlier (data collection by the end of 2004, see De Best-Waldhober, Daamen & Faaij, 2006). Although none of the CCS technologies in that study completely match one of the two CCS technologies in the current study, some technologies are very similar. These technologies in the 2004 study were evaluated on average between 6.23 and 6.51. Depending on the option, between 2.7 and 4.9 percent of respondents rejected the option. So compared to the 2004 study, the overall evaluations of the two CCS technologies in the 2007 study are less positive; However, there are several differences between the two studies, the main difference being that the earlier study compared six CCS technologies, whereas the current study compared seven CO_2 reduction options. Several results from the current study (See section 3.10 and appendix 5.1.3) corroborate the hypothesis that CCS is evaluated less positively mainly due to this comparison with other CO_2 reduction options. **The most plausible explanation for the less favorable evaluation of CCS technologies in 2007 (than in 2004) is that these options were evaluated in comparison with other CO_2 mitigation options.**

The information on consequences of CCS influences respondents' evaluation in several ways as well. First, this influence became apparent by the difference in evaluations of CCS in general, the first specific CCS option and the second specific CCS option in the study. The information regarding consequences of CCS in general contained information about consequences of CO_2 transport and storage themselves, but *not* about the consequences of the whole chain necessary for a specific technology (i.e., consequences of use of coal, gas or hydrogen, etc.). CCS in general was overall evaluated on average 6.3. This was significantly higher than the first CCS option ("Large plants where coal or gas is converted into electricity with CCS") was evaluated (5.3). It was also higher, though not as much, than the overall evaluation of the second CCS option "Large plants where natural gas is converted into hydrogen with CCS", 5,9).

Summary figure 2: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Large plants where coal or gas is converted into electricity with capture and storage of CO_2

Average evaluation
(-9 to 9)

Correlation
(-1 to 1)

Contribution to pollution due to coal mining
The coal needed for the 20 plants will be mined abroad. The area around the coal mines is highly polluted in some countries, less in others. The degree of pollution of the land, water, and air will vary from little to very high in the area surrounding the mines, depending on the countries from which The Netherlands imports the coal needed for this package.

-5.3 .18

Reliability of the energy supply
Experts place a great deal of importance on the reliability of the energy supply in that it is important that we will always be able to generate enough energy. Part of the fuels necessary for this must be imported from other countries. We do not wish to be dependant on the politics of only a few countries, such as the dependence on the Middle East for oil. Coal can be imported from several countries in several parts of the world. The chance that the coal needed for part of this package cannot be imported is therefore very small. The reliability of the energy supply from part of the power plants is, therefore, high. The use of natural gas as fuel is less reliable if it has to be imported from other countries.

.20 **-0.2**

Safety of CO_2 transport in pipelines
Too much CO_2 in the air is hazardous and can even be lethal. During the transportation of CO_2 in pipelines, the pipeline may spring a leak, causing the CO_2 to be emitted into the air. There is a small chance that a cloud of CO_2 which is dangerous for people, animals and plants, will keep hanging in the air without dispersing. The chance of leakage is comparable to the chance of gas leakage in the current underground gas pipelines in The Netherlands. Approximately 2000 kilometres of pipelines will be needed for this package. For this amount of pipelines, it can be expected that accidents will occur about once every two years, but this will not always lead to the escape of CO_2. Expectations are that by placing good systems for monitoring the chance of leakage of CO_2 from pipelines will become very small.

-2.0 .34

Price
If electricity is generated in power plants with CO_2 capture and storage, businesses will have to pay about 20% more for their electricity in 2030. Households will have to pay approximately 5% to 10% more.

.12 **-3.3**

Safety of underground CO_2 storage
Subsoil storage of CO_2 can cause minor earthquakes similar to those caused by natural gas mining. This might cause small ruptures in buildings in the area. Once CO_2 is stored in the underground storage space, it might leak away through poorly sealed wells, and tears and cracks in the sealing layer of the underground storage space. When an underground storage space keeps leaking for years, this will for the most part undo the emission reduction effect of this package. Although experts are not sure how much CO_2 would be released into the air, quantities are likely to be extremely small. In addition, there is a very small chance that the leaked CO_2 would accumulate in low lying closed spaces such as cellars. This would be hazardous and possibly lethal for humans, animals and plants occupying this type of space. There is a small chance that CO_2 leakage acidifies the surrounding groundwater. If this is used for drinking water, it will only be potable after additional treatment. Expectations are that good monitoring will make the risk of CO_2 leakage from underground storage space very small.

-3.0 .35

Contribution to the greenhouse effect
The contribution to the greenhouse effect of CO_2 emissions in the Netherlands would be greatly reduced by this package. The emission of CO_2 would be 17% less than the amount that is currently being emitting.

.21 **6.0**

Average Overall Evaluation:
(1 to 10)
5.34

Summary figure 3: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Conversion of natural gas into hydrogen in large plants with CO_2 capture and storage

Average evaluation (-9 to 9)

Correlation (-1 to 1)

New pipelines needed
The hydrogen would have to be transported to businesses and to hundreds of thousands of homes and buildings. This would necessitate a dense network of many underground pipelines. The realisation of this network will be massive and time-consuming, and will cause inconvenience due to excavations, including in residential areas.

-4.0 | .33

New vehicles needed
The implementation of this package necessitates the replacement of all cars by hydrogen fuelled cars. These cars could be more expensive in 2030 than a car that runs on gas, but it is expected that fuel cell cars will become less expensive over time.

-1.1 | .37

Contribution to air quality
Vehicles powered by hydrogen emit almost no poisonous substances, and improve the air quality in the cities greatly. In The Netherlands, approximately 5000 premature deaths are caused by poor air quality due to traffic exhaust. When this package is realized on a large scale in The Netherlands around 2030, thousands of lives will be saved annually in the Netherlands because of the cleaner air.

6.5 | .21

Contribution to noise
Engines from cars and other vehicles that run on hydrogen, do not make any noise. The implementation of this package will lead to a decrease in the level of noise in cities and residential areas from 85 decibel to 70 or less decibel. (For example: 85 decibel is about the level of noise from a crowded intersection in the city, 70 decibel is about the level of noise from a calm intersection).

5.8 | .32

Safety of hydrogen plants
There has been a lot of experience gained in the last decades in the industry with the conversion of natural gas into hydrogen. The designs of these factories and the necessary safety precautions are standard. Experts do not always agree if hydrogen factories can be made as safe as current gas fired plants.

-2.2 | .24

Safety of use of hydrogen in daily life
Experts believe that transporting hydrogen through pipelines and using hydrogen in homes can be made as safe as the existing transport and use of natural gas. Costs for technical safety measures are, however, probably higher. Accidents caused by asphyxiation, fire or explosion will not occur more often than at present. Safety measures would make the use of hydrogen in fuel stations, buses and trucks just as safe as the current use of petrol.

1.8 | .32

Safety of CO_2 transport in pipelines
Too much CO_2 in the air is hazardous and can even be lethal. During the transportion of CO_2 in pipelines, the pipeline may spring a leak, causing the CO_2 to be emitting in the air. There is a small chance that a cloud of CO_2 which is dangerous for people, animals and plants will keep hanging in the air without dispersing. The chance of leakage is comparable to the chance of gas leakage in the current underground gas pipelines in the Netherlands. Approximately 2000 kilometres of pipelines will be needed for this package. For this amount of pipelines, it can be expected that accidents will occur about once every two years, but this will not always lead to the escape of CO_2. Expectations are that by placing good systems for monitoring the chance of leakage of CO_2 from pipelines will be very small.

-0.9 | .27

Safety underground CO_2 storage
Subsoil storage of CO_2 can cause minor earthquakes similar to those caused by natural gas mining. This might cause small ruptures in buildings in the area. Once CO_2 is stored in the underground storage space, it might leak away through poorly sealed wells, and tears and cracks in the sealing layer of the underground storage space. When an underground storage space keeps leaking for years, this will for the most part undo the emission reduction effect of this package. Although experts are not sure how much CO_2 would be released into the air, quantities are likely to be extremely small. In addition, there is a very small chance that the leaked CO_2 would accumulate in low lying closed spaces such as cellars. This would be hazardous and possibly lethal for humans, animals and plants occupying this type of space. There is a small chance that CO_2 leakage acidifies the surrounding groundwater. If this is used for drinking water, it will only be potable after it additional treatment. Expectations are that good monitoring will make the risk of CO_2 leakage from underground storage spaces very small.

.27 | -2.7

Reliability of energy supply
Experts place a great deal of importance on our being able to generate enough energy. Parts of the fuel necessary for this package must be imported from other countries. We do not wish to be dependant on the politics of only a few countries, such as the dependency on the Middle East for oil. In order to ensure high reliability it is possible to store reserves of gas for later use. It is also possible to produce hydrogen from other fuels than natural gas, such as coal or biomass.

.28 | 3.0

Economic consequences
The Netherlands would have to invest a great deal of money in all of the changes necessary for the implementation of this package, including new installations and vehicles, and numerous CO_2 pipelines. It is unknown what the effect of these investments would have on the economy.

.30 | -3.6

Price
The costs of hydrogen for households will be approximately 25-35% higher than that of natural gas. Producing hydrogen is about twice as expensive as petrol. Because of this, the car fuel price will rise with about 20%. Electricity generated from hydrogen with this technology will cost the industry approximately twice as much as it does now. The fuel costs for road traffic will probably rise much less because hydrogen fuelled cars will be more efficient. It is expected that the costs for driving a hydrogen fuelled car in 2030 will be equal to the costs of driving a diesel car.

.28 | -1.9

Contribution to the greenhouse effect
The contribution to the greenhouse effect of CO_2 emissions in The Netherlands would be greatly reduced by this package. The emission of CO_2 would be 17% less than the amount that is currently being emitting.

.28 | 6.2

Average Overall Evaluation: (1 to 10)

5.92

This means that the evaluation of CCS can be influenced by the consequences of the whole chain, such as use of coal or gas. The results of this study suggest that the lower evaluation of the first CCS option ("Large plants where coal or gas is converted into electricity with CCS) and the higher rejection rate are associated with the use (and consequences) of coal, which is usually perceived negatively by most of the general public (e.g, Staats & Daamen, 2000). **It seems that the general Dutch publics' evaluation of CCS might be influenced somewhat by an association with a specific technology (such as coal-fired powerplants), but not much.**

Furthermore, several analyses showed that the evaluation of the information regarding consequences moderately influences how options are evaluated overall. This means that although respondents base their evaluation of an option in part on the information about the consequences, part of their overall evaluation is not explained by the information (Section 3.3). Although the consequences of the options in the ICQ were selected by experts as the most important consequences, it seems that not all the arguments that are important to respondents are stated in the given information. However, compared to how much respondents based their evaluation of a CCS option on the consequences of this CCS option before information is given, respondents do base their overall evaluation substantially on the information regarding the consequences of the CCS options (Section 3.6). The current study also gave evidence that respondents are willing to reconsider their opinion when confronted with valid new information regarding consequences of an option, and change their evaluations to reflect an opinion based on their evaluation of this information. **Apparently, when people processed accurate, balanced and comprehensible information regarding the consequences of an option, they did base a substantial part of their overall evaluation of each option on this information.**

It would then be interesting which specific consequences respondents base their overall evaluation on. If certain consequences are publicly perceived as especially advantageous or disadvantageous, this might be useful knowledge in the choice for a specific technology. Several consequences of the options are considered by most respondents to be a disadvantage, such as "contribution to pollution due to coal mining", "increased price", "new pipelines needed", "new vehicles needed", "safety of hydrogen plants", and "economic consequences". Some hazards of CCS options under the headings "safety of CO_2 transport in pipelines", and "safety underground CO_2 storage" are evaluated negatively by most respondents as well. On the other hand, the consequences "less contribution to the greenhouse effect" "contribution to air quality" and "less contribution to noise" are evaluated very positively. However, none of the specific consequences of the CCS options stand out as a major predictor of overall evaluation. Although the consequences of storage itself, such as consequences of possible leakage for the environment and humans, seem to have a slightly negative effect on the overall evaluation, this effect is rather small. **This suggests that it will be difficult to influence the publics' overall evaluations of CCS technologies by changing single consequences of a CCS technology.**

All together, the results of the current study point out several important finds.
For one, it is possible for experts of different backgrounds and affiliations (e.g. environmental NGO's and oil companies) to agree on what is valid, relevant and balanced information regarding the consequences of CO_2 mitigation options. Secondly, after processing this information, people from the general public base

their option evaluations for a substantial part on this information. Uninformed evaluations of CCS options did not predict informed evaluations at all. No single, specific consequence of CCS stood out as a critical influence on the evaluation or acceptance of CCS, but the results do hint at a possible negative influence of the association with aspects of specific technologies, such as the use of coal. The comparison with other CO_2 reduction options such as efficiency, wind energy and energy from biomass also leaves people slightly less positive about CCS. Most importantly, after processing valid, relevant, balanced and comprehensible information on the consequences of CCS options, the majority of the Dutch public is not enthusiastic about CCS options, but does not reject large scale implementation of these options either.

INTRODUCTION

In 2004, CATO[2] started the study of CO_2 capture, transport and storage at many levels. A number of issues concerning CO_2 capture, transport and storage ("CCS") are addressed in six work packages. One of these work packages (WP6) focuses not so much on the technology itself but on the communication of this technology to the general public. This report is a description of the project: "Decision support NGO's" that has been done for Work Package 6. This study has investigated the choices the general public[3] would make concerning CO_2 emission reduction options after having received and evaluated expert information on the consequences pertaining to these options. The method to collect these informed preferences is called the Information-Choice Questionnaire (ICQ). The ICQ method assesses not only informed evaluations of, in this case, CO_2 reduction options. It also investigates the evaluations of the consequences of these options after information has been processed, thus giving insight into which consequences influence the overall evaluation, choice and rejection of an option. The current ICQ study compared two CCS options with five other CO_2 reduction options. The next sections will elaborate on the arguments for the design and administration of the current study.

1.1 Review of research on public perception of energy options

1.1.1 Focus of this study: CCS in comparison with other CO_2 reduction options

The aim of this study was to investigate the perceptions of the Dutch general public regarding CO_2 reduction options, and which of these options they prefer. However, the main research questions concerned the publics' perceptions of CCS, albeit in comparison with other possible options for CO_2 reduction. Because of this, the focus throughout this report is on the issue of CCS, which is sometimes discussed much more elaborate than issues relating to the other options. This is mostly the case for discussions of comparisons within the options. Because CCS is the CO_2 reduction option this report focuses on, elaborate comparisons between this study and earlier national and international research methods as well as results are discussed in this report. Such comparisons are not discussed for the other CO_2 reduction options in this study.

For more elaborate discussions regarding Dutch public perceptions and/or acceptance of the other CO_2 reduction options, we refer to several other Dutch studies. For a more elaborate discussion of research regarding public perceptions of wind energy, we refer to several reviews that, amongst other topics, discuss the gap between the commonly high level of general public support and the lack of implementation of wind power projects in the Netherlands as well as other countries (Bell, Gray, Hagget, 2005; Breukers & Wolsink, 2007; Devine Wright, 2005; Wolsink, 2000, 2006, 2007). For a more elaborate review of public perceptions of nuclear energy in the Netherlands, we refer to a Dutch report that reviewed, amongst other area's, several Dutch studies on

---

[2] CATO stands for CO_2 Afvang, Transport en Opslag, which is the Dutch equivalent of Carbondioxide Capture and Storage.

[3] Originally, the proposal for this study was to investigate the opinions of members of or contributors to NGO's related to energy and environment. However, delegates of the NGO's (Greenpeace, The Netherlands Society for Nature and Environment, World Wildlife Fund) preferred a representative sample of the general Dutch public.

public perception of nuclear energy (Slingerland, Bello, Davidson, van Loo, Rooyers, Sevenster, 2004). More recent data of Dutch public perception, though not accompanied by discussions of other studies, can be found in the Eurobarometer of 2007. For a discussion of research on public acceptance of energy from biomass in the Netherlands and the factors that influence this, we refer to the dissertation of van den Hoogen (2007).

Two CO_2 reduction options in the current study are based on improved efficiency on many levels. Although there are studies and reviews regarding public attitudes or behaviour within separate area's such as transport or built environment, studies of public opinion regarding efficiency improvement in as many areas as the options in the current study encompass, are rare. We will therefore not discuss possible references.

1.1.2 Review of research on public perception of CCS

In the past years there have been several studies regarding public perception and awareness of CCS in several countries. These studies, although very different in method, seem to have several rather similar results. First, results of several studies indicate that awareness of CCS is very low in different countries. Reiner et al. (2006) compared awareness of CCS in the United States, the United Kingdom, Sweden and Japan. The four samples in this study were mostly drawn at random from the countries' adult population and consisted of at least 742 respondents per sample. Reiner et al. (2006) found low awareness in all four countries, ranging from 22% of respondents confirming they had heard or read about CCS in Japan, to as little as 4% of respondents confirming this in the US. A more recent study in Japan (Itaoka, Okuda, Saito, Akai, 2008) showed similar results, with 7 to 18 % of respondents stating they know to some extent. In a survey of 900 respondents in Australia, only 29.9% of respondents were able to give meaningful answers when asked what they understood about CCS (Ashworth et al., 2006). A less representative but more recent Australian study also showed low average knowledge levels of CCS (Ashworth et al., 2008). Sharp et al. (2006) also found low awareness of CCS in a survey among 1972 respondents in Canada. Although between 10% of respondents in Alberta and Saskatchewan and 15% of respondents in the rest of Canada said to have heard of CCS, only very few of the respondents were able to correctly identify the problem CCS[4] addresses. A small study among 112 residents in a Dutch area above a possible future CO_2 storage site showed similar results. Of the 112 respondents, 97% stated to know either a little, very little or almost nothing about CO_2 storage (Huijts et al., 2007). The results of Huijts et al. (2007) are based on a sample that is too small and select to generalize to the Dutch population. Two studies with much bigger samples in the Netherlands in 2004 and 2005 (De Best-Waldhober, Daamen & Faaij, 2006) showed similar results. Depending on the kind of CCS technology that the two samples of totally 627 respondents were asked about, between 60.0% and 91.4% of respondents stated to be unaware of the technology.

A possible low awareness of CCS makes measuring attitudes towards CCS rather tricky. A part of the group that has no knowledge of CCS may refrain from giving their opinion, but a significant part of the respondents may respond with "pseudo-

[4] Sharp et al use the abbreviation GDC (Geological disposal of CO2) in their survey, instead of CCS.

opinions" or "non-attitudes" (cf. Converse, 1964). An early demonstration of this phenomenon was presented by results of a survey in the US on attitudes towards a non-existing act: A substantial part of the sample expressed (strong) views regarding this fictitious act (Bishop, Oldendick, Tuchfarber & Bennet, 1980). Although people are inclined to give their opinion even if they had no information on the topic at hand, these kinds of opinions are known to be unstable and easily changed by contextual information (Bishop, Tuchfarber & Oldendick, 1986; Strack, Schwarz & Wänke, 1991). Assuming a lack of awareness of CCS amongst the general public, it is likely that measuring public opinion regarding CCS will result in unreliable data. Other researchers have addressed this problem by providing respondents with information about CCS. In several studies, written information is given to respondents to read, in other studies respondents are gathered in focus groups and are informed by either researcher, experts or handouts. Sharp et al. (2006) used focus groups to develop a survey in Canada. Two groups, one of 11 people and one of 9 people, had a one and a half hour structured discussion about CCS, during which they received some handouts with background information. During discussion, the focus group members were slightly to moderately opposed to CCS. Sharp et al. (2006) observe that the participants seemed to focus on risks of CCS, not on the benefits. They furthermore observe that there seemed to be confusion among the participants as to what problem carbon dioxide gas causes. The handouts participants received seemed to have a minor impact. The Toronto participants moved from neutral to slightly opposed when given more detailed information, while in Edmonton participants started off and remained somewhat opposed to the technology. These results should be interpreted carefully though. Because these focus groups were used to develop a survey, the number of participants was too small to base conclusions on. Shackley et al. (2004) also used panels of participants in the United Kingdom. They formed two Citizen panels with 17 participants combined, who each met 5 times for 2 hours and heard from a variety of technical experts. Shackley et al. (2004) observed a moderate support for CCS, provided that a range of other decarbonisation options are also supported. Support for CCS was, however, conditional on understanding the reasons for CO_2 mitigation. One of the panels showed several shifts in opinion about CCS, first towards more positive perceptions after hearing about global warming and CCS as part of the solution to global warming. The second shift was towards more negative perceptions after a critical presentation by an independent academic energy expert. This result seems to be in line with the effect of information that Sharp et al. (2006) observe. Both studies show a negative effect of provision of information, although neither study made clear what aspects of the information concerning CCS motivated participants to become more negative about CCS in general. A recent Australian study used a large group process for engaging the public on energy sources and technologies with a low emission profile. Two samples of the general public containing 60 and 47 participants were presented with information on climate change and energy by an international expert in the field of climate change and energy technologies. The information was developed using an advisory group of representatives of diverse stakeholder groups. After a morning of information and part of the afternoon with deliberation and the possibility to get more information from the expert, participants were given the same questionnaire they filled in at the start of the day. On average, participants became more positive regarding CCS. During the discussions among participants, their responses initially highlighted practical concerns about CCS and they appeared to be seeking reassurance about the benefits of the technology.

In several studies, respondents received written information about CCS before or during a survey. Curry et al. (2004) included a small experiment regarding information about consequences of different electricity options in their survey. Respondents were given seven electricity options that address global warming and they were asked to choose the one that they preferred. About half of the respondents received no information. The other half of the respondents received information about two consequences of the seven electricity options, namely changes in electricity price and CO_2 emissions. Of the group that had been given this information, 16% thought CCS was best to address global warming, whereas only 6% of the group without information thought so. Itaoka et al. (2004) also found a positive effect of information provision in their study. To identify various factors that influence public acceptance of CCS in Japan, Itaoka et al. (2004) administered two versions of a survey questionnaire to 1006 adults residing in Tokyo or Sapporo. One version of the questionnaire provided limited information about CCS; the other version provided more extensive information about CCS. Itaoka and colleagues found that the more information respondents obtained about CCS, the more likely they were to support storage options, except for the onshore option of geological storage. This study furthermore explored which factors influence public opinion. These factors were established by asking respondents questions about possible attitudes and concerns. Itaoka et al. (2004) found four important factors influencing public opinion, namely “risks and leakage”, “effectiveness of CCS”, “responsibility”, and “fossil fuel use”. Each of these factors influenced public acceptability for CCS in general as well as support for implementation of four specific technology types of CCS. A path analysis of these data (Itaoka et al., 2006) reveals that understanding the effectiveness of CCS was most influential for public acceptance of CCS. Understanding the effectiveness of CCS itself was largely represented by the thought that CCS is a realistic option to reduce the amount of CO_2 emission substantially. Another Japanese study that analyzed which factors are crucial for the acceptance of CCS seems to point in the same direction. Tokushige et al. (2007) administered a survey to 423 Japanese university students. The respondents were provided with information regarding CCS, which was either a fact sheet with an overview of natural analogues or a fact sheet on field demonstrations of the geological storage of CO_2. They furthermore received questions related to risk and benefit perceptions, perceptions of human interference with the environment, trust, and public acceptance. Slightly similar to what Itaoka et al. (2004, 2006) find, part of the information in this study was effective in decreasing the risk perception and increasing public acceptance. The most important factor for public acceptance was the perception of benefit though, which was influenced by neither kind of information.
In a Dutch study by van Knippenberg and Daamen (1994, 1996), half the respondents were given information about coalfired plants with CCS as well as information about coalfired plants without CCS and five other options for generating electricity. Little over a third of respondents chose coal with CCS as one of their two preferred options, independent of having read and evaluated information or not. Similar to the results in the Japanese studies, respondents’ evaluation of CCS was significantly influenced by a benefit, specifically by the consequence of less CO_2 emissions.

Considering the results of the studies mentioned so far, the effect of information regarding CCS seems to lack a general direction. Although several studies report a positive effect of information on the acceptance of CCS, other studies report a negative effect or no effect at all. These studies use different procedures as well as different kinds of information. It seems warranted to acknowledge the importance of the specifics of both procedure and information to gain insight in the factors that influence public opinion regarding CCS. Except for the study by van Knippenberg and Daamen (1994, 1996), all of the studies discussed here combined either a large sample with limited information in a survey, or a small sample with elaborate information in a focus group situation. However, in 2004 a study was done in the Netherlands that aimed to measure awareness of global warming and CO_2 emission reduction options as well as informed opinions regarding six CCS options by combining a large sample with valid and well-balanced information (de Best-Waldhober, Daamen, Faaij (2006). The method of the Information-Choice Questionnaire was used to inform respondents and aid them in their decision making process, so as to obtain more stable opinions and make a better prediction of future public opinion on CO_2-capture and storage technologies. Moreover, the ICQ method provided the possibility to analyse how the evaluation of certain aspects of energy options influenced the opinions of the options overall. Before respondents chose between policy options, they received information to make a more informed choice. First, the choice was explicitly framed as a decision problem (i.e. *"Which CCS options is the best to implement in the Netherlands by 2030 at the latest in order to reduce CO_2 emissions by 20% compare to the status quo?")*. Respondents were furthermore informed about the background of the decision problem (e.g. they were told why these specific options were included in the decision problem). Second, respondents were provided with information about the consequences of the different policy options. The results of this ICQ suggested that, after processing relevant information, people are likely to agree with large scale implementation of each of the six CCS options. Respondents found all CCS options on average "adequate", seldom found these options unacceptable and did not choose one of the options over the others with a majority of respondents.

However, an important reservation of this study concerned the context of the choice problem that was presented to respondents. Because little was known about public perceptions of CCS, the choice problem restricted the choice of respondents for energy options to CCS technologies. This was useful to assess public perceptions of specific CCS technologies and their consequences. But although this restriction to CCS technologies gives us insight into the evaluation of specific consequences, it does not show how the public evaluates CCS in comparison to other CO_2 reduction options. When the CCS options are compared with other energy mitigation options, which is usually the case in real life, overall evaluations might change. The current study therefore addresses a broader choice problem. Not only is the choice problem based on more recent insights, which shows itself among other things in the more stringent CO_2 reduction percentage (see also section 1.4), the seven options presented in the study (as chosen by experts) contain two CCS options and five other CO_2 reduction options, i.e. two efficiency options, a wind energy option, a biomass energy option, and a nuclear energy option.

1.2 Why the Information-Choice Questionnaire is an appropriate instrument when assessing public opinion on CO_2 emission reduction options[5].

Traditional public opinion surveys present a representative sample of the population with questions about the topic at hand, which can be policy measures. Traditional questionnaires are often a useful instrument to assess the public acceptance of a specific policy. However, for some purposes the traditional questionnaire is not sufficient. As stated above in section 1.1, the main drawback that can be held against traditional questionnaires, especially when it comes to problems which involve technologies that are new to the public, is that a substantial part of the general public lacks the knowledge to have a well considered opinion. Part of them may refrain from answering but a significant part of the respondents may respond with "pseudo-opinions" or "non-attitudes" (cf. Converse, 1964). An early demonstration of this phenomenon was presented in a survey in the US on attitudes towards a non-existing act: A substantial part of the sample expressed (strong) views regarding this fictitious act (Bishop et al., 1980). Thus, respondents are inclined to give an opinion even on topics they know nothing about (Bishop, Oldendick and Tuchfarber, 1986, Schuman and Presser, 1981). Other research showed that such pseudo-opinions are unstable and easily changed by contextual information (e.g., Strack, Schwarz, and Wänke, 1991; Daamen, De Best-Waldhober, Damen & Faaij, 2006) or slight changes in mood (De Best-Waldhober, Daamen & Faaij, 2006).

Another drawback of traditional surveys is that respondents are not encouraged to compare policy options. Most policy measures are simply the choice of certain options above other policy options. But where policymakers have to make a choice between several policy options, respondents are seldom presented with a choice problem in opinion research. Usually, respondents are asked to evaluate options rather than choose between them. As a consequence, responses are often isolated (Neuman, 1986). Especially if a policy problem is complex with a number of options to solve the problem, such isolated instead of comparative responses may be less useful because they are ephemeral and not really diagnostic for societal support or opposition. First of all, the isolated evaluation is without frame of reference and therefore its quantification is rather meaningless. But second and more importantly, isolated instead of comparative evaluations of options do not lead to the solution of the policy problem and can even lead to the wrong conclusions concerning societal support of or opposition to an option. For instance, if a respondent is asked to evaluate a number of options without instructions or implication to compare these options, all options could be evaluated as very negative. This would imply that none of the options is preferred. This might lead to the wrongful conclusion that the public is ready to oppose all options, which in the case of energy options would mean that the public is prepared to stop using energy altogether. In a similar vein, isolated evaluations lead to other possible wrongful conclusions, which we will not discuss further here.

[5] Parts of this section are taken from our earlier report on a different ICQ study, de Best-Waldhober, Daamen and Faaij, 2006

1.2.1 Measures of "informed" public opinion

The Information-Choice Questionnaire that is discussed in this report is one of the possible instruments that tries to meet these objections to traditional questionnaires. First of all, the ICQ focuses on the choice of one option over the alternative options. Secondly, respondents are informed on the most important consequences of the choice options before they are asked to make an actual choice. The ICQ is not the only instrument that meets these criteria. In an extensive review of research on informed opinions, Price and Neijens (1998) name four main new techniques that aim at increasing the quality of public opinion. Among surveys of informed opinion they single out the method of the American Talk Issues Foundation (ATIF, e.g. Kay et al., 1994) and the Information-Choice Questionnaire (e.g. Neijens, 1987). Among deliberative polls, they focus on work on deliberative polls of Fishkin (e.g. 1995) and the Planning Cell method as developed by Dienel (1978, 1989). The description and comparison of these methods is based on Price and Neijens' review (1998).

The ATIF formats are designed to assess what difference it makes for measured public support of particular proposals if survey respondents are fully aware of multiple options and encouraged to consider possible outcomes of each. Although this is not very different from the ICQ method, the ATIF format differs on several important aspects from the ICQ method. The ATIF format uses telephone interviews with questions that are ordered such that respondents are forced to consider the consequences of proposals. These questions are framed as persuasive arguments supporting and opposing a proposal. Unlike in the ICQ, respondents are not given time to deliberate.

The deliberative polls of Fishkin (e.g. 1995) and the Planning Cell method as developed by Dienel (1978,1989) are both very different methodologies compared to the ICQ method. The procedures in these studies are very elaborate as "to model what the electorate would think if, hypothetically, it could be immersed in intense deliberative processes" (Fishkin, 1991, p 81). These studies involve random selection of a group of citizens, paying their leave from their working obligations, and transporting them as "delegates" to a single site for several days of debate and deliberation. After debating issues with political leaders or technical advisors and with each other, the delegates are then polled on their preferences. The method of these two deliberative polls has a much more ambitious aim than the ICQ. Fishkin states that the goal is nothing less than "direct democracy", carried out by "a statistical microcosm of the society" that is empowered to deliberate for the whole (1991, p. 93).

The ICQ as a method has different ambitions than either the ATIF formats, the deliberative polls of Fishkin or the Planning Cell method. It limits its efforts to improving the evaluation phase of collective decision-making. By doing so, several advantages are generated that make the ICQ a more suitable instrument for the prediction of future public opinion on the policy problem of CO_2 emission reduction. In the ICQ, written information is presented to respondents, which not only makes careful private deliberation possible, but also makes it much more feasible to study public opinion by investigating a large sample of the population. This gives the ICQ an advantage over the deliberative polls, when a large sample is needed to ensure a representative sample. The fact that careful private deliberation of objective, non-persuasive information is possible in the ICQ and not in the ATIF formats, gives the

ICQ an advantage if the choice problem concerns complex new technology instead of more familiar political issues. This makes the ICQ a very useful instrument for the purpose of the current study.

1.2.2 Information-Choice Questionnaire: Potential[6]

The ICQ was originally developed by Saris, Neijens and De Ridder 1983a (see e.g. Neijens, 1987; Neijens et al., 1992) to assess preferences for different ways of generating electricity in the Netherlands (but has since been used to assess preferences in other areas as well; see Neijens (1998) for a review). The aim of the ICQ is not only to provide respondents with the necessary information to reach an informed opinion, but also to help them make use of this information to form opinions about different policy options: part of its aim is to guide respondents' information processing. Before respondents in the ICQ choose between policy options, they receive information to make a more informed choice. First, the choice is explicitly framed as a decision problem and respondents are informed about the background of the decision problem (e.g., they are told why these specific options are included in the decision problem). Second, respondents are provided with information about the consequences of the different policy options. To stimulate information processing and to help respondents reach a decision, they are requested to give a quantitative evaluation of each consequence (a rating on a scale with nineteen response categories ranging from -9 "a very big disadvantage" via 0 "totally irrelevant" to + 9 "a very big advantage"). On the basis of these quantitative evaluations, the subjective utility of each option may be determined. If respondents base their choices on these evaluations of consequences, they will choose the alternative(s) with the highest subjective utility (Neijens, 1987; Neijens et al., 1992). The ICQ procedure, however, neither requires nor requests that respondents base their choices on their evaluations of consequences.

The effects and usefulness of the ICQ has been studied in extensive evaluation research (Neijens, 1987). Neijens shows that non-response in the ICQ is not substantially different from non-response in traditional opinion surveys (non-response is low and the group of non-respondents has the same profile as the group that does respond) and concludes that the ICQ may be used to collect opinions of representative samples of the general public. In addition, Neijens found that preferences of respondents in an ICQ survey differ from those in a traditional survey, i.e., ICQ respondents make different choices than respondents in a survey in which no information about the policy options is provided. Van der Salm, van Knippenberg and Daamen (1995) provide experimental evidence for the fact that ICQ respondents' preferences are affected by the information provided in the ICQ. Neijens' examination of the correspondence between evaluations of consequences of the options and choices suggests that ICQ respondents tend to base their choices – at least in part – on their evaluations of the consequences of the options. Moreover, comparison of evaluation-choice correspondence in the ICQ with evaluation-choice correspondence in a survey in which respondents first make their choice and then evaluate the consequences of the options shows that respondents' choices correspond more to their evaluations in the ICQ (Neijens et al., 1992). This suggests that the ICQ's effect on respondents' preferences is probably due to both the information provided – which may wholly or in part contain new information relevant to the decision problem – and

[6] Part of this section is taken from van Knippenberg and Daamen (1996).

to better integration of the available information (due to the ICQ's structuring of information processing). The fact that ICQ respondents may report different preferences than respondents in a more traditional survey shows that it may indeed be worth the trouble to use the ICQ in public opinion research. At the same time it implies that the results of an ICQ do not necessarily reflect *present* public support for a policy. Rather, the ICQ is especially suited to assess how public opinion may be *after* the public is informed about an issue or to assess the *potential* (i.e. after extra information is provided to the public) support for alternative policies.

1.3 Important aspects of development of an ICQ

The current study focuses on a complex environmental problem (global warming) and on the complex, future technologies that may contribute to solving this problem. When informing lay people about such complex matters via an ICQ, several precautions are needed to guarantee that the public is presented with a relevant policy problem and with valid and balanced information regarding a restricted set of viable options to solve this problem. These precautionary procedures are crucial when preparing an ICQ and will be discussed here.

First, it is essential to define a clearly specified and policy relevant choice problem that is not overly demanding for respondents. The policy problem should be *clear* regarding what, when, where and to what end (in the current ICQ for instance "Which combination of options is best to meet the expected Dutch energy demand in 2030 *and* reduce CO_2 emissions in the Netherlands by 50%?") and only *policy relevant* options to solve the problem should be presented, that is, options which are according to experts viable and not unlikely to be implemented (for a description of such options in the current ICQ, see section 1.4). Obviously, it is more worthwhile to predict public support (or lack of support) for feasible options than for unfeasible options. This restriction to policy relevant options also reduces the number of options, which helps to keep the choice problem manageable for lay people. However, to fully attain the latter goal (i.e., a choice problem tuned to the capabilities of lay people) a further reduction of options as well as some simplification of options may be needed. For instance, while preparing the current ICQ, the experts identified many energy options which could reduce CO_2 emissions. There are many new technologies that emit less CO_2 than current technologies or even emit no CO_2 at all. There are also many ways to reduce the use of energy (efficiency improvements as well as change of behaviour). These options may all be implemented to different degrees. There are a huge number of combinations of these options and each combination may solve the policy problem. Exclusion of options that were not policy relevant reduced the number of options. Furthermore, restriction of choice to combinations of options which were policy relevant also helped but still the choice problem was very complex. It was decided to confine choice to options that led to a substantial and equal emission reduction (40 Mt CO_2 per year) and to options where the energy conversion was situated in the Netherlands (in the current ICQ, respondents should choose three options out of seven to solve the policy problem and some choice restrictions are specified, see section 1.4).

Second, when informing people about the choice problem and about the consequences of the options that can solve this problem, it is essential that this information is valid and balanced. To compile this kind of information is a project on its own. The information that is generated this way should be extensive and detailed. However, when the need for a representative sample of the general public calls for the inclusion of respondents that are not very motivated or not highly educated, the amount of information that can be provided is limited. In the current ICQ, *the amount of information that can be given to respondents is one page per policy option*, for reasons that will be explained in section 1.6. In the case of complex topics this means that in order to keep the amount of information manageable for all respondents, one must make a selection of the available expert information. With relatively complex and controversial topics such a selection could arouse debate. It is therefore recommended that the information for an ICQ is compiled by experts from different backgrounds and different organizations and checked by another, similarly differentiated group of experts. This method also results in the avoidance of another possible problem that arises with controversial issues, namely the (lack of) credibility of the source of the information.

When the responsibility for the definition of the choice problem and the given information is not carried by a differentiated group of experts, an ICQ runs the risk of losing accuracy, balance and credibility in the eyes of the respondents. For these reasons, the task of defining the policy problem and the compilation of the expert information was carefully done by experts from different backgrounds and institutions. How this was done exactly and what measures were taken to ensure that the information was the most recent and accurate information available will be discussed in section 1.6.

The expert information that has thus been gathered and the translation of this expert information for lay people has been checked by a new, independent group of experts with different backgrounds. Only after their approval that this translated information is still valid and balanced, this information was inserted in the Information-Choice Questionnaire and administered to a representative sample of the Dutch population.

1.4 Defining a specific and relevant policy problem

As it was stated above, defining a specified policy problem is essential, sensitive and subject to debate. To ensure this was done correctly, the researchers took much care in the process of developing the policy problem. Three leading experts on energy and environment from NGO's were consulted (Greenpeace, The Netherlands Society for Nature and Environment and World Wildlife Fund) as were two leading experts from the CATO project (Ecofys and Utrecht University-Department of Science, Technology and Society). Several extensive meetings were held to define a concrete policy problem that was realistic and usable for an ICQ. Based on several long discussions with the experts and the researchers on this project the assumptions of the policy problem and the most likely options to solve this policy problem were defined. The policy problem was defined as:

"How can the Dutch demand for energy be fulfilled in 2030 in such a way that emissions of carbon dioxide will be reduced by 50%?"

Assumptions, criteria and points of attention

1. The Netherlands strives for a reduction of 50% of the current CO_2 emissions in order to limit global temperature increase to a maximum of 2ºC.
2. Other countries in the world also put optimal efforts in reducing emissions. It is taken into account that Western countries could and should achieve higher emissions reduction figures than non-western countries.
3. The geographical area where conversion takes place is the Netherlands.
4. The time frame considered is 2030.
5. The options must contribute significantly to the total energy supply during a substantial period of time, starting not later than 2030.
6. The application of three of the seven options should be enough to achieve a 50% reduction in the emissions of 2030 with respect to the emission levels of 2005.
7. Assuming current growth rates, the emission reduction goal of 50% corresponds to about 125 Million tonnes CO_2.
8. The reference year is 2005. The emission reduction goal has been estimated in relation to the status quo at the moment of carrying out the survey, and it concerns the Dutch situation.
9. The starting point for the selection of options is all economic sectors. On this basis, seven options have been selected:

    1. Improvement of energy efficiency;
    2. Improvement of energy efficiency and decreased use of material and energy;
    3. Electricity from wind turbines at sea;
    4. Conversion of biomass to car fuel and electricity;
    5. Large plants where coal or gas is converted into electricity with CCS;
    6. Large plants where gas is converted into hydrogen with CCS;
    7. Electricity from nuclear plants

As each option is set up to reduce 40 Mt CO_2, the respondents should select three of these options in order to (almost) achieve the goal of reducing 125 million tonnes CO_2. Additionally, it should be explained which combinations are not possible: it is only possible to choose for energy efficiency improvement and decreased use of material and energy when the first option of energy efficiency has already been selected. It is not possible to select more than two options that target electricity production, because otherwise the supply of electricity will exceed the demand for it. The options that deal with electricity production are: wind energy, nuclear energy, fossil fuel combustion with CCS and hydrogen production with CCS. It is also not possible to choose for more than one option that targets fuel for cars and other transportation vehicles.

1.5 Expert information on seven options for CO_2 emission reduction

In this section we provide the final descriptions of the seven carbon dioxide emission reduction options specified in section 1.4. This compilation of information is the result of a 6-month process, which can be summarized in three main steps:

1. A literature review of each of the emission reduction options which resulted in a first draft description of each option.
2. An internal review of each of the descriptions which resulted in a second draft.
3. An external review of the second drafts which resulted in the final versions that are shown in appendix 1.

The external review

A main restriction when collecting the information and writing the descriptions of each option is the fact that the information needs to be summarized as much as possible (since in the ICQ only one page of information per option will be given). The external review was therefore fundamental, not only for assuring that no relevant arguments were missing and that the information was accurate and balanced, but also for selecting relevant information.

The external review was made in written form by providing the experts with (i) a letter containing a detailed account of what it was required from them, (ii) the policy problem, assumptions and points of attention, and (iii) a questionnaire. The questionnaire provided the expert with a systematic way of evaluating each individual part of the description: Firstly, the expert was asked to read the whole description for the option. Secondly, he (or she) was asked to evaluate each individual part by answering the following questions:

1. *Do you think this information is accurate?*
   0 YES
   0 NO
   If your answer was NO, can you underline the inaccurate and improve?

   ……………………………………………………………………………………

2. *Do you think this information is complete?*
   0 YES
   0 NO
   Can you add or remove the information that you think is lacking or is unnecessary?

   ……………………………………………………………………………………

3. Do you think this information is essential, that is, to what extend do you think a layperson needs this information to make a well-informed decision?

Not at all necessary	1	2	3	4	5	Essential

4. Is there anything else you would like to comment on concerning this information?

…………………………………………………………………………………………

These four questions were repeated for every part of the information given in each description. Finally, the experts were asked to evaluate the whole option by answering the following questions:

Do you think there are arguments missing from the description of this technology?

…………………………………………………………………………………………

Do you think there is information in this description that is unnecessary or redundant?

…………………………………………………………………………………………

Is there anything else you would like to comment on concerning this option?

…………………………………………………………………………………………

Short CVs of the external experts are presented in the interim report (Ramirez, Faaij, Hendriks, de Visser, de Best-Waldhober & Daamen, 2005). The comments made by the experts for each option are shown in the interim report as well, together with the answers to these comments (i.e., how the comment was taken into account, and if not, why). The final documents are shown in appendix 1.

1.6 Selection and translation of the expert information[7]

There were several demands for the information on the consequences of the policy options. The information on consequences had to apply to the specific options. The information aims to describe the most important consequences of the implementation of each of the options, given the assumptions of the choice problem.

Another demand for the information in the questionnaire is that it needs to be understandable for nearly all groups in Dutch society. When the need for a representative sample of the general public calls for the inclusion of respondents that are not very motivated or not highly educated, the amount of information that can be

[7] As the method of the current study is very similar to our earlier ICQ study, several descriptions in this section are similar to the 2006 report as well (de Best-Waldhober, Daamen and Faaij, 2006)

provided and understood is limited. To avoid dropout of groups like the elderly, who are usually slower completing questionnaires, the more difficult groups should not need more than two hours to complete. In that case the average sample will take 1 hour to complete. Half of this hour is needed for the instructions, the presentation of the problem and the information about current situation and global warming. This means that half an hour is left for seven options, 4.28 minutes per option. This time limit reduces the possible amount of information that can be given on one option to *a single page*.

After the experts had evaluated the importance of all the pieces of expert information, the following step was to establish which information is essential to the public according to the experts we consulted, keeping in mind that the information has to be valid, balanced, and does not exceed the ability and willingness of respondents to process this information. Several extra steps were taken to make sure that the information was limited enough and understandable for all respondents to process properly. First, the information on consequences was formulated per consequence, so that respondents are able to evaluate each consequence separately. In this way, respondents are able to evaluate one by one how much of an advantage or disadvantage they think the relevant consequences are. This method of giving respondents little “blocks” of information and asking them to evaluate this information helps respondents to process the information (Neijens, 1987). Second, the information on the consequences is preferably given relative to the status quo. For instance: “When this technology is implemented, the costs of power for households will be 10% higher compared to current costs”. Relative information is preferable over absolute information because the latter is more difficult to process and results in extended processing (Chestnut, 1976; Van Raaij, 1977).

Information on consequences was omitted from the questionnaire when it was either non-discriminatory or a so-called null-effect. These two points will be explained in the next paragraphs.

1.6.1 Non-discriminatory information.

When a consequence results from all options equally, the information on this consequence is not informative to the decision making process, because the information does not discriminate between options. For instance, an important consequence of all the options in the questionnaire is that they provide enough energy. This information does not help in making a choice, as it is true for all options.

1.6.2 Null-effects.

With information on null-effects we mean information on the lack of a certain consequence. For instance “Studies so far show that movements of mammals and fish are not affected by wind turbine foundation”. The information that was gathered by the experts contains several of such null-effects. Most null-effects concern information on consequences that do not differ from the status quo. A null-effect can be a consequence that lacks absolutely, it can also be a consequence that does not differentiate from the current consequences of energy production. There are several reasons to omit these kinds of information from the information on consequences that will be given to respondents. First, omitting this kind of information leads to less information to read and to process for respondents, but does not lead to much information loss. Even when null-effects are not added to the information, they are still implicitly assumed when options are compared. The contrast between options that do contribute to for instance bird deaths from wind turbines and options that do not remains present, as the consequence of actual contribution to bird deaths is still mentioned. (See also Neijens, de Ridder and Saris, 1988).

The second reason to omit null-effects is that if they are not omitted they count twice. For instance, when it is mentioned that the use of coal for generating power does contribute to more deaths in coalmines and that the use of wind turbines does not, this information is counted twice, namely as an advantage of wind turbines and as a disadvantage of coal. In this case, for reasons of equality, it would be fair to mention that the use of power from coal or gas does not contribute to the need for new vehicles that run on hydrogen or the production of radioactive waste. This would lead to the addition of great amounts of trivial information and it is also likely to annoy the respondents. Given all these negative results of null-effects, this kind of information will be omitted from the questionnaire.

1.6.3 Translation

To make the information understandable for lay people, we have translated the text from expert language to lay language. We have used several methods to adapt the text in such a way that lay people were able to understand it. First, we replaced expert terms with terms that were more understandable for lay people. For instance, the seventh package mentions an Advanced Light Water Reactor (ALWR). This terminology is not used in the lay version, but has been replaced by “an advanced nuclear power station”, as most lay people have never heard of an “Advanced Light Water Reactor”, let alone understand that this concerns nuclear energy. We also added extra explanation of processes or installations if we thought this might be unclear for respondents. These explanations could be redundant for experts and therefore not mentioned in the information, but necessary for lay people to understand and evaluate consequences.

Second, we converted the information, if necessary, from expert standard measures to measures that are understandable for lay people. For instance, instead of framing the costs of energy in terms of Euros per kWh or Euros per gallon of fuel, it is framed as the percentage people would have to pay more (or less) compared to what they pay now for the same amount of energy. Sometimes a frame of reference can be given to clarify quantification. For instance, when stating how many birds might die by flying into wind turbines, it could help people to evaluate this better if it is also stated how many birds die in general each year. Or the size of an installation might be clearly illustrated by stating that the amount of land it needs is comparable to three soccer fields.

Third, a real effort was made to specify to what extend a consequence might occur, as well as to specify the probability of occurrence. For instance, how high the chance was of something occurring, how much more this would happen compared to the current situation, or for a more literal example: how many accidents and deaths of miners would occur. Of course, sometimes expert knowledge is simply not yet available and then it is just not possible to get an exact number or even a quantitative estimate.

It is essential to realize that although many details that experts have given were not mentioned literally in the translation for lay people, these details were the basis for the consequences that were described in the translation for lay people. For instance, efficiency of a technology is an aspect that is frequently specified by experts. However, efficiency was not mentioned in the translation. It was taken into account for the specification of the price of energy, which was mentioned in the translation, mostly stated as the percentage customers have to pay extra for energy or fuel. This is something that is clearer and more important to lay people. Therefore, although it might seem that a lot of expert information has been omitted, this information has in fact been taken into account for the statements in the translation for lay people.

1.7 Adjustments following tests and reviews of the resonance committee

1.7.1 The resonance committee (“klankbordgroep”)

Several translation checks were done with the help of students as well as a sample of the Dutch public. This translation process will be described in more detail in the paragraphs below. During this process of improving the translation of the expert information into lay language, we were advised by the resonance committee. This group consisted of 6 experts from different backgrounds most of whom had not participated during the gathering of information. The purpose of the resonance committee was to independently check the quality of the research that was being done. An important check was the check of the selection and translation of the expert information. Before the information was tested, the resonance committee checked the information on accuracy and balance. With their help, the text on all options was improved, as was the text regarding the consequences of global warming. The main reason for adjustments was the balance of the consequences, the resonance committee indicated that several options were out of balance in relation to the others because their consequences were either stated too positively, or not positive enough. After the two tests, on VMBO (highschool) students and on a sample of the Dutch public, the resonance committee reviewed the researchers’ improvements again. At this point, the resonance committee approved the ICQ information as being valid, impartial, and even-handed.

1.7.2 Tests of the ICQ

There are two main reasons for testing an ICQ. First, as an ICQ in general and our ICQ in particular tries to explain difficult subjects, it is essential to find out if explaining these subjects succeeds using the ICQ. Since one of the goals of the ICQ is to inform respondents, it is necessary to test how well respondents are informed. Second, the ICQ functions as a decision aid. Respondents are not only informed, but the way they are informed is such that it structures the decision making process. Respondents are asked to evaluate options by evaluating the consequences of an option, after which they are able to compare the options and their consequences and make an informed decision. Before evaluating consequences, however, respondents are given several suggestions and exercises to help them decide and evaluate more rationally. As the second goal of an ICQ is to structure the decision process, it is necessary to test if respondents understand these suggestions and exercises and if they make use of these suggestions when evaluating consequences.

Furthermore, as the ICQ entails a complex procedure as well as a lot of difficult information, it is expected that most respondents need quite some time to complete the ICQ. The amount of time that is needed to fill in a questionnaire can become a problem when the questionnaire takes so much time that certain groups of respondents will drop out (e.g. elderly respondents, less interested respondents, etcetera). As this will cause an unrepresentative sample, it is necessary to design a questionnaire that is short enough for all groups in the expected sample. Therefore, it is necessary to test how long it takes respondents to finish the questionnaire.

1.7.3 Test on VMBO students

After selecting and translating the information in the questionnaire to the level and proportion suitable for almost all respondents, we tested the information on 31 VMBO students. These students were between 14 and 16 years of age. VMBO is the lowest level of secondary vocational training in the Netherlands except for the level with students with serious learning problems. The questionnaire they were given contained information on the current Dutch use and sources of energy. Before the questionnaire was filled in, students were presented with information on global warming and the consequences of global warming. One of the researchers presented this information orally with some visual aids (in powerpoint). This was done because most of the text regarding global warming had already been tested in a previous study, on VMBO students as well as the general Dutch public. As the questionnaire is very long and we wanted the students undivided attention, we tested only the text regarding the energy options. Furthermore, since the purpose of this test was to measure the amount of time it would take the students to complete the questionnaire and to measure how understandable the test was, we were not interested in students' opinions on CCS, but rather recorded additional measures. We recorded the time students used to finish the questionnaire. Questions about the comprehensibility of the information were inserted multiple times after every few sentences of information that could be misunderstood. Students were asked to underline words or sentences that they did not understand, and were asked to rewrite parts they did not understand in their own words. After finishing the questionnaire, students were asked to answer a few knowledge questions that they should be able to answer after having seen the information in the questionnaire. The purpose of these questions was twofold. On the one hand, it was another measure of the comprehensibility of the text. On the other, it was a measure of how seriously students had participated.

Although the text was found comprehensible for the most part, the students mentioned several sentences more than once as being difficult to understand. These sentences or the paragraphs containing these sentences were rewritten to become more comprehensible. When rewriting, we took into account what information had been misunderstood as apparent from the frequent wrong answers on the knowledge test. We were not able to avoid all difficult terms though, for instance "uranium" was mentioned a lot as being a difficult "word", but this term was well-explained and furthermore unavoidable in this questionnaire. The time it took students to finish the questionnaire gave no reason to shorten the questionnaire. Last but not least, most students seem to have done their absolute best at reading and processing all the information, as they answered the majority of the knowledge questions correctly.

1.7.4 Test on a sample of the Dutch public

The test of the complete ICQ was designed to test the comprehension of language and procedure as well as to measure the amount of time needed to finish the ICQ. In order to test the comprehension of language and procedure, we added two questions to every part of the questionnaire. After every bit of information or each small series of questions we asked respondents if they thought this information was clear, and if they thought it was not clear, we asked if they could state in their own words what wasn't clear. In order to measure the time needed to finish the questionnaire without all these extra questions, half of the respondents would receive a test ICQ with the extra questions and the other half of the respondents would receive a test ICQ as it was intended, without the extra questions. The test ICQ was a computer-assisted questionnaire, which was send to respondents by TNS-NIPO so they could fill in the questionnaire at home, on their own computer. The procedure of this test, the results of this test and the improvements that were made based on these results are described in appendix 4. The conclusions of the results were that the 109 respondents understood most of the text. The time it took respondents to finish the questionnaire was not too long. The language was mostly comprehensible, only a few pieces of text needed to be adjusted. The technical information seemed mostly comprehensible too, although some text had to be adjusted based on the objective measures of difficulty. The subjective measures of difficulty showed that respondents perceived the quality of the information in the test as quite good. The decision aid, the explanation at the beginning of the test about how to evaluate rationally, was either already being used or picked up by respondents. Most respondents were content with the method, although it was not evaluated as simple by most respondents. One explanation regarding the use of the evaluations of the consequences was unclear to a substantial percentage of respondents. This explanation was adjusted. One of the consequences of the biomass option was also unclear, this was adjusted with the help of a biomass expert. The consequences of the temperature rise due to the greenhouse effect were adjusted, not because of the reactions of respondents, but because the new report of the IPCC came out during this phase of improvement of the text. We adjusted the text with the help of two experts on this topic from Utrecht University and KNMI. All adjustments were approved by the resonance committee.

2. DESCRIPTION OF THE QUESTIONNAIRE

2.0 Baseline questions (awareness and uninformed evaluation of options and global warming)

A random selection of the respondents (about a third of the sample) received questions about climate and energy before the actual ICQ started. Before respondents were asked these questions, they received a brief introduction about the study. It was explained to them that our current manner of energy use influences the environment and the climate and that the Netherlands are looking for other methods of energy use. It was explained to respondents that it was therefore necessary to study the evaluation of the public concerning a few possibilities for future energy use. It was furthermore explained that it was likely that most people knew very little about these technologies, and that therefore, they would have the possibility to refrain from evaluation. By asking these questions, it is possible to study current public opinion that has not yet been influenced by the information in the questionnaire, and its relation to the opinion after information from the questionnaire.

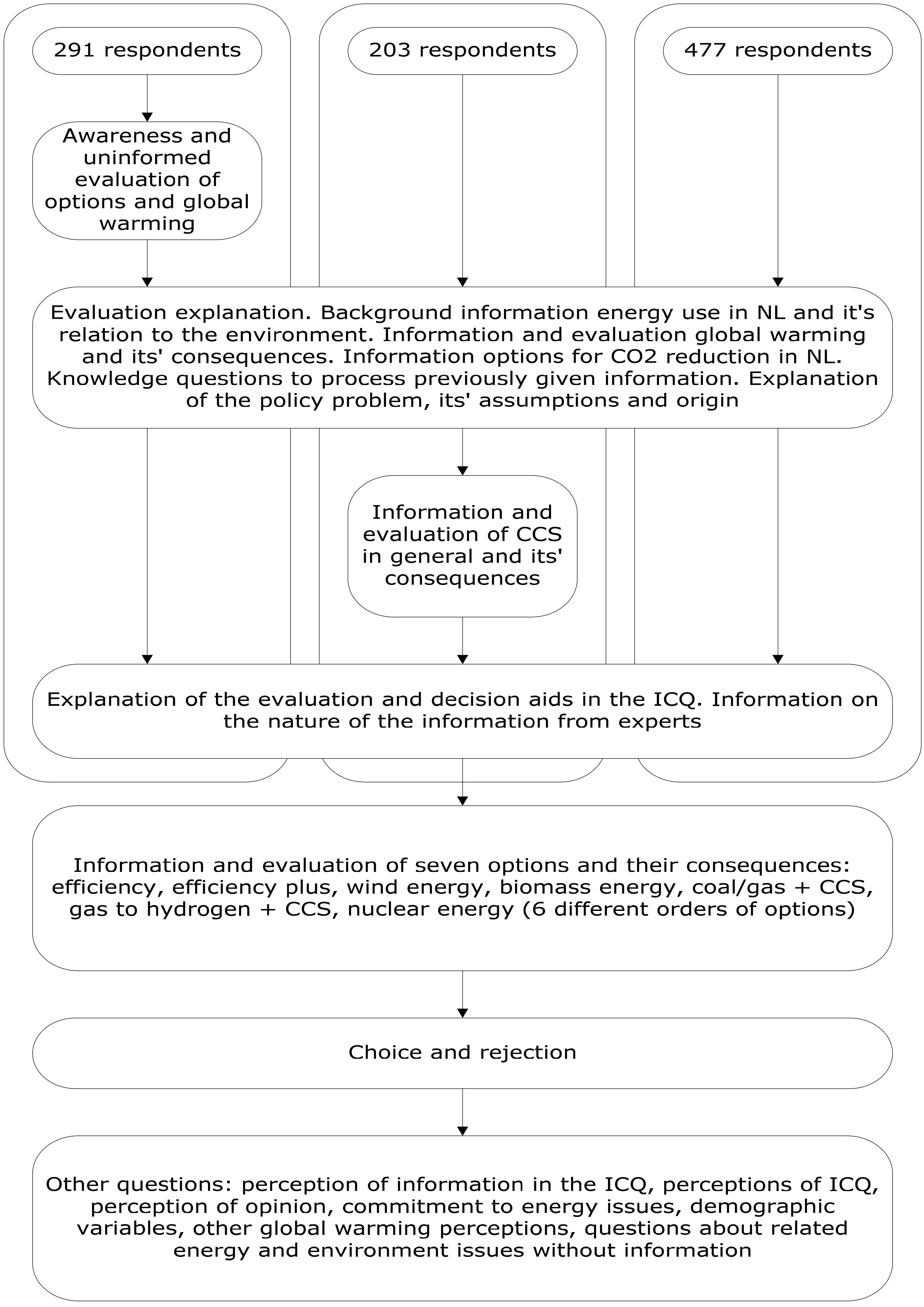
Respondents were told that each time, they would first receive a question if they had heard about something, and would then be asked to state their overall evaluation of this. Respondents were urged not to be afraid to admit they had never heard of the topic of question, and were explained how they would be able to refrain from giving their evaluation by using the "no-opinion button" on the screen. For all seven energy options, the title of an option would be given (same title as later in the ICQ), with the question "have you heard of…", which they could answer with "no, not at all", "a little bit", or "yes, I know quite a few things about that". Only the question about global warming had different answering categories to be exactly comparable to a question in the 2004 ICQ study. After each awareness question, respondents would be asked to grade the option on a scale of 1 to 10 (i.e. give a "rapportcijfer"). For global warming, besides a grade another evaluation was asked for on a scale of 1 (very bad) to 7 (very good), again to compare to a question in the 2004 ICQ study.

2.1 Explanation of the ICQ procedure (start of the ICQ)

2.1.1 Calibration and calibration of probability

After a quick introduction of the purpose of the ICQ and kind of task respondents could expect, respondents were given several exemplary questions and exercises to practice the ICQ procedure with. These examples and exercises were used to explain how to evaluate consequences. Respondents were given four negative consequences to evaluate on a scale of one to nine, one being a very small disadvantage, nine being a very big disadvantage. These four consequences differed on two dimensions; the negativity of the consequence and the chance the consequence would occur. The purpose of this was to explain to respondents that it would be logical to rate a certain more negative consequence as more negative, and that it would be logical to rate a chance of less than 100% on something negative (e.g. 50% chance on 100 casualties) as less negative than a certainty (100%) of the same thing occurring.

Figure 2.1: Summary design questionnaire



2.1.2 Evaluation of consequences

Respondents were then given an exemplary ICQ about painkillers. With this exemplary ICQ, respondents were explained how to fully evaluate consequences; For every consequence respondents were asked to state if they thought this consequence was an advantage, a disadvantage or not important. If the consequence was evaluated as an advantage or a disadvantage, respondents could state to what extend they saw it as an advantage or disadvantage on a scale of one to nine (1= "a very small disadvantage" or "very small advantage", and 9= "a very large disadvantage" or " a very large advantage"). After respondents had received 4 consequences of medicine "X", the computer would check if the respondent had evaluated all disadvantages as disadvantages. If this was not the case, the respondent received the following text: "You have evaluated one or more of the consequences of medicine "X" as an advantage. Although you are of course free to think so, something could be said for considering the possible side-effects of a painkiller to be a disadvantage."

2.1.3 Value and consistency

As one of the consequences in the exemplary ICQ about medicine "X" was the same as in the first four negative consequences, respondents that gave equal evaluations of this consequence were explained that this was the logical thing to do. Respondents that gave different evaluations to the same consequence were suggested to consider that equal consequences should receive equal evaluations.

2.2 Presentation of the choice problem and background information

After familiarizing respondents with some elements of the ICQ procedure, respondents were explained in detail what the questionnaire was about. They were told that the questionnaire had been made with the help of a diverse group of energy experts and that the information in the questionnaire was acknowledged by these experts as a trustworthy account of energy dilemmas and of the consequences of seven options to diminish CO_2 emissions. The respondents were given information on the current use of energy in the Netherlands and the current ways in which energy is produced in the Netherlands. Next, they were explained what the frequent use of oil, gas and coal mean for our climate, by explaining the role of carbon dioxide in global warming. They were then given 8 consequences to evaluate that are expected to occur when the earth's temperature rises as much as expected by scientists. They were also asked to state their overall evaluation on global warming. This overall evaluation was asked for twice; the respondents were asked to give their overall evaluation on a scale of 1 to 7, 1 being very bad and 7 being very good. They were furthermore asked to grade global warming on a scale of 1 to 10.

2.2.1 Knowledge test

Following the information on global warming, respondents were given information on ways to reduce emissions of carbon dioxide. It is explained that this questionnaire focuses on seven options that can help to reduce carbon dioxide emissions. Respondents were made clear that three of these seven options are necessary to reduce carbon dioxide emissions by 50%. Respondents received a summary of all the information they had to process at this point. As respondents have had a lot of information to take in so far, it was questionable if they remembered all of it. To test respondents' knowledge at this point and to fill in any omissions, respondents received 11 multiple-choice questions on information they had just been given to read. After respondents gave their answer, the right answer would always be displayed on screen once more.

2.2.2 General information on carbon dioxide capture and storage

In a previous ICQ, six CCS options were compared. Because all the options in this questionnaire were CCS options, part of the consequences of all options were the same (i.e. the consequences of the actual capture, transport and storage itself). To avoid asking the respondents about the same consequences six times in a row, these consequences were evaluated before any of the (consequences of) options were evaluated. In the current ICQ, there are other options besides CCS options. Therefore, a similar design would not be logical. However, we were interested if separating the consequences of CCS itself (just capture, transport and storage consequences) from the consequences of the rest of the chain (for instance consequences of use of coal or gas or consequences of end use) might have had an effect on the overall evaluations of the CCS options in the 2004 ICQ study. To be able to study this possibility, a fifth of the sample of the current ICQ received a similar design with just CCS consequences before any of the other options. Respondents received a general description of CCS and information on six aspects and consequences and were asked to evaluate these consequences and asked to provide their overall evaluation of CCS. This overall evaluation was asked for twice; the respondents were asked to give their overall evaluation on a scale of 1 to 7, 1 being very bad and 7 being very good; and the respondents were asked to grade CCS overall on a scale of 1 to 10.

2.2.3 More evaluation aid; explanation of accounting system

It was announced at this point that they would not only be asked to evaluate the options and their consequences, as they had done in an example before, but that they would also be asked to make a choice for three of the seven options. We used an exemplary choice procedure to explain what the real choice procedure would be like. Respondents were shown in a table, what evaluations they had given before in the earlier example of the ICQ procedure of "medicine X". Not only were their evaluations given, but also an explanation how adding these numbers would give respondents their overall scores of disadvantage and advantage of "medicine X". They were explained how to let the computer calculate these scores, and how these scores could be used to further evaluate the option (medicine X) overall.

2.3 Evaluating consequences of seven options

At this point, respondents would receive the information on each of the seven options in general as well as information on the consequences of each option. Per option, respondents would first get a description of the option. Descriptions of the option contained information on, for instance, the essence of the technologies, the amount and location of plants or fuel cells, conditions for implementation, or the kind of end use. After the general description, respondents were asked to evaluate all the consequences of the option in question.

The criteria for the information about the options was explained to respondents; first it was explained that the respondent would receive information on consequences that experts found important, but we added the comment that experts obviously could not decide for the respondent whether they thought a consequence was important or not. The second criterion for the information on consequences was relevance of a kind of consequence for a policy option. If the consequence of one option is an influence on sea life whereas the other option does not cause this, only the consequence of influence is mentioned. The third criterion was a difference from the status quo. For instance, if the consequences for air quality of an option do not differ from the consequences of the currently used option, these air quality consequences were not mentioned. Only if it was well known or expected that lay people expect a consequence that experts know will not occur, this was explicitly mentioned.

Another criterion was the level of knowledge of a certain consequence of all options. It was explained to respondents that certain consequences were studied or otherwise well known for some options, but not for others. These kind of consequences are likely to occur in several options, not just the ones experts studied. However, as it was impossible to give information about these consequences for some options, information about these consequences was not given for any of the options.

A last remark about the information on consequences that respondents received was that although the prices of all options seem to be higher in comparison with the current energy prices, energy prices are expected by experts to rise over time, indifferent of the origin of the energy.

The information about a consequence was given to respondents in such a way that it was possible for them to evaluate this consequence. As in the exemplary ICQ, respondents were asked to state for every consequence if they thought this consequence was an advantage, a disadvantage or not important. If the consequence was evaluated as an advantage or a disadvantage, respondents could state how much of an advantage of disadvantage on a scale of one to nine, with one being a very small disadvantage or very small advantage, and nine being a very large disadvantage or advantage. This way, respondents could evaluate all the relevant consequences of an option, one by one, as they had been practising with the exemplary ICQ. At this point, respondents were asked to accumulate all the evaluations of an option, and were asked to base their overall evaluation of the option on the resulting total.
They could do so by pressing a button above a table on screen with all the consequences and their evaluations. If a consequence had been evaluated as unimportant, this would presented as a “0” in white colour, if it had been evaluated as a disadvantage the evaluation would be presented in red colour, and if it had been evaluated as an advantage the evaluation would be presented in green colour. Respondents were now asked how they thought about the option as a whole, and were suggested to base this on their evaluations of the consequences and the total disadvantage and advantage score they calculated. They were asked to give an overall evaluation of the option on two different scales. First they were asked to state on a scale of one to seven what they thought all in all, with one meaning “very bad” and seven meaning “very good”. They were furthermore asked to grade the options on a scale of one to ten.

2.4 Choice of three out of seven options

When respondents had evaluated all seven options, a table would appear on screen with all options, their overall evaluations and total disadvantage and advantage scores. Respondents were told they could now change the overall evaluations if they wanted, having now read all of the information on the seven options. Following this respondents were asked which three options they preferred to be implemented on a large scale. They could choose three options. It was suggested that they could base their choice on their overall evaluations of the options and/or on the total disadvantage and advantage scores. They were furthermore informed that not all combinations of options were possible. The second efficiency option could only be chosen together with the first efficiency option. It was not possible to select more than two options that target electricity production, because otherwise the supply will exceed the demand. The options concerned are “electricity from wind turbines at sea”, “large plants where coal or gas is converted to electricity with CCS”, “large plants where gas is converted to hydrogen with CCS” and “electricity from nuclear plants”. It was also not possible to choose for more than one option that targets fuel for cars and other transportation vehicles (“large plants where gas is converted to hydrogen with CCS” and “conversion of biomass to car fuel and electricity”).
Respondents were subsequently asked if there were any options in the questionnaire of which they thought implementation on a large scale was absolutely unacceptable, to a level that they considered taking action if Dutch society considered implementing this option on a large scale.

To study the effect of the choice restrictions mentioned above, we also asked respondents to choose again assuming there were no restrictions, except the restriction that the second efficiency option could only be chosen together with the first efficiency option.

2.5 Perception of information

After the respondent had made a choice, the actual Information-Choice-Questionnaire was over. However, several additional measures were taken. First, fourteen questions were asked to evaluate whether – subjectively- the goal of the ICQ had been reached. These questions concerned the amount, the impartiality, the clarity and the completeness of the information. The questions furthermore concerned how the procedure of the ICQ had aided respondents’ decision, how comprehensible it was and how complicated. Respondents were also asked if they had felt restricted in their choice for packages.

Second, respondents received five questions on opinion change due to the information in the questionnaire. For instance: “To what extend did the information in the questionnaire give you more arguments for your choice for one of the options to produce energy?”

2.6 Questions regarding global warming and energy outside the ICQ scope

The method of the ICQ uses expert information on the consequences of options to inform respondents and help them make a more rational decision. Because of this, there are no questions in the ICQ that address other possible arguments or misconceptions that respondents might also base their opinion on. However, during the development of the information, several experts mentioned possible arguments or misconceptions that they thought were frequent among lay people. We therefore made several additional questions to be asked after the ICQ concerning these kinds of arguments. These questions are by far not inclusive of all possible arguments of misconceptions that lay people might have. That would require an entire new study and questionnaire. We selected, in discussion with several experts and NGO representatives, a number of questions that we thought were most relevant. These questions are described shortly in the next paragraphs. In the result section (section 3.9) the questions are stated literally in Table 3.9. Please keep in mind that the answers to these questions are very different from the evaluations respondents make regarding the options and their consequences in the ICQ method, after having processed valid and balanced expert information.

2.6.1 Global warming perceptions

To study the perceptions respondents might have of global warming as a topic of scientific debate, four questions were asked regarding a warmer climate, cause of warming and protection against consequences of a warmer climate. To study how the respondents think the Netherlands as a country should handle carbon dioxide emissions, three statements were given to respondents to evaluate on a scale of 1 to 7, completely disagree to completely agree.

2.6.2 Perceptions of financial aspects of carbon dioxide reduction

To further unravel how committed respondents were to reducing carbon dioxide, several questions were asked regarding sources of funding, such as support from the government, funding of energy companies and taxes for civilians. These questions were often framed as a social dilemma to be solved, by asking respondents where the money should come from (for instance more government funding for emission reduction by giving less money to education or health care, or price of energy more dependent on the amount used).

2.6.3 More perceptions of energy from biomass

In the information regarding the consequences of one of the options, “conversion of biomass to car fuel and electricity”, respondents were confronted with possible consequences that are dependent on regulations that are yet to be designed. Depending on the way biomass is produced, some consequences could turn out quite negative or quite positive. Respondents were asked to evaluate these consequences, with only minor clues as to the chance of occurrence. Three extra questions at the end of the questionnaire therefore addressed the perception of the biomass option if it was certain which consequences would occur. Respondents were asked how important it was to them that the Netherlands would only import biomass with certificate (for the consequences of biomass with certificate, see Appendix 2). and were furthermore asked if they would change their evaluation of the biomass option if it was certain that the Netherlands would also import biomass without a certificate.

2.6.4 Alternative energy sources

Respondents were furthermore asked several questions about the importance to them that the Netherlands would invest in research and development of “green” energy (wind, solar, biomass).

2.7 Background questions

Last, respondents were asked nine questions that were meant to measure their involvement with issues regarding energy and environment. Involvement indicates to what extend people inform themselves on, think about and feel engaged to a topic. Involvement in this topic was measured with the use of questions from a validated and reliable questionnaire that was developed by Verplanken (1991). Some questions were slightly altered to fit the current situation and questionnaire, one question was added. A questions was added regarding Al Gore’s “An inconvenient truth”. At the moment of the administration of the questionnaire (May/June 2007), this book and documentary had won an Oscar, but Al Gore had not yet won the Nobel prize.

One more very important question was added regarding respondents contributions to environmental NGO’s. During the development of the ICQ, the original research proposal to study only respondents that were either contributing to, members of or employees for environmental NGO’s was abandoned at the request of the NGO representatives. This change was made in order to be able to study a representative sample of the Dutch public, containing respondents who contribute as well as respondents who do not contribute. The added question enables us to study possible differences between these groups.

Measures of backgroundvariables were not asked but were already known through earlier work of TNS-NIPO, the institute that has done the fieldwork of programming and administering the questionnaire to the respondents. These backgroundvariables were sex, year of birth, education, kind of employment and work hours per week, residence, province, region, urbanization and voting behavior in the last national election.

3. RESULTS

3.1 Sample

The ICQ was administered in May of 2007. The sample for the ICQ consisted of 971 respondents of at least 18 years of age and was a representative sample for the Dutch population. 1000 respondents completed the ICQ. However, 29 respondents had completed the questionnaire so fast they would never have been able to read all the information. A check of their answers and evaluations showed clearly that these respondents had not participated seriously (e.g., several of these 29 had given the same evaluation to all consequences throughout the questionnaire, which is rather suspicious with at least 60 very different consequences to evaluate on an 18-point scale) and that they had probably typed their way through the questionnaire to receive the bonus from TNS-NIPO that each respondents received. These 29 respondents were omitted from our sample, leaving 971 respondents. This sample was tested to find if there were any differences in the most common demographic variables between our sample and the Dutch population. The distributions of all demographic variables we tested (sex, age, education and province, see also Appendix D1.1) were the same for the ICQ sample and the Dutch population (data from Central Bureau for Statistics), which means the ICQ sample is representative for the Dutch population.

Based on the sample size of the ICQ ($n \approx 1000$) when interpreting the presented response percentages in this report one should reckon with an uncertainty margin of *maximally* plus or minus 3.2% (these margins apply with a 95% confidence level). An example: when 50% of the respondents give an affirmative response to a yes/no question then the real percentage is between 46.8% and 53.2%. However, when 90% of the respondents answers affirmative then the uncertainty margin is smaller (i.e., 1.9%) and the real percentage is between 88.1% and 91.9%.

3.2. Evaluation and Choice in the ICQ

3.2.1 Ruling out scale, order or design effects

3.2.1.1 Scale choice

The overall evaluations of global warming, CO_2 capture and storage (CCS) and the seven options were all measured with two different scales. Respondents were asked to give their overall evaluations on a scale ranging from 1 "very bad" to 7 "very good". They were furthermore asked to grade on a scale of one to ten. This means that there are two measures for all overall evaluations. To find out if respondents evaluate differently depending on scale type or size, we analyzed the correlations between these two measures for global warming, CCS and the seven options. The correlations were moderate to high, ranging from .63 to .84. This means that these measures are quite similar. To avoid redundant analyses and results, we will use just one of these measures for further analyses from here on. The grade between one and ten was used as a measure for the overall evaluation. Appendix 5.1.2 shows the average overall evaluations on the 1 to 7 scale in Table Appendix 5.1.2

3.2.1.2 Order effects

To avoid the possible influence of order effects on the overall evaluations, groups of respondents received the information on consequences of the seven options in different orders. Six versions of the ICQ were made with different option orders. In Appendix 5.1.3, an elaborate description is given of the analyses on order effects. Only very minor effects were found, which are averaged out as the overall evaluations that are further used in the analyses are an average of overall evaluations from six different order versions. The very minor effect of position therefore cannot be considered as a factor in the analyses that are described below. The minor effects that were found do point towards an effect of the comparison between options. The CCS options were overall evaluated more positively if they were evaluated first, before the information regarding the consequences of the CCS option could be compared to the information regarding the consequences of the efficiency, wind or biomass options. However, the second CCS option was evaluated even more positively if the option was second, right after the nuclear option.

3.2.1.3 Design effects

As noted in section 2.0 and 2.2.2, several respondents were given an extended version of the ICQ. Of the 971 respondents that participated, 291 participants were asked to state their familiarity with the options and to evaluate the options before the ICQ started (i.e. without information on the options). Another 203 participants were asked to evaluate extra consequences of CCS during the ICQ. In Appendix 5.1.4 a description is given of analyses to rule out effects of these extra questions on later evaluations of the options. Such effects were not found.

3.2.2 Overall opinion options

3.2.2.1 Overall evaluations: Grades of the seven options

After respondents had seen an overview of their evaluations of the consequences of a option and calculated the total advantage and disadvantage score, they were asked to give their overall evaluation of this option. Respondents were asked to give the option a “rapportcijfer” (Dutch school grade), which is a grade on a scale from 1 to 10, with 1 meaning the lowest score possible and 10 meaning a perfect score. A 6 is considered an acceptable score (adequate). A “6^-” (i.e. > 5.5 is rounded to “6^-”) means in the Dutch grading system you did just good enough to pass but not any better. 5 or lower means you failed the test.

After respondents had evaluated all consequences of the seven options and given their overall evaluations of all seven options, they were shown a table with an overview of all their overall evaluations of the seven options, grades as well as total advantage and disadvantage scores. At this point, respondents were given the opportunity to change the overall evaluations of the seven options, based on the argument that they might have changed their mind about some of their overall evaluations now they had received and evaluated the information on all seven options. Only a small percentage of respondents used this possibility. Depending on the option, between 5.7% and 3.3% of respondents changed their overall evaluation of a technology. The following calculations are based on respondents’ *final* overall evaluations.

Table 2.2.1 contains the distribution of the overall evaluations per option and the mean overall evaluation given by respondents in the ICQ. On average, not all options are evaluated as adequate (>5.5). The two CCS options, “Large plants where coal or gas are converted into electricity with CCS” and “Large plants where gas is converted into hydrogen with CCS”, were evaluated somewhat negatively by most respondents. The first CCS option was graded below 6 on average (5.34), the second CCS option was graded just below 6 on average (5.92). In comparison, respondents evaluated most of the other options in the questionnaire rather positively.

Table 2.2.1: Overall evaluations of seven options in the ICQ: percentages for grades and means and standard deviations.[8]

Option	1-3	4-5	6-7	8-10	Mean	SD
Efficiency	0.7	5.5	47.7	46.0	7.33	1.23
Efficiency plus	7.1	32.3	47.9	12.8	5.84	1.54
Wind	1.7	8.7	46.5	43.2	7.15	1.37
Biomass	1.3	5.0	42.2	51.4	7.41	1.32
Powerplants + CCS	11.2	41.0	41.3	6.40	5.34	1.50
Hydrogen + CCS	6.1	28.8	53.1	12.1	5.92	1.44
Nuclear	19.4	31.1	36.9	12.7	5.29	1.96

The first efficiency option was evaluated 7.33 on average, the wind energy option was evaluated 7.15 on average and the biomass option was evaluated 7.41 on average.

[8] Obviously, the technical labels used in this paragraph for the CCS options were translated. For a full description of the options in lay terms see Appendix 2.

Respondents were also less positive about the second efficiency option and the nuclear energy option, which on average were evaluated 5.84 and 5.29 respectively. Although the average overall evaluation of one of the CCS options (5.34) is not very different from the average overall evaluation of the nuclear energy option, Table 2.2.1 shows that the distribution of evaluations is different. The nuclear energy option was evaluated as very negative (a 1,2 or 3) or very positive (an 8, 9 or 10) by substantially more respondents than the CCS option was.

3.2.2.1b: Relation between overall evaluation options

To test whether respondents were likely to grade certain options alike, we did several analyses. First, we tested if the overall evaluations of the seven options were correlated. Correlations between the grades for the seven options varied between 0.03 and 0.45. This means that respondents evaluate some options quite alike, and some very different. The nuclear energy option and the two CCS options correlate moderately (between the coal and gas CCS option and the nuclear option r=0.36, between the two CCS options r=0.30, between the hydrogen CCS option and the nuclear option r=0.45), which means that most respondents evaluate those options somewhat similar. The first efficiency option is moderately correlated with the second efficiency option (0.38), with wind energy option (0.36) and with the biomass option (0.33). The wind energy option and the biomass option are also moderately correlated (0.38). (For a more thorough explanation of the concept of correlation, see Section 3). We furthermore tested whether respondents graded the seven options in such a way, that certain clusters of options are recognizable. For instance, respondents might have evaluated options that have much in common more alike than options that are more different. With factor analysis, we can determine if respondents overall evaluated certain groups of options more alike than others. The factor analysis showed two clusters of options that respondents evaluate alike. Eigenvalues of the first two components were 2.44 and 1.31, with explained variance of 54%. The two efficiency options, the wind energy option and the biomass option load highly on one factor (0.74, 0.51, 0.77, 0.67), the two CCS options and the nuclear energy option loaded highly on another (0.78, 0.71, 0.74). This implies that respondents who evaluated one of the two efficiency options, the wind energy option or the biomass option very positively, are likely to also evaluate the other of three options very positively. Similarly, if respondents evaluate one of the two CCS options or the nuclear energy option positively, they are likely to evaluate the other two of these options positively.

3.2.2.2 Seven options: Choice and rejection

After evaluating all options and their consequences, respondents were asked to choose three out of the seven options to solve the policy problem. Most respondents choose either the first efficiency option (90.2%), the wind energy option (75.4%), or the biomass option (70%). A substantial percentage chooses all three of these options (44.8%). The second most chosen combination was the two efficiency options and the wind energy option (10.7%), the third most chosen combination was the combination of the first two efficiency options with the biomass option (9.2%). Fourth and fifth were the combinations of the biomass option and the nuclear option either with the efficiency option, or with the wind energy option (6.8% and 5.9% respectively). The second efficiency option was chosen by almost a quarter of respondents <u>as one of their preferred three options</u> (24.0%). The nuclear energy option was chosen by a few percent less respondents, 22.9%. The two CCS options were chosen by a small percentage of respondents as one of their three preferred options, 6.9 % and 10.6% respectively.

Table 2.2.2: Overall evaluations of seven options in the ICQ: percentages for grades, mean grades, percentages for choice and rejection

Option	1-3	4-5	6-7	8-10	Mean grade	Choice %	Reject %
Efficiency	0.7	5.5	47.7	46.0	7.33	90.2	0.4
Efficiency plus	7.1	32.3	47.9	12.8	5.84	24.0	5.9
Wind	1.7	8.7	46.5	43.2	7.15	75.4	1.9
Biomass	1.3	5.0	42.2	51.4	7.41	70.0	1.5
Powerplants + CCS	11.2	41.0	41.3	6.4	5.34	6.9	11.0
Hydrogen + CCS	6.1	28.8	53.1	12.1	5.92	10.6	6.8
Nuclear	19.4	31.1	36.9	12.7	5.29	22.9	20.0

Each respondent was asked to choose three options, therefore the percentages of preference (choice) must amount to 300%, not 100%.

After respondents had chosen three options, they were asked if any options were unacceptable to them. Respondents were asked if large scale implementation of any of the seven options is so unacceptable to the respondent that he or she considers taking action if this was planned. The first efficiency option, the wind energy option and the biomass option are evaluated as unacceptable by very few respondents, 0.4%, 1.9% and 1.5% of respondents, respectively. The second efficiency option is rejected more often than the first efficiency option, 5.9% of respondents reject this option. The first CCS option (“Large plants where coal or gas is converted to electricity with CCS”) is rejected by 11.0% of respondents. The second CCS option (“Large plants where natural gas is converted to hydrogen with CCS”) is rejected by less respondents, 6.8%. The nuclear energy option is rejected by a substantial percentage of respondents, 20.0%.

When respondents chose their three preferred options, they had several restrictions. The second efficiency option could only be chosen together with the first efficiency option. It was not possible to select more than two options that target electricity production, because otherwise the supply would exceed the demand. The options concerned were “Electricity from wind turbines at sea”, “Large plants where coal or gas is converted to electricity with CCS”, “Large plants where gas is converted to hydrogen with CCS” and “Electricity from nuclear plants”. It was also not possible to choose for more than one option that targets fuel for cars and other transportation vehicles (“Large plants where gas is converted to hydrogen with CCS” and “Conversion of biomass to car fuel and electricity”). Because these restrictions might have had an effect on the choice for individual options as well, we also asked respondents to choose again without restrictions. Only the restriction that the second efficiency option could only be chosen after the first efficiency option had been chosen, was upheld. Without restrictions, some options are chosen less often. The first efficiency option is chosen 82.0% without restrictions (down from 90.2%) and the wind energy option is chosen 69.4% without restrictions (down from 75.4%). Especially the second CCS option (“Large plants where gas is converted to hydrogen with CCS”) is chosen more often without restrictions, 18.0% (up from 10.6%). The other options are all chosen slightly more often without restrictions than with restrictions. The second efficiency option is chosen by 26.8% (up from 24.0%), the biomass option is chosen by 71.2% (up from 70.0%), the first CCS option ("large plants where coal or gas is converted to electricity with CCS") is chosen by 9.4% (up from 6.9%) and the nuclear energy option is chosen by 23.3% (up from 22.9%). The most notable change therefore is with the second CCS option. Without restrictions, this option is chosen in combination with biomass by 10.5% of respondents. It seems therefore that a substantial percentage prefers the biomass option over the second CCS option, but does choose the second CCS option ("Large plants where natural gas is converted into hydrogen with CCS") if the biomass option can be chosen as well. However, this would only be policy relevant if the combination of the options the respondents evaluated would be practically possible.

3.2.2.3 Consistency between grades and choice

It is logical to assume that most respondents choose the three options they grade the highest, given the choice restrictions. In this paragraph we discuss the relationship between the overall evaluations of the seven options and choice as well.

When respondents base their choice for three of the seven options on their own overall evaluations of the seven options, they should choose the options they have given the three highest grades. The majority of respondents does in fact do so, 75.8% of respondents choose the options they had given the three highest grades or, in case respondents gave the same highest grade to more than three options (for instance, if the highest grade a respondent gave was 8, and four options were grade 8 by this respondent), chooses from these options. Most of the other respondents (21.3%) choose two of the three options they gave their highest grades to. As there were restrictions to what combinations of options could be chosen, not all respondents were able to choose all three options they had given the highest grades, which might have resulted in a lower percentage of consistent choices.

When respondents base their choice for three of the seven options on their own evaluations of the consequences of the seven options, they should choose the options they had given the three highest total consequence scores (see also Section 2.3). This total consequence score was calculated as follows: The sum of the disadvantages was calculated by adding, per respondent, all the evaluations of consequences that were defined as disadvantages by the respondent. The sum of the advantages was calculated by adding, per respondent, all the evaluations of consequences that were defined as advantages by the respondent. The total consequence score (sometimes referred to as the subjective utility) is calculated by subtracting the disadvantage score from the advantage score. A minority of respondents does in fact choose the options they had given the three highest total consequence scores, 37.2% of respondents choose as such. A majority of respondents (52.6%) chooses two out of the three options they had given the three highest total consequences score. Few respondents (9.8%) choose only one of the options they had given the highest total consequences score. This means that although most respondents base their choice in part on their own evaluations of the consequences, the majority of respondents does not choose at least one option which subjective utility was the highest, the second highest or the third highest. However, as was stated above, there were restrictions to what combinations of options could be chosen. This has probably resulted in a lower percentage of consistent choices, because respondents were sometimes unable to choose for the three options they had given the three highest total consequence scores.

3.2.2.4 Relation between grades and rejection

To study the relationship between the overall evaluation of an option and its rejection, we looked at the percentages of respondents that reject an option per grade. It is logical to assume that respondents who find an option unacceptable, also evaluate this option negatively. The results correspond with this assumption. Most respondents that give a low grade to an option, also reject it. Only few respondents that have given an option a moderate to high grade still reject the option. None of the respondents that give a very high grade (9 or 10) to an option, still reject the option. This shows that although most respondents' rejection of an option is consistent with their overall evaluation, some respondents do reject an option that they've evaluated positively, or do not reject an option that they have evaluated very negatively. It is possible that

Table 2.2.4: Percentages of rejection per overall evaluation (grade 1-10) of options

	Grade 1-2	Grade 3-4	Grade 5-6	Grade 7-8	Grade 9-10	Mean grade
Improvement of energy efficiency						
ACCEPT		100	95.7	99.5	100	7.5
REJECT		0	4.3	0.5	0	6.0
Improvement of energy efficiency and decreased use of material and energy						
ACCEPT	35.3	62.1	88.3	98.0	100	5.9
REJECT	64.7	37.9	11.7	2.0	0	3.9
Electricity from windturbines at sea						
ACCEPT	0	50.0	89.2	99.1	100	7.4
REJECT	100	50.0	10.8	0.8	0	4.6
Conversion of biomass to car fuel and electricity						
ACCEPT	50.0	44.4	91.5	98.4	100	7.6
REJECT	50.0	55.6	8.5	1.6	0	4.9
Large plants were coal or gas are converted into electricity with CCS						
ACCEPT	44.4	51.9	78.1	94.1	100	5.3
REJECT	55.6	48.1	21.2	5.9	0	4.1
Large plants were gas is converted into hydrogen with CCS						
ACCEPT	44.4	55.7	85.8	91.7	100	5.9
REJECT	55.6	44.3	14.2	8.3	0	4.6
Electricity from nuclear plants						
ACCEPT	4.7	22.5	60.4	91.8	100	6.1
REJECT	95.3	77.5	39.6	8.2	0	3.5

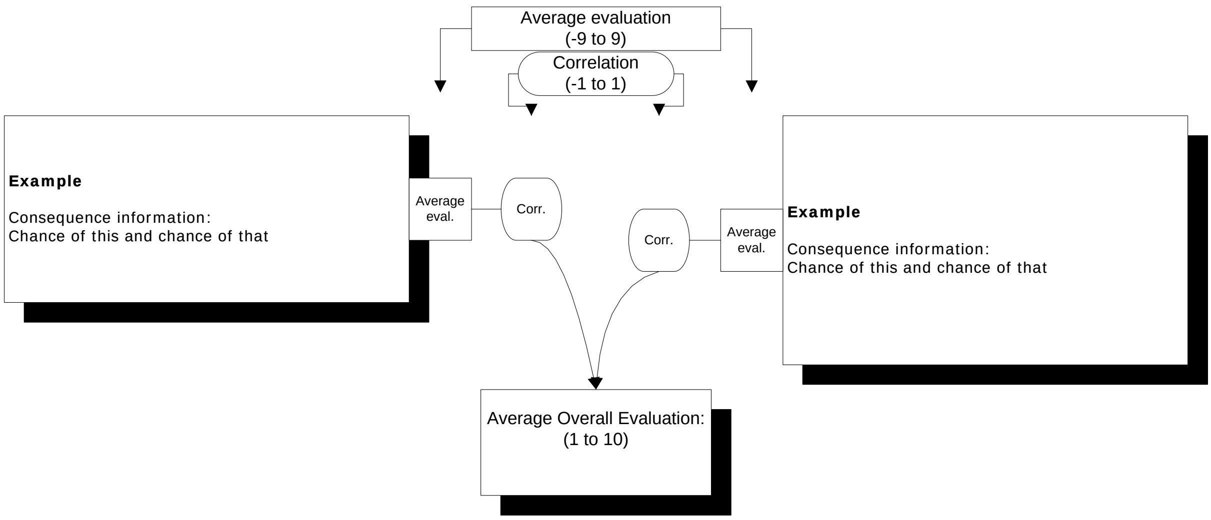
those people took the general public opinion into account when rejecting an option that they have evaluated positively. At the end of the questionnaire, this possibility was addressed. The options that have substantial rejection rates with moderate to high grades (i.e. more than 5% of respondents that graded an option with a 7 or 8 still rejected the option, which is the case for the two CCS options and the nuclear option) are indeed mentioned by a small percentage of respondents as options that they expect the public to be opposed to. (See also Section 3.9).

Appendix 5.2 shows further relations between evaluations of the options and rejection. In Table A5.2 the mean evaluations of consequences are given for the group that rejected a particular option versus the mean evaluations of the group that accepted the particular option. This was done to study if there were specific consequences of options that might have caused rejection. If rejection is based on just a few or even one single consequence, than this consequence is likely to be evaluated much more negatively by the group that rejects than the group that does not. (It is also possible that such a consequence is not evaluated more negatively but has a stronger influence on the overall evaluation of an option. Analyses to study this further are discussed in Section 3.) These analyses could only be done reliably for the four options that were rejected by a substantial percentage of respondents, therefore only the second efficiency option, the two CCS options and the nuclear option have been analyzed in such a way. The results show that almost all consequences of these four options are evaluated significantly more negative on average by the rejecting group than by the non-rejection group. These differences in evaluation are mostly small. Some consequences are evaluated substantially more negative by the rejecting group though. Respondents that reject the second efficiency option are substantially more negative about the consequence “more expenses consumers” and “drastic regulations for energy use houses and buildings”. On a scale of -9 to 9, these consequences are evaluated on average -3.16 and -5.6 by the rejecting group and 0.32 and -1.75 by the non-rejection group. (For more information about the evaluation of consequences, see Section 3.3) Two consequences of the first CCS option (“Large plants where coal or gas is converted into electricity with CCS”) are evaluated substantially more negative by the rejecting group. The consequence “very small chance of leakage from lines” is evaluated -4.06 on average versus -1.72 by the non-rejecting group. The consequence “very small chance of leakage from storage” is evaluated -5.28 on average versus -2.71 by the non-rejection group. The other CCS option has these same consequences. However, for this option the difference in evaluation of these consequences between the rejecting group and the non-rejection group is not as substantial. This might mean that respondent partly take the option overall into account when evaluating a specific consequence. Five consequences of the nuclear option are evaluated substantially more negative by the rejecting group than by the non-rejection group. The consequences “long term consequences low radiation very unlikely”, “very small chance of health risks from highly radioactive waste”, “chance of serious accident < 1:200.000 years”, “terrorist attack reactor close to impossible”, and “risk of proliferation: possibly moderate” are evaluated -5.53, -7.28, -3.84, -4.95, and -6.31 respectively by the rejecting group, versus -2.17, -3.52, -.2, -1.09, and -4.31 respectively by the non-rejection group.

3.3 Evaluations of consequences in relation to overall evaluations

Before respondents made a choice between the seven energy options, they evaluated, one by one, all the consequences of the seven energy options. Respondents stated whether they thought the consequence was an advantage, a disadvantage or not important. When the consequence was thought to be an advantage or disadvantage, they evaluated how much of an advantage or disadvantage the consequence was on a scale of one to nine. The same method was used for the evaluation of the consequences of CO_2 transport and storage in general. In Appendix 5.3, Tables 5.3.1-5.3.8 state the evaluations of each consequence of CO_2 transport and storage and all seven options. In the current section, the average evaluations of consequences and their relation to the overall evaluation of an option are presented and discussed per option. The evaluations of the consequences are measured on a scale of -9 to 9, with -9 meaning a very big disadvantage, 0 meaning unimportant, and 9 meaning a very big advantage. The outer right and outer left columns of each figure of an option contains the information regarding the consequences of a option. This information is an English translation of the Dutch information for lay people that respondents received. This Dutch information has been tested and improved vigorously, as described in section 1.6. The English translation of the lay information has not been tested or checked by experts again, but is simply a rather literal translation of the Dutch information for the purpose of this report. Right and left of the information columns, in the square box, the average evaluation of the specific consequence is given. Connected to this is the correlation between the evaluation of the consequence and the overall evaluation of the option, given in the round box.

EXAMPLE:



These correlations are all single correlations between evaluation of one consequence and the overall evaluation of the option it concerns. These correlations give some insight in the relative influence of the different aspects or consequences. A correlation can vary between -1 and 1, with 0 meaning no relationship between two variables. A correlation of 1 means a perfect linear relation between two variables, in the sense that the values of one variable are perfectly predictable from the value of the other variable. A correlation of -1 also means a perfect linear relation between two variables, however, a negative correlation means that as one variable increases, the other variable decreases, and vice versa. A positive correlation means that as one variable increases, the other variable also increases, and if one variable decreases, so does the other variable. As the correlation between the overall evaluation and the evaluation of a consequence rises, the consequence is likely to play a more important role in the determination of the overall evaluation.

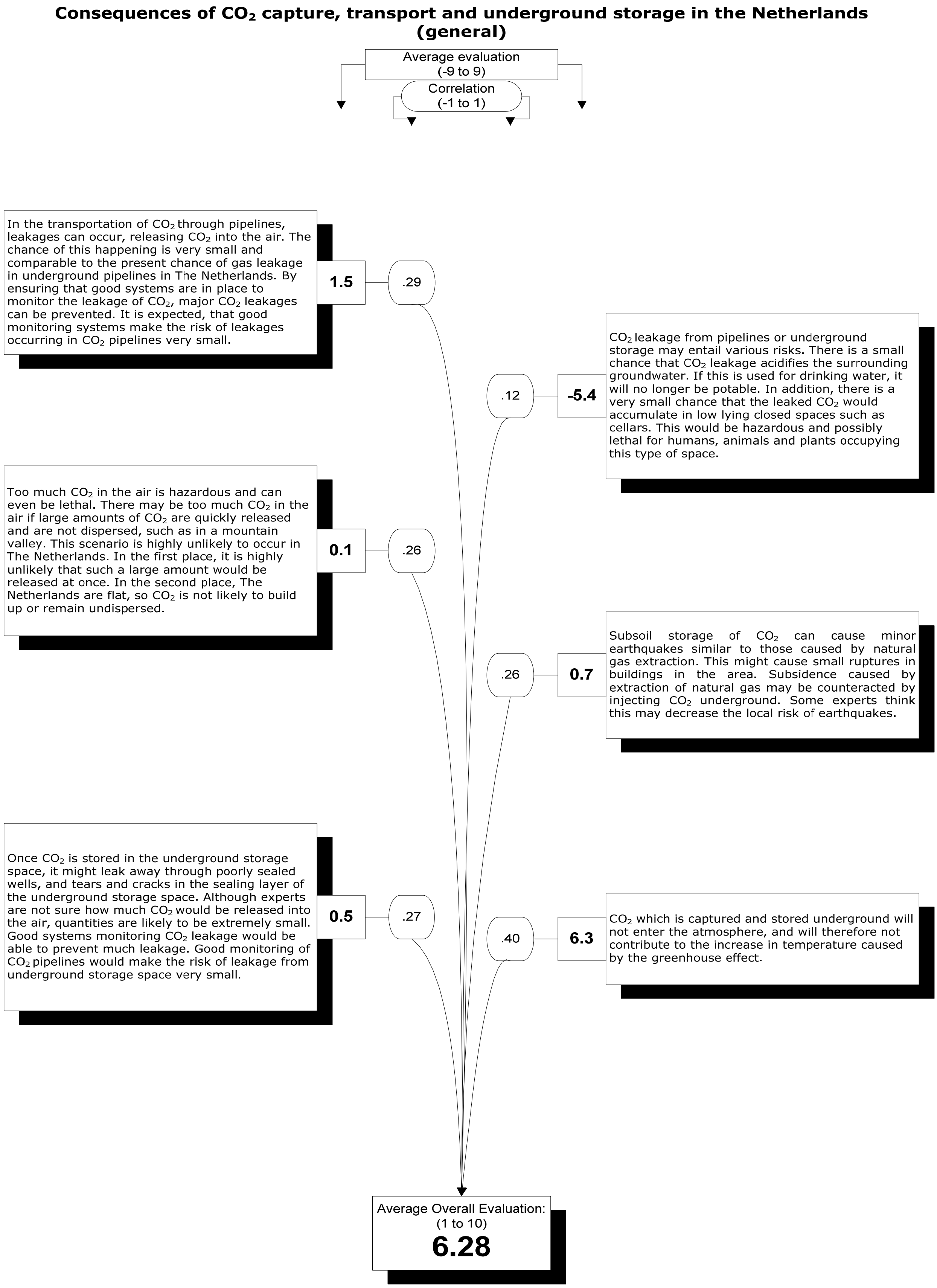
In the middle column of the figures, the average overall evaluation of the option is given. The multiple correlation between the evaluations of the consequences of an option and the overall evaluation of that option is stated in the discussion of the figure. The multiple correlations represent how much the evaluations of the consequences of an option together are connected to the overall evaluation of an option. A multiple correlation can vary between 0 and 1. The squared multiple correlation (R^2) represents the proportion of variance that can be explained. In this case, the multiple correlation gives an indication of the degree to which the overall evaluation of an option can be explained or predicted from the evaluations of the consequences of that option. Linear regression analyses were done to investigate this.

Although all consequences of an option are described in the figures with their average evaluations and their correlations to the overall evaluation, they are not all discussed individually in the text. To avoid long discussions, we selected the consequences based on their relatively high correlation with the overall evaluation, or because of an unexpected low correlation. Several other consequences that were noteworthy for other reasons are discussed as well.

3.3.1 From consequence evaluations to overall evaluation: CCS in general

A fifth of the sample received information on consequences of CCS in general. Respondents received information on the consequences of capture, transport and storage of CO_2 and were asked to evaluate these consequences as described above. After this, respondents were asked to state their overall evaluation of CCS in general on a scale of 1 to 7, very bad to very good, and on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of CCS is moderate, R=.47. This moderate correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of CCS, the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The “single” correlations between the evaluations of the consequences and the overall evaluation of CCS differ from moderate to low. Although the consequence “very small risk for life underground” is evaluated quite negatively, the correlation with the overall evaluation is very low (.12). This means that this consequence hardly seems to have a relation with the overall evaluation of CCS. The consequences “very small chance of leakage

Figure 3.3.1: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

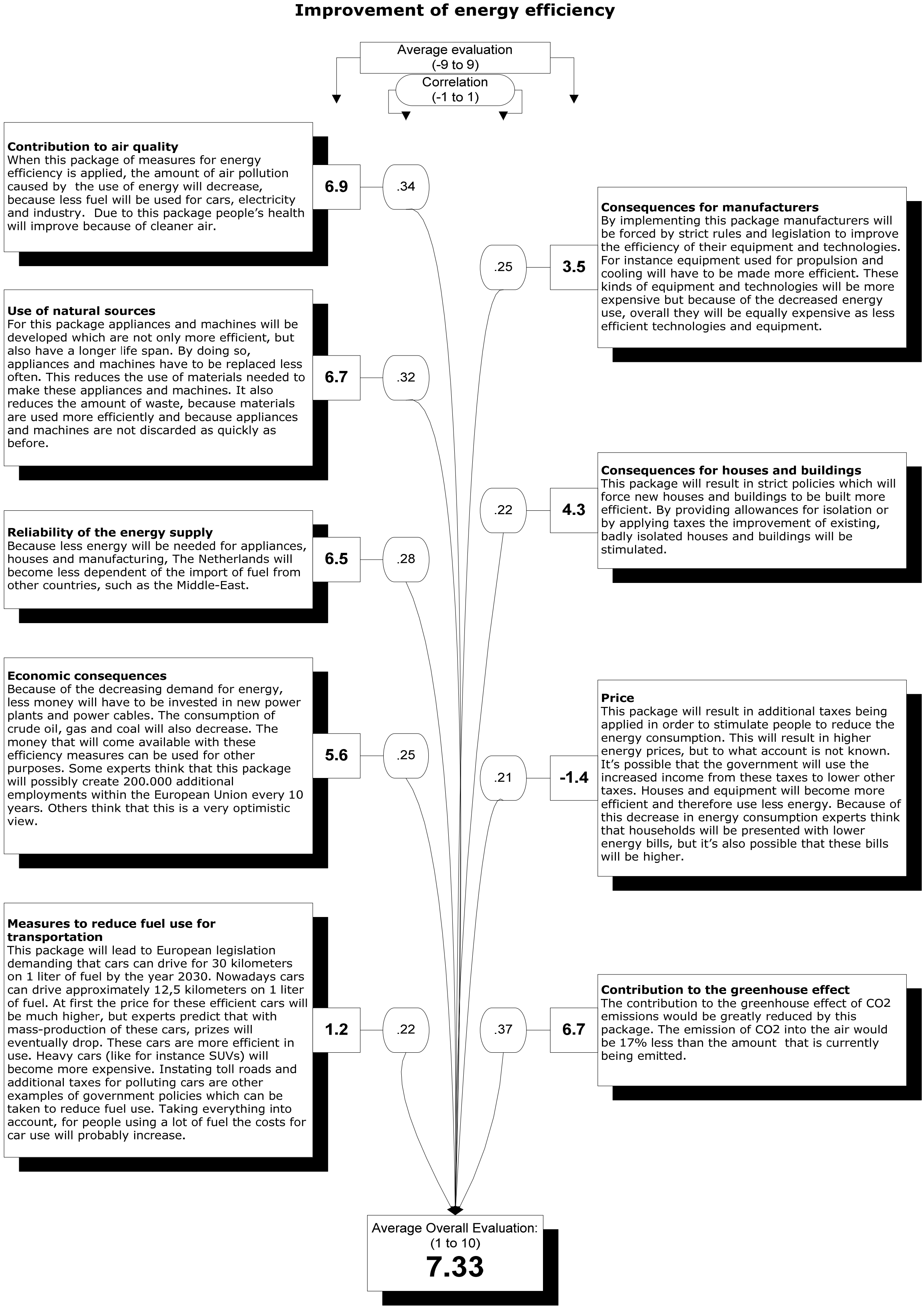


from lines", "very small chance of CO_2 cloud", "very small chance of leakage from storage", and "less or more earthquakes" have a low to moderate correlation with the overall evaluation of CCS. However, on average these consequences are evaluated mostly as unimportant or as a very small advantage. This means that although these consequences are taken somewhat into considerations by respondent for their overall evaluation of CCS, they do not predict a more negative or more positive opinion of CCS. The consequence of "much less contribution to the greenhouse effect" has the highest correlation with the overall evaluation of CCS, although the correlation is still moderate (.4). This consequence is also evaluated very positively on average (6.3). This means on average, respondents evaluate CCS more positively because of the advantage of less contribution to the greenhouse effect. On a scale of 1 to 7, very bad to very good, CCS in general was evaluated overall with a 5.2. On a scale of 1 to 10, CCS in general was evaluated overall with a 6.28.

3.3.2 From consequence evaluations to overall evaluation: Option "Improvement of energy efficiency"

Respondents received information on the option "improvement of energy efficiency". First they received a description of the option, then they received information on nine consequences of the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of "improvement of energy efficiency" on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of this first efficiency option is moderate, R=.48. This moderate correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option "improvement of energy efficiency", the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The "single" correlations between the evaluations of the consequences and the overall evaluation of the first efficiency option differ from moderate to low. The highest correlation is between the consequence "much less contribution to the greenhouse effect" and the overall evaluation. Most respondents evaluate this consequence very positively, and this seems to have a moderate but positive effect on the overall evaluation of the first efficiency option. The consequences "some contribution to improvement of air quality" and "less use of natural resources" are also evaluated rather positively and correlate moderately with the overall evaluation. These consequences also seem to have a moderate but positive effect on the overall evaluation of the first efficiency option. Most consequences of this option are evaluated rather positively, except for the consequence "measures to reduce fuel use for transport" and "price: lower or higher". "Measures to reduce fuel use for transport" is evaluated only slightly positively (1.2), and has a low correlation with the overall evaluation (.22). This means that this consequence influences the overall evaluation neither very positively nor very negatively. The consequence "price: lower or higher" was evaluated slightly negatively (-1.43), and also has a low correlation with the overall evaluation (.21). This consequence also seems to influence the overall evaluation neither very positively nor very negatively.

Figure 3.3.2: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

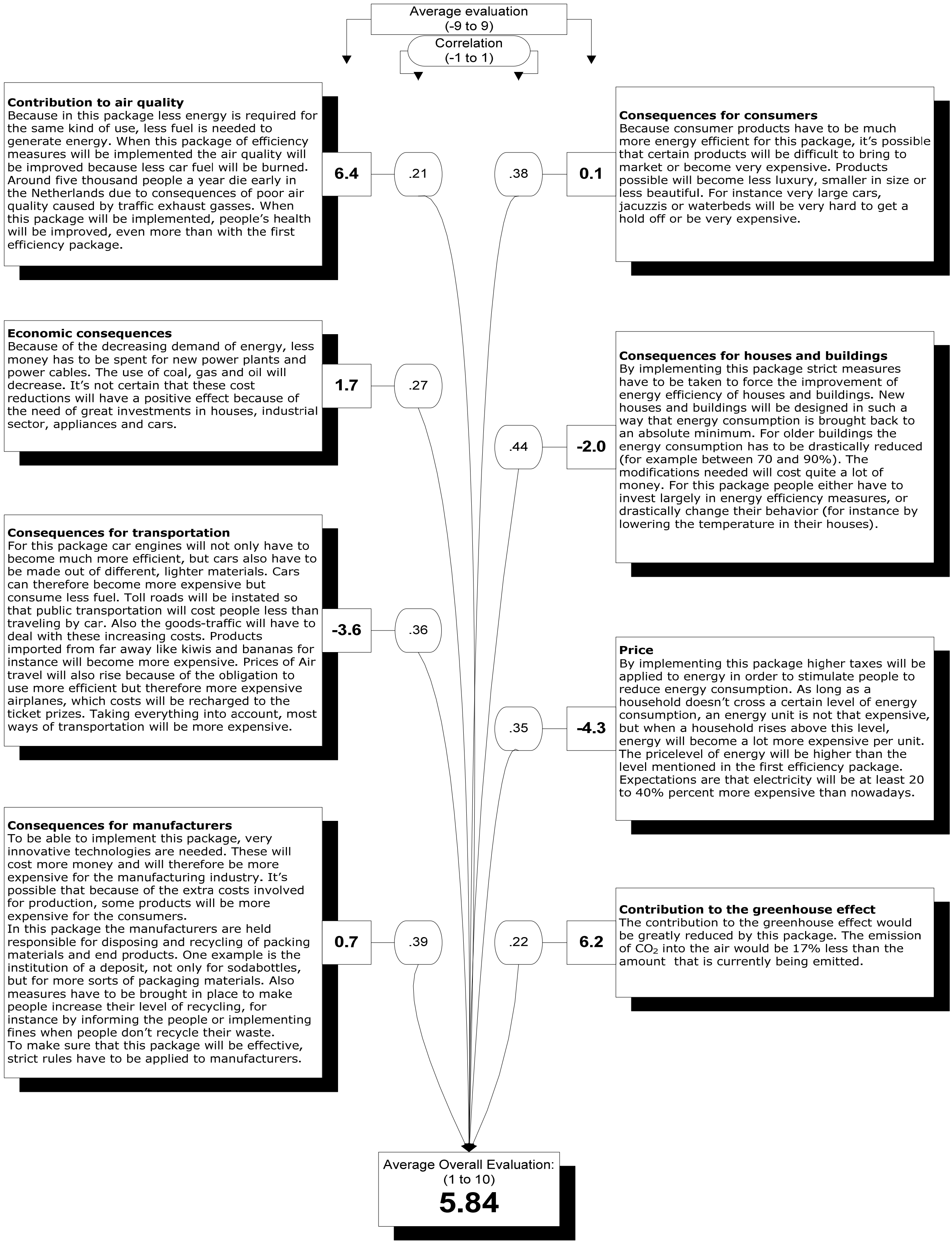


3.3.3 From consequence evaluations to overall evaluation: Option "Improvement of energy efficiency and decreased use of material and energy"

Respondents received information on the option "Improvement of energy efficiency and decreased use of material and energy" after they had processed and evaluated the first efficiency option. First they received a description of the option, then they received information on eight consequences the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of "Improvement of energy efficiency and decreased use of material and energy" on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of this second efficiency option is moderately high, R=.60. This moderately high correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option "Improvement of energy efficiency and decreased use of material and energy", the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The "single" correlations between the evaluations of the consequences and the overall evaluation of the first efficiency option differ from moderate to low. Several consequences correlate moderately with the overall evaluation, "more expensive transport", "strict regulations for industrial technology and recycling", "more expenses consumers", "drastic regulations for energy use houses and buildings" and "price: at least 20% higher". These consequences are mostly evaluated somewhat negatively on average, between 0.7 and -4.3. It seems that especially the consequences of this option for transportation and the consequences for prices influence the overall evaluation of this option negatively. The consequences of this option for air quality and for contribution to the greenhouse effect are evaluated very positively on average, but have less influence on the overall evaluation (correlations .21 and .22 respectively).

Figure 3.3.3: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Improvement of energy efficiency and decreased use of material and energy

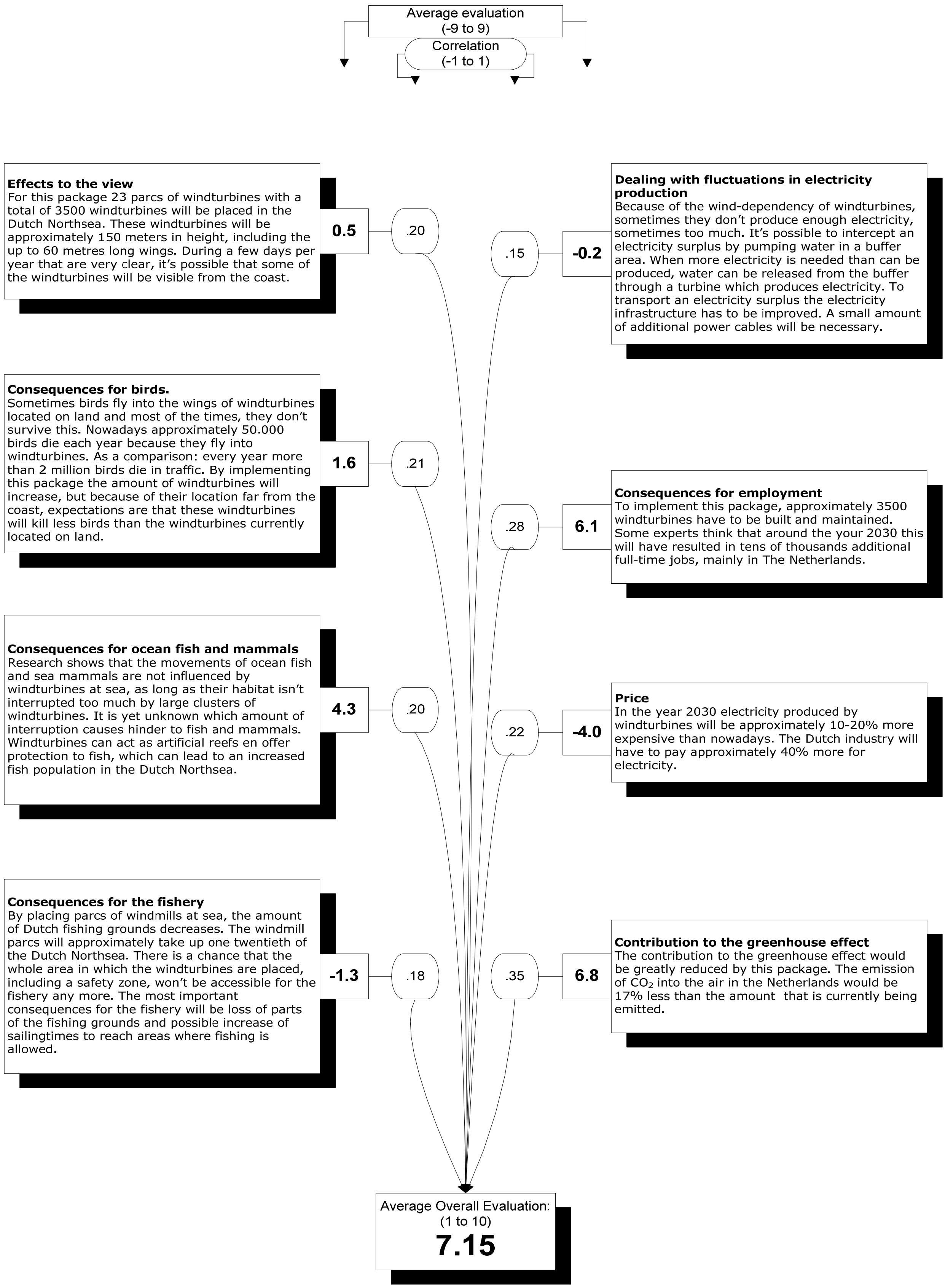


3.3.4 From consequence evaluations to overall evaluation: Option "Electricity from wind turbines at sea"

Respondents received information on the option "Electricity from wind turbines at sea". As with the other options, first they received a description of the option, then they received information on eight consequences the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of "Electricity from wind turbines at sea" on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of this option is moderate, R=.50. As with the other options, this moderate correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option "Electricity from wind turbines at sea", the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The "single" correlations between the evaluations of the consequences and the overall evaluation of the wind energy option differ from moderate to low. The highest correlation is between the consequence "much less contribution to the greenhouse effect" and the overall evaluation. Most respondents evaluate this consequence very positively, and this seems to have a moderate but positive effect on the overall evaluation of the wind energy option. The consequence "more jobs" has some positive influence as well. Respondents are on average very positive about this consequence and this has a moderate and positive influence on their overall evaluation of the wind energy option. The consequences of this option for price are evaluated rather negatively, however, price is only slightly correlated with the overall evaluation of the wind energy option. This means that most respondents do acknowledge the higher price of wind energy as a disadvantage, but hardly take this into account when evaluating the option overall. The consequences of the wind energy option for the view from the coast and the fluctuations in electricity production are evaluated as unimportant by most respondents. The evaluations of both consequences are only slightly correlated with the overall evaluation of the option. This means that the overall evaluation of the wind energy option is hardly influenced by the evaluations of these two consequences.

Figure 3.3.4: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Electricity from windturbines at sea

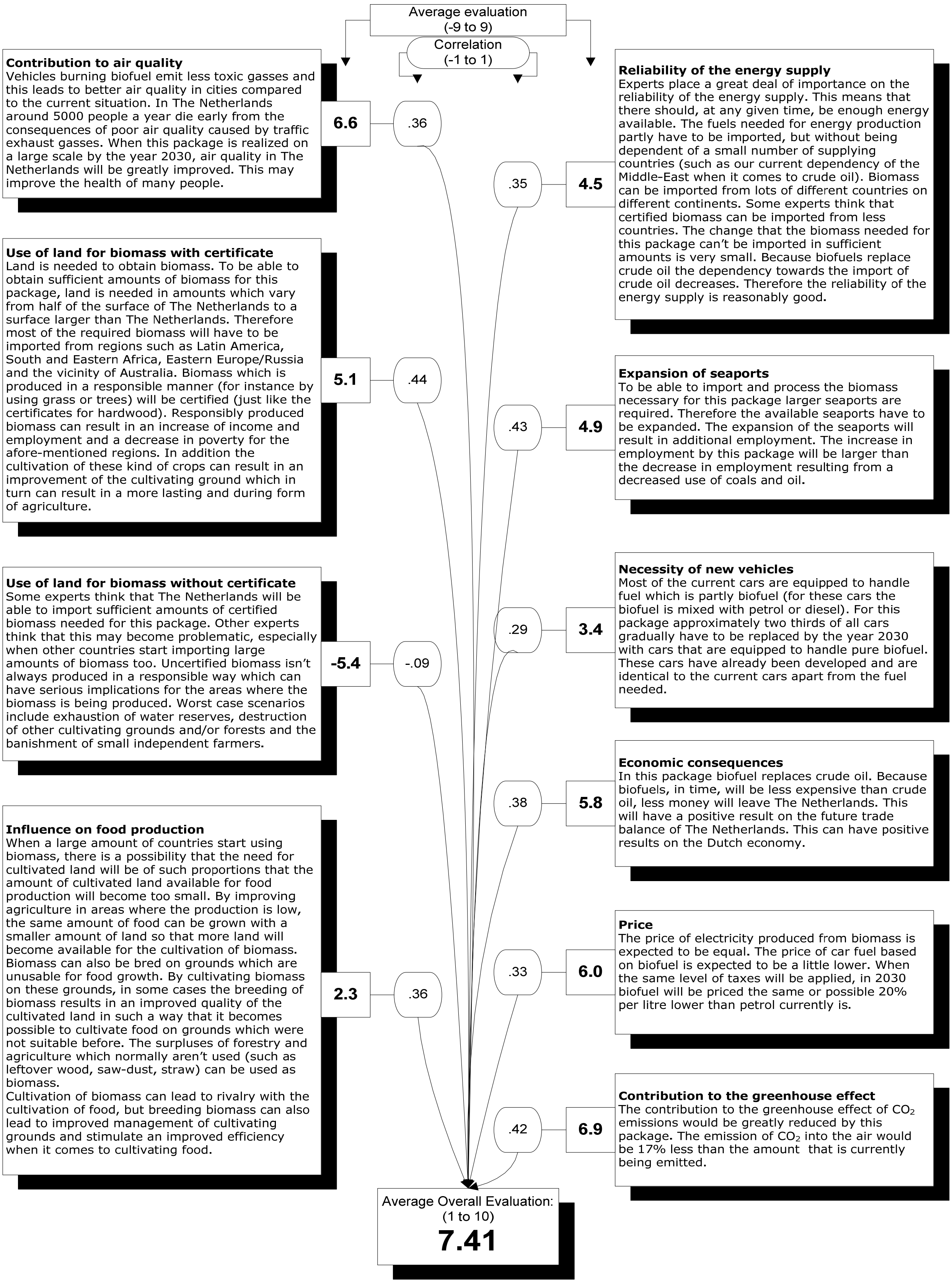


3.3.5 From consequence evaluations to overall evaluation: Option "Conversion of biomass to car fuel and electricity"

As with the other options, respondents first received a description of the option "Conversion of biomass to car fuel and electricity", then they received information on ten consequences of the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of "Conversion of biomass to car fuel and electricity" on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of the biomass option is moderately high, R=.60. This moderately high correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option "Conversion of biomass to car fuel and electricity", the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The "single" correlations between the evaluations of the consequences and the overall evaluation of the first efficiency option differ from moderate to low. The highest correlation is between the consequence "use of land for biomass with certificate" and the overall evaluation. Most respondents evaluate this consequence very positively, and this seems to have a moderate but positive effect on the overall evaluation of the first efficiency option. The information on this consequence explained several advantages of biomass assuming it is certified. Another consequence in this option contained information on the consequences of uncertified biomass. On average, respondents are rather negative about this consequence. However, the correlation between this consequence and the overall evaluation of biomass is close to non-existent. It seems that respondents do take the advantage of certified biomass into account, but not the disadvantage of uncertified biomass. This might mean that respondents do acknowledge the possible negative effects of this option, but trust that only certified biomass will be used, which pre-empts possible negative effects of land use. Respondents evaluate several other consequences very positively. "Considerate contribution to air quality", "positive economic consequences", "price: equal to 20% lower", and "much less contribution to the greenhouse effect" are all evaluated very positively, and all have a moderate correlation with the overall evaluation of the biomass option. This means that these consequences have a moderate but positive influence on the overall evaluation of the biomass option.

Figure 3.3.5: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Conversion of biomass to car fuel and electricity

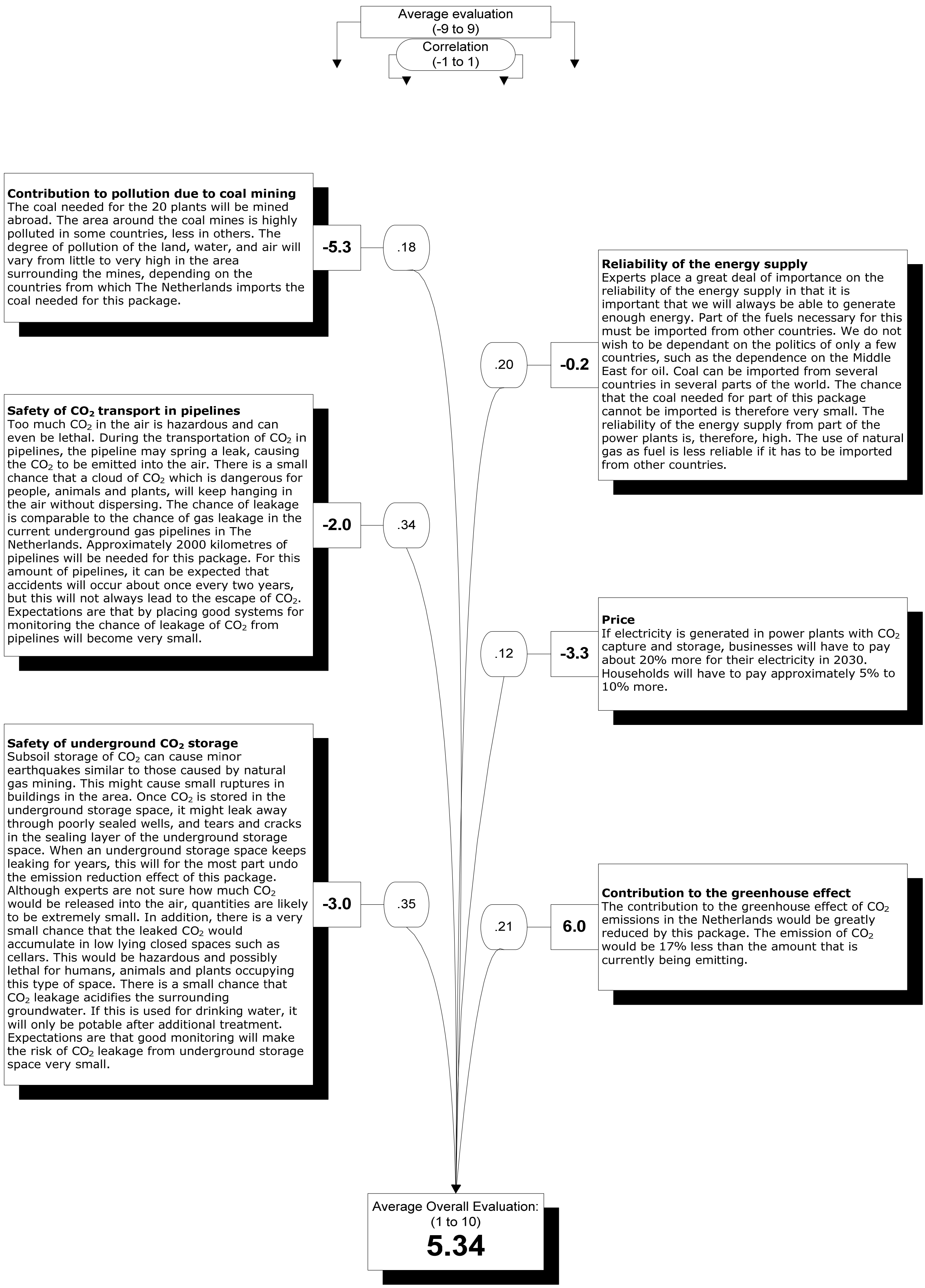


3.3.6 From consequence evaluations to overall evaluation: Option "Large plants where coal or gas is converted into electricity with CCS"

Similar to the other options, respondents first received a description of the first CCS option, "Large plants where coal or gas are converted into electricity with CCS", then they received information on six consequences of the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of "Large plants where coal or gas is converted into electricity with CCS" on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of this option is moderate, R=.45. This moderate correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option "Large plants where coal or gas is converted into electricity with CCS", the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The "single" correlations between the evaluations of the consequences and the overall evaluation of the first CCS option differ from moderate to low. The consequences "very small chance of leakage from lines" and "very small chance of leakage from storage" have the highest correlations with the overall evaluation, .34 and .35 respectively. On average, these consequences are evaluated as slightly negative, though a substantial percentage of respondents does evaluate these consequences as very negative. This means that although the influence of these consequences on the overall evaluation is minor, these consequences do seem to have a negative influence on the evaluation of the first CCS option.

Figure 3.3.6: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Large plants where coal or gas is converted into electricity with capture and storage of CO_2

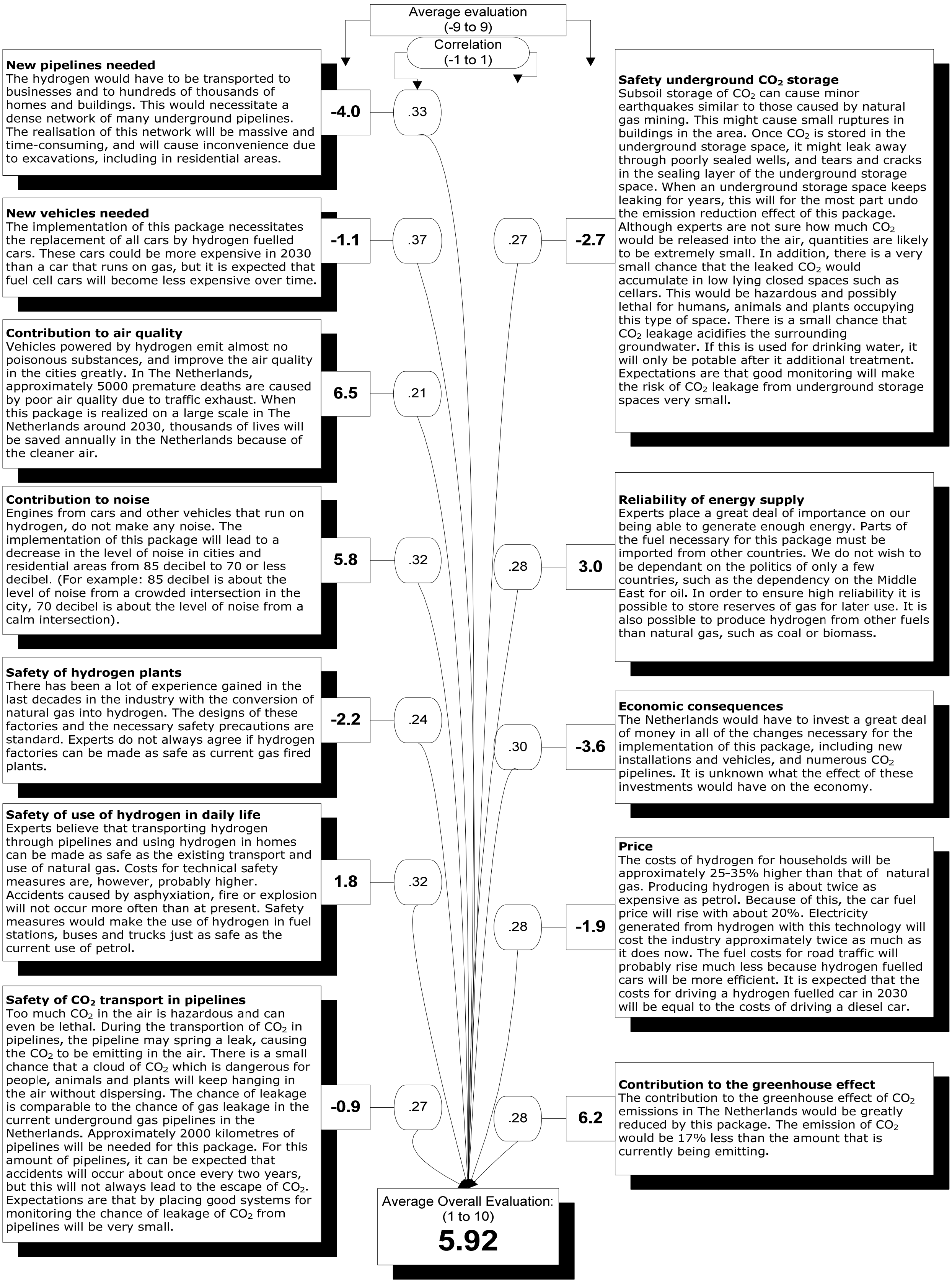


3.3.7 From consequence evaluations to overall evaluation: Option “Large plants where gas is converted into hydrogen with CCS”

As before, respondents first received a description of the second CCS option, “Large plants where natural gas is converted into hydrogen with CCS”, then they received information on twelve consequences of the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of “Large plants where natural gas is converted into hydrogen with CCS” on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of this option is moderately high, R=.62. This moderately high correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option “Large plants where natural gas is converted into hydrogen with CCS”, the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The “single” correlations between the evaluations of the consequences and the overall evaluation of the second CCS option differ from moderate to low. The consequence “need for new vehicles” has the highest correlation with the overall evaluation, .33. On average, this consequence is evaluated as slightly negative. However, as can be seen in table appendix 5.3.6, respondents are quite divided about this consequence. A substantial amount of respondents evaluates this consequence as very negative, but an almost as substantial percentage of respondents evaluates it as very positive. This means that this consequence can have a positive as well as a negative influence on the overall evaluation, depending on how the consequence itself is evaluated. The consequence “decrease of sound level” is evaluated very positively on average and has a moderate correlation with the overall evaluation of the second CCS option. This consequence seems to have a moderate but positive influence on the overall evaluation of the second CCS option. The consequence “safety in daily life” also has a moderate correlation with the overall evaluation of the second CCS option, but is evaluated by a substantial percentage of respondents as unimportant. On average, this consequence is evaluated as slightly positive. The consequences that both CCS options have in common are “very small chance of leakage from lines” and ”very small chance of leakage from storage”. These consequences are evaluated very slightly less negative in the second CCS option than in the first CCS option. The correlations between these consequences and the overall evaluation of the option is also slightly lower in the second CCS option than in the first CCS option. The differences are very small though. It seems that the consequences of leakage influence the overall evaluation of “Large plants where natural gas is converted into hydrogen with CCS” somewhat negatively as well.

Figure 3.3.7: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Conversion of natural gas into hydrogen in large plants with CO_2 capture and storage



3.3.8 From consequence evaluations to overall evaluation: Option "Electricity from nuclear plants"

As before, respondents first received a description of the nuclear energy option, "Electricity from nuclear plants", then they received information on eight consequences of the option and were asked to evaluate these consequences as described earlier. After this, respondents were asked to state their overall evaluation of "Electricity from nuclear plants" on a scale of 1 to 10, like a grade. The multiple correlation between the evaluations of the consequences and the overall evaluation of the nuclear energy option is moderately high, R=.66. This moderately high correlation seems to implicate that although the information that is given about the consequences does influence the overall evaluation of the option "Electricity from nuclear plants", a part of the overall evaluation is based on more than this information. A possible explanation for this could be that not all the arguments that are important to respondents are stated in the given information. The "single" correlations between the evaluations of the consequences and the overall evaluation of the nuclear energy option are mostly moderate. Compared to the other options, the correlations between the evaluations of the consequences and the overall evaluation of the nuclear energy option are mostly higher. It seems that the overall evaluation of the nuclear energy option is, more than the other options, based on the information regarding the consequences. This might be connected to the public awareness of consequences of nuclear energy, but this is discussed in more detail in section 3.6. Most consequences of the nuclear energy option are evaluated a little to rather negatively. The consequences "very small chance of health risks from highly radioactive waste" and "risk of proliferation: possibly moderate" are on average evaluated rather negatively. These consequences are also moderately correlated to the overall evaluation, so it seems these specific consequences have a moderate but negative influence on the overall evaluation of the nuclear energy option. Three consequences are evaluated only slightly negative on average. A closer look (see table appendix 5.3.9) however shows that substantial percentages of respondents are either very negative about these consequences or very positive. The evaluation of these consequences, "long term consequences low radiation very unlikely", "chance of serious accident less than once every 200,000 year", and "terrorist attack reactor close to impossible", correlate moderately high with the overall evaluation. The evaluation of these consequences can therefore have substantial influence on the overall evaluation of the nuclear energy option, but the value of this influence (i.e. positive or negative) depends on the evaluation of the individual. Most respondents are rather positive about the consequence "high reliability of the energy supply", which has a moderate but positive influence on the overall evaluation.

Figure 3.3.8: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation

Electricity from nuclear plants

Average evaluation (-9 to 9)

Correlation (-1 to 1)

Consequence	Average evaluation	Correlation
Background radiation during normal operation	-2.8	.46
Nuclear waste	-4.3	.46
Safety of nuclear power plants	-0.9	.46
Protection of power plants against terrorist attacks	-1.9	.45
Nuclear power plants en nuclear weapons	-4.7	.36
Reliability of the energy supply	4.4	.39
Price	-2.9	.25
Contribution to the greenhouse effect	6.1	.26

Background radiation during normal operation
During normal operation of a nuclear power plant very small particles are released which produce very small amounts of radioactive radiation. The amount of radiation is even less than normally present in the area by nature. This amount of radiation will not cause any health problems on the short term. Some experts think that on the long term there will not be any risk of health problems due to this very small amount of radiation. Other experts think that we do not have enough knowledge to make predictions about this.

Nuclear waste
In the process of preparing uranium for the use in nuclear power plants, but especially when using uranium in the actual power plants, nuclear waste is produced. A portion of this nuclear waste will be very radioactive for thousands of years; it will produce a lot of radiation. In this package the nuclear waste will probably be stored in heavily secured barrels in deep underground storage facilities. Experts know that this method of storage is safe for the first couple of centuries and that there will be no leakages of any kind. Experts think that after this initial period the risk of leakage is very small, but they acknowledge the existence of uncertainties, because it’s hard to predict what happens underneath the ground. Some experts think that as of 2030 it will be possible to treat nuclear waste in such a way that it will be strongly radioactive for a maximum period of 200 to 300 years. Other experts doubt whether this technology of nuclear waste treatment will be developed enough in 2030 to be able to use it at that time. Leakage of nuclear waste can produce health problems with plants, animals and people in cases where for instance the leakage occurs in the vicinity of the ground water. This may be prevented by making sure that the storage of the nuclear waste does not take place in the vicinity of ground water, but there’s no way to be sure that in thousands of years the ground water will not get closer to the nuclear waste. Taking everything into account, experts predict that the risk of health problems for plants, animals and people caused by leakage of nuclear waste is very small.

Safety of nuclear power plants
The nuclear power plants mentioned in this package are build in such a way that human interference is unnecessary regarding checking the system for failures or resolving these failures. A protective dome wille be constructed around the nuclear power plant. Therefore these power plants are safer than the current nuclear power plants and much safer than for instance the former nuclear power plant in Tsjernobyl. The nuclear power plants mentioned in this package are just as safe as the current chemical industry in The Netherlands. The chance of a serious accident is very small. An example of a very serious accident with the power plant in this package is an accident with the reactor. People living within one and a half kilometer of the power plant have to be evacuated. An area with a radius of 20 by 40 kilometers around the power plant will be completely unusable for at least one year, but possibly a lot longer. The chance of an accident like this happening is less than once in two hundred thousand years. The chance of accidents with even more serious consequences is much less.

Protection of power plants against terrorist attacks.
Some people are concerned about terrorist attacks on nuclear power plants with devastating results. The power plants mentioned in this package are very efficiently protected. Accidents with the reactor using bombs or airplane crashes on top or in the close vicinity of the power plant are very hard to accomplish. Sabotage by employees is not impossible, but difficult.

Nuclear power plants en nuclear weapons
Spreading of nuclear weapons means that either countries currently not in possession of nuclear arms will be enabled to produce them or that nuclear weapons fall into the hands of terrorists. According to some experts, the spreading of nuclear arms will be more likely because of the development and use of nuclear power plants. Some experts think that when knowledge is being developed about nuclear technology for power production, this generates more knowledge about nuclear weapons as well. In addition to that, some expert think that the development of materials needed for the power plants leads to availability of materials used in the production of nuclear weapons. Other experts state that there is no connection between the development and deployment of nuclear power plants and the spreading of nuclear weapons.

Reliability of the energy supply
Experts place a great deal of importance on the reliability of the energy supply. This means that there should, at any given time, be enough energy available. The fuels needed for energy production have to be imported, but without being dependent on a small number of supplying countries (such as our current dependency of the Middle-East when it comes to crude oil). Uranium can be imported from lots of different countries on different continents. Therefore the chance will be very small that the uranium needed for the nuclear plants cannot be imported. Besides that, building reserves of uranium is very easy because of the small amount of space uranium takes. Taking this into account, the overall reliability of energy coming from these plants will be good.

Price
Some experts expect that the price of electricity produced by nuclear power plants will be roughly the same as the current price of electricity produced by coalfired power plants. The price will increase when additional security measures have to be taken or when the nuclear waste from the plants has to be treated to reduce the period of radio-activity. Some experts estimate that due to these measures the price of electricity coming from nuclear power plants will be twenty percent higher. The costs involved in building a nuclear power plant are very high, but if and in what amount this has an effect on the price of electricity is unknown.

Contribution to the greenhouse effect
The contribution to the greenhouse effect of CO_2 emissions would be greatly reduced by this package. The emission of CO_2 into the air would be 17 % less than the amount that is currently being emitted.

Average Overall Evaluation: (1 to 10)

5.29

3.4. Evaluations of global warming

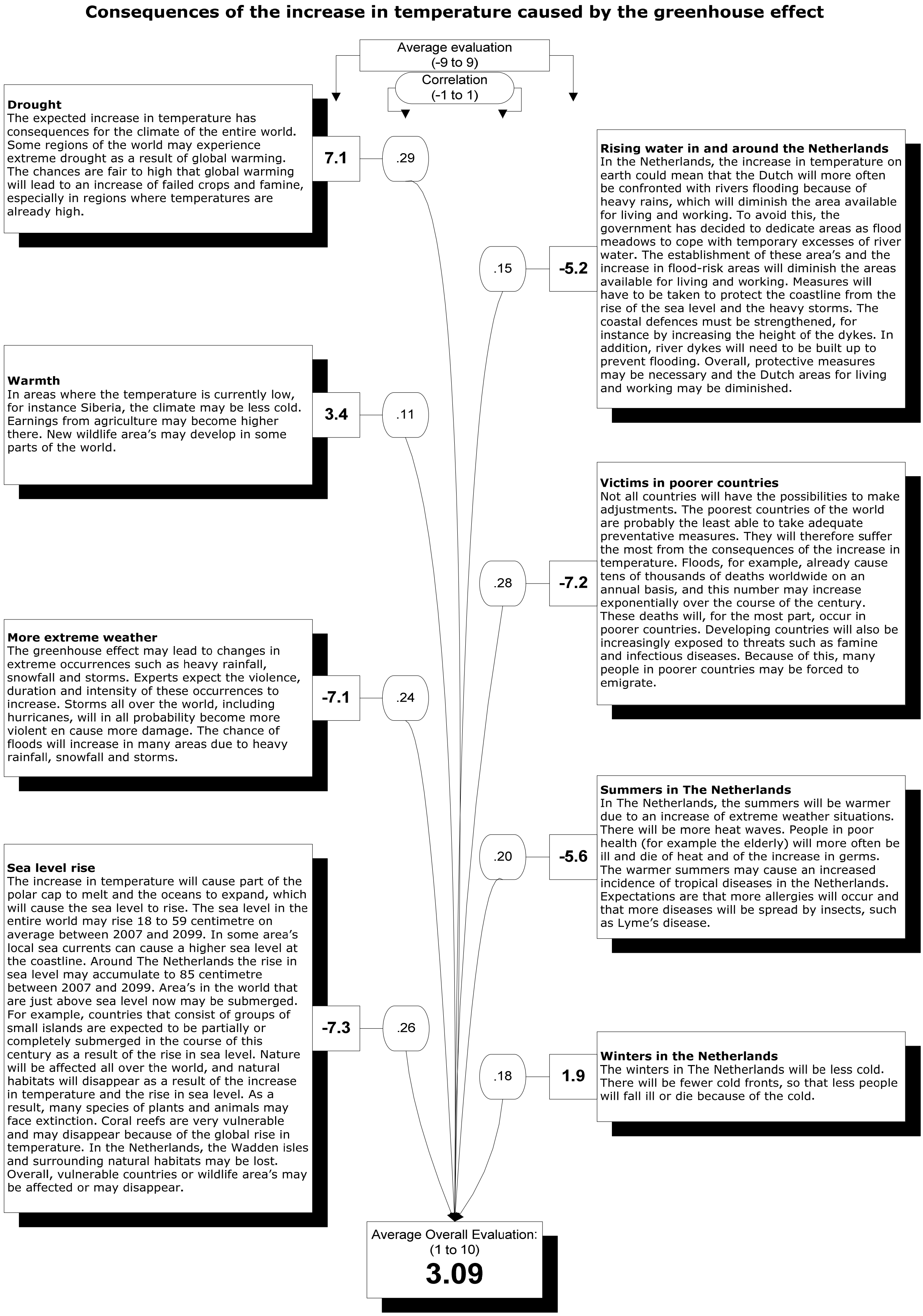
3.4.1 Evaluations of global warming consequences

Respondents were asked to evaluate several aspects of global warming in different stages of the questionnaire. 291 respondents were asked if they had heard about global warming at the beginning of the questionnaire, before any information was given. They were furthermore asked to evaluate global warming on a scale of 1 (bad) to 7 (good) and on a scale of 1 to 10, like a grade. Most respondents stated to be aware of global warming, only 2.4% stated not to know, and 49.8% stated to know a bit. On average, uninformed opinion of global warming was negative, 2.52 on a scale of 1 to 7, and 3.0 on a scale of 1 to 10.

The whole sample of 971 respondents was given information regarding the consequences of global warming, and asked to evaluate these consequences as unimportant, an advantage or a disadvantage, and furthermore how much of an advantage or disadvantage. The results of these questions are given in figure 3.4, and also in appendix 5.4.1. Figure 3.4 is comparable to figure 3.0 - 3.8, an explanation of the figure is given in section 3.0. Most respondents are very negative about the consequences “more droughts”, “extremer storms and rainfall”, “sealevel rise”, and “poor countries affected most”. They are also quite negative regarding “rising water in and around the Netherlands” and “more heatwaves”. The relationship between these consequences and the overall evaluation of global warming was not very strong though. Most single correlations between a consequence and the overall evaluation of global warming are quite small. The multiple regression coefficient is moderate to low as well. This means that respondents based their overall evaluation of global warming only in part on the consequences that experts deemed important. The relation between the evaluation of global warming before information on the consequences was given and the evaluation of global warming after was also analyzed. There is a moderately high correlation, r=.47.

After this information, respondents were (again for some) asked to evaluate global warming on a scale of 1 (bad) to 7 (good) and on a scale of 1 to 10. After information, respondents are quite negative regarding global warming, on average 3.09 on the 7-point scale and 3.88 on the 10-point scale. This is significantly ($F_{1,1966} = 173.5$, $p = .000$, eta-square = .081) less negative than in 2004, when the average for the 7-point scale (there was no 10-point scale in 2004) was 2.29. It is possible that respondents are more positive in the current ICQ than in 2004 due to some changes in the information about the consequences. Especially two consequences changed. First, in the 2004 ICQ, there was no mention of the positive consequences of global warming for colder areas such as Siberia. This was added to the 2007 ICQ on request of several experts involved in the improvement of the information. This consequence was evaluated rather positively, and might have influenced the overall evaluation somewhat. Furthermore, in the 2004 ICQ, there was mention of a small chance of possible catastrophic consequences of global warming for the thermohaline circulation in the North pole region. A new report of the IPCC came out which stated that there seems to be no chance of such catastrophic consequences (IPCC, 2007). This consequence was therefore not in the 2007 ICQ. As this consequence was evaluated very negatively on average in the 2004 ICQ, this might have led to a more positive evaluation of global warming in 2007.

Figure 3.4: Information and mean evaluations of consequences, mean overall evaluation option and correlations between consequence evaluations and overall option evaluation



To study the perceptions respondents might have of global warming as a topic of scientific debate, four questions were asked regarding a warmer climate, cause of warming and protection against consequences of a warmer climate. These questions were asked to all 971 respondents after they processed all the information regarding global warming and the seven options. When asked if they were convinced that the average global temperature had become higher during the past century, on a scale of 1 to 7, not at all convinced to very convinced, the majority of respondents (76.6%) answer that they are quite or very convinced that the average global temperature has become higher. Even more respondents (81.8%) are rather convinced that the average global temperature will rise even further this century. Few respondents (14.8%) are not convinced that global warming is a consequence of carbondioxide emissions by mankind. The majority of respondents (70.2%) state to be quite or even very convinced that global warming is a consequence of carbondioxide emissions by mankind. When asked how necessary they thought it was for the Netherlands to protect itself from the possible consequences of a warmer climate, such as flooding, a vast majority (87.6%) responds to find this quite to very necessary.

Table 4. Perceptions of global warming, percentages per part of the scale ranging from 1 "not at all" to 7 "very"

	1-3	4	5-7
To what extent are you convinced that the climate on earth has become warmer on average in the past century?	10.6%	11.4%	76.6%
To what extent are you convinced that the climate on earth will become even warmer on average in the coming century?	7.9%	8.8%	81.8%
To what extent are you convinced that global warming is a consequence of CO2 emissions by mankind?	14.8%	13.5%	70.2%
To what extent do you think it is necessary for the Netherlands to protect themselves against possible consequences of a warmer climate, such as floods, by for instance raising the dikes or strengthening the sea wall?	3.2%	8.1%	87.6%

3.4.2 Relation between different global warming perceptions

During the design of the questionnaire, it was hypothesized by some of the experts and researchers that the conviction of anthropogenic global warming might influence people's perception of global warming and the need to prevent possible negative consequences of global warming. To analyze the relationship between these perceptions we computed the correlations between the conviction of anthropogenic global warming and all the different evaluations of global warming that were in the questionnaire. The conviction of anthropogenic global warming correlates rather highly with the conviction of past global warming ($r=.58$) and with the conviction of future global warming ($r=.63$). This means that most respondents who are convinced that the climate on earth has become warmer and will become warmer are also convinced that this is caused by mankind, and vice versa. We found low correlations between the perception of global warming in general before and after information about the consequences on one hand, and conviction of anthropogenic global warming on the other (-.26 and -.24 respectively). Apparently, there is only a weak linear relationship between the conviction about the cause of climate change and the evaluation of climate change. Respondents who are not convinced that global warming is caused by mankind were not more positive about global warming. It is possible that people who do not believe that global warming is happening or do not believe human activities are the cause of this, still acknowledge that if global warming were happening, this would be a bad thing. Still, it would be logical for these people to argue that measures against the negative consequences of global warming are unnecessary. Analyses indeed show a high correlation between the conviction of future global warming and the perception of necessity for measures against consequences of climate change, r=.59. There is also a high correlation between the latter and the conviction that global warming is manmade, r=.49. It seems that being convinced that global warming is not manmade and/or that it is not happening hardly influences the evaluation of global warming, but does influence how necessary measures against negative consequences seem to be. Some caution should be taken when interpreting these results though.

3.4.3 Relation between global warming perceptions and evaluation options

Some studies in other countries regarding the public perception of CCS have found hints that lay people become more positive about CCS technologies when they realize why it is deemed necessary to reduce CO_2 (Shackley et al, 2005; Itaoka et al, 2006; Tokushige et al, 2007). To explore quantitative evidence for this hypothesis, we studied the relationship between global warming perceptions and the overall evaluations of options via regression analysis and correlations. Table 3.4.3 shows the correlations between the overall evaluations of the options and several measures of global warming perceptions. The last column shows the increase in explained variance if these measures of global warming perceptions are included in a regression analysis with the evaluations of the consequences of an option as predictors for the overall evaluation of the option. In other words, do certain perceptions of global warming influence how positive or negative an option is evaluated?

Table3.4.3 Correlations between overall evaluations options and perceptions of global warming. Extra explained variance of the overall evaluations of options by perceptions of global warming as predictors.

	Evaluation global warming before info	Evaluation global warming after info	Conviction passed warming	Conviction future warming	Conviction warming is manmade	Extra R^2
Efficiency	-.12*	-.17**	.11**	.12**	.12**	.02
Efficiency plus	-.08	-.09**	.04	.07*	.10**	.02
Wind	-.16**	-.1**	.07*	.14**	.13**	.01
Biomass	-.12	-.1**	.09**	.15**	.10**	.00
Powerplants+ CCS	-.02	-.11**	-.02	-.01	-.03	.01
Hydrogen + CCS	-.13*	-.02	.05	.07*	.05	.01
Nuclear	.02	.16**	-.14**	-.17**	-.17**	.02*
CCS in general		.20**	-.03	.09	.15*	

** $p < 0.05$, ** $p < 0.01$ Keep in mind that very small correlations become significant based on the large sample, the significance of the relationship does not imply strength.*

As can be seen in Table 3.4.3, correlations between the different perceptions and evaluations of global warming on the one hand and the overall evaluations of the options on the other hand are all low to non-existent. This lack of relationship is also shown in the multiple regression analyses. The perceptions and evaluations of global warming hardly add any explained variance to the prediction of the evaluations of the options. In other words, how respondents perceived global warming has only a very minor influence on the overall evaluations of the options. This is also the case for evaluations before information is given regarding the consequences of global warming or the seven options. The correlation between the evaluation of global warming before information is given and the evaluation of the option “Large plants where coal or gas is converted to electricity with CCS” before information is given is non-existent (-.02) The correlation between the evaluation of global warming before information is given and the evaluation of the option “Large plants where natural gas is converted to hydrogen with CCS” before information is given is also very low (-.13).

3.5 Uninformed opinions

3.5.1 Self-reported awareness options

A group of 291 respondents had several questions about the options before the actual Information-Choice Questionnaire started. These respondents were asked about their awareness of global warming and of the seven options. They were furthermore asked to evaluate global warming and each of the seven options, with the option to refrain from evaluation.

As can be seen in Table 3.5.1, a large majority of respondents states to have heard about global warming. Contrary to expectations, the percentage of respondents that states to have never heard of global warming is slightly higher than three years ago, when a different sample of 327 respondents was asked exactly the same question, and only 1.5% answered not to have heard of global warming. Most respondents also state to have heard (a bit) about “Improvement of energy efficiency”, “Improvement of energy efficiency and decreased use of material and energy”, “Electricity from wind turbines at sea”, “Conversion of biomass to car fuel and electricity” and “Electricity from nuclear plants”. However, the majority of respondents states not to have heard of “Large plant where coal or gas are converted into electricity with CO_2 capture and storage” and “Large plants where gas is converted into hydrogen with CO_2 capture and storage”.

Table 3.5.1 Percentages of respondents that state no or little knowledge of global warming or an option.

	Have you heard of…		
	No, never heard of	A little bit	Yes, quite a bit
Global warming	2.4%	49.8%	47.8%
Efficiency	24.4%	55.7%	19.9%
Efficiency plus	33.0%	55.3%	11.7%
Wind	5.2%	64.3%	30.5%
Biomass	23.4%	63.6%	13.0%
Powerplants + CCS	51.2%	41.9%	6.9%
Hydrogen + CCS	67.7%	27.1%	5.2%
Nuclear	6.5%	66.3%	17.2%

3.5.2 Pseudo-opinions

In comparison to the percentages of respondents that state to have never heard of an option, the percentages of respondents that refrain from evaluation are quite low. Most respondents that have just stated to have never heard of global warming or of an option, still give their evaluation. The percentages of respondents that first stated not to have heard of an option but did give their evaluation ranged from 2.1% to 51.2% of the total of 291 respondents, depending on the option they were asked about. Put differently, 63.2% to 85.7% of the respondents that state not to have heard of an option, do give their evaluation of that option. In Tables 3.5.2a-h, percentages are given of the respondents that evaluate an option after stating they have never heard of an option, know a bit about a option or know quite a bit about a option. For instance, table 3.5.2g concerns the CCS option “Large plants were gas is converted into hydrogen with CCS”. This shows that out of 291 respondents, 197 participants state not to have heard of this option. Of these 197 participants that stated not to have heard of this option, only 48 participants refrained from evaluation. This means that 75.6% of respondents that state not to have heard of this option, give pseudo-opinions. Out of the total of 291 respondents, 51% give pseudo-opinions. In tables 3.5.2a-h each cell states the percentage of the total of 291 respondents, so the percentages of pseudo-opinions, stated in bold in the upper left cell, are always a percentage of the total. This explains why for instance for global warming this percentage is very low, because most respondents had stated to know about global warming. So even if all respondents that stated not to have heard of global warming still gave their opinion, the percentage of pseudo-opinions would be low.

Table 3.5.2a Frequency and percentages of participants evaluating option "global warming" by self-reported awareness of "global warming"

	Evaluation	No opinion	Total
No, never heard of	**6 (2.1%)**	1 (0.3%)	7 (2.4%)
A bit	135 (46.4%)	10 (3.4%)	145 (49.8%)
Yes, know quite a bit	135 (46.4%)	4 (1.4%)	139 (47.8%)
	276 (94.8%)	15 (5.2%)	291 (100%)

Table 3.5.2b Frequency and percentages of participants evaluating option "Improvement of energy efficiency" by self-reported awareness of this option

	Evaluation	No opinion	Total
No, never heard of	**57 (19.6%)**	14 (4.8%)	71 (24.4%)
A bit	158 (54.3%)	4 (1.4%)	162 (55.7%)
Yes, know quite a bit	58 (19.9%)	0	58 (19.9%)
	273 (93.8%)	18 (6.2%)	291 (100%)

Table 3.5.2c Frequency and percentages of participants evaluating option "Improvement of energy efficiency and decreased use of material and energy" by self-reported awareness of this option

	Evaluation	No opinion	Total
No, never heard of	**77 (26.5%)**	19 (6.5%)	96 (33.0%)
A bit	156 (53.6%)	5 (1.7%)	161 (55.3%)
Yes, know quite a bit	34 (11.7%)	0	34 (11.7%)
	267 (91.8%)	24 (8.2%)	291 (100%)

Table 3.5.2d Frequency and percentages of participants evaluating option "Electricity from windturbines at sea" by self-reported awareness of this option

	Evaluation		No opinion		Total	
No, never heard of	**11**	**(3.8%)**	4	(1.4%)	15	(5.2%)
A bit	186	(63.9%)	1	(0.3%)	187	(64.3%)
Yes, know quite a bit	88	(30.2%)	1	(0.3%)	89	(30.6%)
	285	(97.9%)	6	(2.1%)	291	(100%)

Table 3.5.2e Frequency and percentages of participants evaluating option "Conversion of biomass to car fuel and electricity" by self-reported awareness of this option

	Evaluation		No opinion		Total	
No, never heard of	**51**	**(17.5%)**	17	(5.8%)	68	(23.4%)
A bit	179	(61.5%)	6	(2.1%)	185	(63.6%)
Yes, know quite a bit	37	(12.7%)	1	(0.3%)	38	(13.1%)
	267	(91.8%)	24	(8.2%)	291	(100%)

Table 3.5.2f Frequency and percentages of participants evaluating option "Large plants were coal of gas are converted into electricity with CCS" by self-reported awareness of this option

	Evaluation		No opinion		Total	
No, never heard of	**118**	**(40.5%)**	31	(10.7%)	149	(51.2%)
A bit	118	(40.5%)	4	(1.4%)	122	(41.9%)
Yes, know quite a bit	20	(6.9%)	0		20	(6.9%)
	256	(88.0%)	35	(12.0%)	291	(100%)

Table 35.2g Frequency and percentages of participants evaluating option "Large plants were gas is converted into hydrogen with CCS" by self-reported awareness of option

	Evaluation		No opinion		Total	
No, never heard of	**149**	**(51.2%)**	48	(16.5%)	197	(67.7%)
A bit	75	(25.8%)	4	(1.4%)	79	(27.1%)
Yes, know quite a bit	15	(5.2%)	0		15	(5.2%)
	239	(82.1%)	52	(17.9%)	291	(100%)

Table 3.5.2h Amount of participants evaluating option "Electricity from nuclear plants" by self-reported awareness of this option

	Evaluation		No opinion		Total	
No, never heard of	**12**	**(4.1%)**	7	(2.4%)	19	(6.5%)
A bit	192	(66.0%)	1	(0.3%)	193	(66.3%)
Yes, know quite a bit	77	(26.5%)	2	(0.7%)	79	(27.1%)
	281	(96.6%)	10	(3.4%)	291	(100%)

3.5.3 Relationship between uninformed and informed opinions

In Table 3.5.3, the uninformed evaluations and informed evaluations are compared. Except for the overall evaluation of the option "Electricity from nuclear plants", all evaluations change significantly after information. On average, respondents become more negative about "Improvement of energy efficiency and decreased use of material and energy" and about "Electricity from wind turbines at sea". Respondents become on average more positive about global warming, about "Improvement of energy efficiency", about "Conversion of biomass to car fuel and electricity", about "Large plants where coal or gas are converted into electricity with CCS", and about "Large plants where gas is converted into hydrogen with CCS". This does not mean that all respondents became more negative or more positive. This becomes clear when the correlations between the uninformed and the informed evaluations are taken into account. As described in Section 3.3, a correlation can vary between -1 and 1, with 0 meaning no relationship between two variables. A correlation of 1 means a perfect linear relation between two variables, in the sense that the values of one variable are perfectly predictable from the value of the other variable. If all respondents became equally more negative or positive about an option, the correlation between the uninformed evaluation of that option and the informed evaluation of that option would approach 1. The more respondents vary in the difference between evaluations, the closer the correlation will be to zero. For the option "Large plants where natural gas is converted into hydrogen with CCS", that has a correlation close to zero (.06), this means that although on average it seems that respondents become more positive after information, there actually is no relation between the uninformed and informed evaluations.

Table 3.5.3: Average overall evaluations of global warming (grade 1-7) and the seven options (grade 1-10) before and after information, and their relation

	Mean uninformed evaluation	Mean informed evaluation	Correlation
Global warming	2.52	3.09	.47
Efficiency	7.17	7.33	.31
Efficiency plus	6.85	5.84	.22
Wind	7.55	7.15	.48
Biomass	6.85	7.41	.29
Powerplants + CCS	5.13	5.34	.28
Hydrogen + CCS	5.44	5.92	.06
Nuclear	5.49	5.29	.60

In other words, the evaluation that respondents give regarding this option does not predict the evaluation respondents give after information at all. On average respondents become more positive, but a substantial part of respondents becomes more negative. Although respondents are obviously not very familiar with the information on consequences of the other options before information is given, they do base their opinion for a substantial part on this information after they have read, processed and evaluated it. For instance, the evaluation of the option "Large plants where natural gas is converted to hydrogen with CCS", is at first hardly based on the information about the consequences. When respondents have processed and evaluated this information though, they radically change their opinion in order to base their opinion much more on the information on the consequences. The radical change is apparent from the non-existent correlation between the evaluation of the option before and after information. This is good news, because it shows respondents are willing to change their opinion when they receive new information on consequences.

3.6 Quality of opinion

In their review of methods to enhance quality of opinion, Price and Neijens (1998) mention several measures of quality of opinion. Several of those have been used earlier in a study of the effect of the ICQ method on quality of opinion by Neijens (1987). One of them is the consistency between the overall opinions of options and the choice for an option, which has been discussed in Section 3.2.2.3 as well. Another indication for the quality of opinion is the relation between the evaluations of the consequences and the overall evaluations of the options, which can be analyzed in several ways. This section shows the results of these analyses.

As stated before, section 3.2.2.3 discussed consistency between the overall opinions of options and the choice for an option. When respondents base their choice for three of the seven options on their own overall evaluations of the seven options, they should choose the options they have given the three highest grades. The majority of respondents does in fact do so, which is a first sign of good opinion quality.

At the end of evaluating the consequences of options, before respondents were asked to evaluate the option overall, respondents received a table with their own evaluation of all consequences of the specific option. Respondents were informed that the computer would compute their personal total of the disadvantages (i.e. sum of disadvantages scores) of the option and their personal total of the advantages of the option. As all the consequences in the questionnaire are independent of each other, it is possible to add all the evaluations of the consequences to compute the subjective utility of the option. In other words, the quantification of the value that an option has for the respondent personally, based on their own evaluations of the expert information on the consequences of the option. Such a "bookkeeping" system has been studied by Neijens (1987) and found to contribute to the consistency of the opinion, in the sense that respondents are more likely to choose options whose consequences they personally evaluated most positive. In the current study, a minority of respondents does in fact choose the options they had given the three highest total consequence scores. The majority does however choose two out of the three options they had given the three highest total consequences scores. As said in section 3.2.2.3 however, there were restrictions to what combinations of options could be chosen. This has probably resulted in a lower percentage of consistent choices, because respondents were sometimes unable to choose for the three options they had given the three highest total consequence scores.

To test whether the "bookkeeping" system has had an effect in the current study, one can compare the sum of the disadvantages and advantages with the individual consequence evaluations. Does the sum predict the overall evaluation of the option better than the single evaluations? To analyze this, we can compare the correlations between the single consequence evaluations and the overall evaluations with the correlations between the sum of the consequence evaluations and the overall evaluations. Table 3.6.1 shows correlations between the sum of the disadvantages, the sum of the advantages, and the overall evaluation of the option. The sum of the disadvantages was calculated by adding, per respondent, all the evaluations of consequences that were defined as disadvantages by the respondent. The sum of the advantages was calculated by adding, per respondent, all the evaluations of consequences that were defined as advantages by the respondent. The sum total is calculated by subtracting the disadvantage score from the advantage score. As can be seen in Table 3.6.1, for most options the sum of the advantage correlates somewhat to significantly higher with the overall evaluation than the sum of the disadvantages. Only the wind energy option and the nuclear energy option have a higher correlation between the sum of the disadvantages and the overall evaluation than between the latter and the sum of the advantages. It seems that for the wind energy option and the nuclear energy option, the disadvantages influence the overall evaluation more than the advantages.

Table 3.6.1 Relation evaluations consequences and overall evaluations options: correlations between the sum (Σ) of advantages, sum (Σ) of disadvantages, sum total (Σ* disadvantage + Σ advantage*) and overall evaluations expressed as grades

	Correlation between Σdisadvantage-Σadvantage	Correlation between Σdisadvantage-grade	Correlation between Σadvantage-grade	Correlation between Sum total-grade
Efficiency	-.30	-.29	.41	.45
Efficiency +	-.39	-.49	.49	.59
Wind	-.15	-.41	.28	.44
Biomass	-.33	-.36	.54	.58
Powerplants+ CCS	-.25	-.30	.41	.44
H2 + CCS	-.23	-.44	.51	.60
Nuclear	-.41	-.59	.50	.66

The correlations between the sum of the consequence evaluations (sum total) and the overall evaluations (grade) are higher than the correlations between the single consequence evaluations and the overall evaluation (Figures 3.3.2-3.3.8). This means that the “bookkeeping” system has had a positive effect on the quality of opinions of the options.

This leaves the question if the information in the questionnaire leads to a higher quality of opinion than the opinions that respondents might have already had. Do opinions change after information, and is this based on the information itself? Especially the evaluations of global warming, wind energy and nuclear energy after information can be predicted in part from the uninformed evaluations. These are also the phenomena that respondents report the most awareness with. It is likely that respondents who already have a certain amount of knowledge of these topics are already familiar with part of the information in the questionnaire, and therefore less inclined to change their opinion based on information that they were already familiar with. To further test this theory, we analyzed the relation between the evaluations of the consequences of an option and the overall evaluation before this information was given. Seven regression analyses were done with the evaluations of the consequences as predictors and the overall evaluation of the option before information as the dependent variable. Moreover, seven regression analyses were performed with the evaluations of the consequences as predictors and the overall evaluation after information as the dependent variable.

Table 3.6.2 shows the multiple regression coefficients of the analyses with the overall evaluation of the option before information, and the multiple regression coefficients of the analyses with the overall evaluation of the option after information (the latter coefficients have been thoroughly discussed in section 3.3.2-3.3.8). The square multiple regression coefficients indicate the percentage of the explained variance of

Table 3.6.2 Multiple regression coefficients (R) of the effect of the evaluations of the consequences on overall evaluation before and after information

	Before	After
Efficiency	.29	.48
Efficiency plus	.25	.60
Wind	.42	.50
Biomass	.25	.60
Powerplants + CCS	.22	.45
Hydrogen + CCS	.22	.62
Nuclear	.46	.66

the overall evaluations. In other words, to what extend the overall evaluation of the option is based on the evaluations of the consequences. The overall evaluations after information are based much more on the evaluation of the consequences than the overall evaluations before information. This means that the overall evaluations of the options before information are hardly based on the information on consequences that experts deem important. Two options have a moderate multiple regression coefficient though. These two options, the nuclear energy option and the wind energy option, are also the options that most respondents stated to know about, and the options with the highest correlation between the overall evaluation before information and the overall evaluation after information. This means that the opinion on wind energy and the opinion on nuclear energy are based for a substantial part on information that experts deem important, even before this information was processed and evaluated in the questionnaire. Apparently, most respondents were already reasonably familiar with this information, and had already formed an informed opinion.

3.7 Subjective evaluations concerning the quality of the information and the method of the ICQ

In the ICQ, a number of questions was asked to gain insight in the evaluations of respondents concerning the quality of the information, the special method of the ICQ and the amount of information. The exact wording of the questions can be found in Appendix 3, page 271-273. In the next paragraphs, the answers to these questions are discussed. For this discussion, the original seven answer categories have been reduced to three categories; a neutral statement (the original middle of the scale; 4), statements on the low end of the scale (1, 2 and 3 on the scale), and statements on the high end of the scale (5, 6 and 7 on the scale). The percentages of respondents in these three categories will be discussed. Due to rounding of the decimals, the percentages do not always accumulate to 100%.

3.7.1 Evaluations concerning the quality of the information

Respondents were asked four questions about their evaluation of the quality of the information on a scale of 1 to 7. These questions concerned the impartiality, the one-sidedness, the clarity and the completeness of the information. When asked how much they thought the information in the questionnaire was partial or impartial, most respondents (55.6%) stated to find the information impartial and most of the other respondents (31.2%) stated to find the information neither partial nor impartial. As the topic of part of the information that was given to respondents is usually ground for fierce debate, this majority evaluation of impartiality is quite remarkable. A majority of respondents (60.6%) also thought the information was not one-sided. A very small minority (12.9%) thought that the information was one-sided. A vast majority of respondents (80.8%) stated that the information was clear, and most of the other respondents (12.2%) found the information neither clear nor unclear. Respondents were also positive about the completeness of the information regarding the consequences of the options. The majority found the information either complete (71.9%) or neither complete nor incomplete (17%). Based on these results, it seems justified to conclude that respondents evaluated the quality of the information very positively.

3.7.2 Evaluations concerning the method of the ICQ

Respondents answered four questions about the method of the ICQ. They were first asked if there had been a moment during the answering of the questions that something was not clear or that they had not understood what they were supposed to do. Most respondents denied there had been such a moment (87.5%). The majority of respondents (86.7%) also stated that the method of the questionnaire was comprehensible to them, only very few respondents (3.7%) thought the method was incomprehensible. When asked if the method was simple or complicated, most respondents thought the method was either simple (39.3%) or neither simple nor complicated (28.5%). Respondents were also asked if the method of the ICQ had helped them to make a choice. A vast majority of the respondents (78.9%) felt the ICQ method helped them to make a choice between options, and only 6% of respondents stated the ICQ method had not helped them in making a choice. It seems justified to conclude that the method of the ICQ was well understood by nearly all respondents, although some respondents did acknowledge the complexity. This was to be expected however, as the method of ICQ asks much more of respondents than most traditional questionnaires would.

3.7.3 Evaluations concerning the amount of information in the ICQ

To study the evaluation of the amount of information in the ICQ, five questions were asked concerning the amount of information needed to make a choice, the amount of information to evaluate the consequences, the appropriateness of the amount of information, the repetition of the information and the limited amount of choice options. The amount of the information was just right for most respondents. A large majority (91.2%) stated to have enough information to make a choice between the options. Most respondents (62.5%) also stated not to want any more or less information about the consequences of the options, but the majority of the rest of the respondents (18.0%) stated that they would have appreciated just a little bit more information. When asked however if they thought the amount of information in the questionnaire was appropriate, the majority of respondents (66.5%) stated that there was too much information in the questionnaire. It might be possible that some respondents would have liked more information about the consequences of the options, but less of the other information in the questionnaire. Contrary to this idea though, most respondents (73%) stated that they found it comfortable that the information and method was sometimes repeated. In general, the amount and quality of the information are obviously appreciated by the majority of the respondents.

Respondents were also asked how limited they felt concerning their choice options. The majority of respondents (66.7%) stated not to feel limited in their choice options.

3.8 Influence of personal characteristics

Several demographic and personal background variables were assessed. We will not discuss the effects of all characteristics of respondents that were assessed or known, as this would generate a lot of information that is far from enlightening. This also has the negative side-effect of false hits: When testing if groups differ on certain variables, there is a chance that the test will suggest that groups differ, when in fact they do not. How small this chance is depends on the parameters of the test. It is customary to use a confidence interval of 95%, which means that there is a 5% chance that you are wrongfully rejecting the hypothesis that there is no effect. In other words, a chance of 5% that there is a false hit: The test suggests the hypothesis of no effect should be rejected, when there is in fact no effect. However, if more tests are done, the chance becomes greater that one of these tests shows an effect that is coincidental. Testing all the effects of all personal characteristics on all major dependent variables – overall evaluations, choice, acceptance – would result in hundreds of tests and a very great chance of false hits. To avoid this, we will only test the personal characteristics that can reasonably be expected to have some influence on opinion about global warming and the seven options. We will discuss the relations of these opinions with gender, education, involvement, political preference and donations to Greenpeace, Stichting Natuur en Milieu, Milieudefensie, and World Wildlife Fund. To further avoid reporting tiny and trivial effects, we will only consider effects of a certain effect size as actual effects. After establishing that there is very likely an effect, it becomes important to know how large this effect is. For instance, if two groups differ in their evaluation of a technology by 0.09 on a scale of one to ten, this might be a statistically significant difference, but it hardly has any practical impact. Therefore, we only considered effect sizes that were at least "small"- partial eta square above .01 by definition of Cohen (1973, 1988). To analyze the influence of personal characteristics on overall evaluations we used analyses of variance. To analyse this influence on the percentage of rejection of technologies, we used Pearson Chi-square tests.

3.8.1 Influence of gender

Whether respondents were male or female hardly influenced on the main dependent variables. Men only differed from women on their overall evaluation of the option "Electricity from nuclear energy"; Men were more positive about nuclear energy than women, $M_{men} = 5.46$, $M_{women} = 5.14$. The second efficiency option was chosen more by women, whereas the second CCS option ("Large plants where gas is converted into hydrogen with CCS") and the nuclear option were chosen more by men (Men 13.1% vs Women 8.3% for the second CCS option, and Men 25.5% vs Women 20.4% for the nuclear option) .

3.8.2 Influence of education

For these analyses, respondents were divided in three groups: low education (lo, lbo, mavo), medium education (mbo) and higher education (havo, vwo, hbo, wo). These groups did not differ much, but there was a difference on the evaluations of the first efficiency option and the evaluation of global warming after information. The groups differed in their evaluation of the first efficiency option, $M_{low} = 7.17$, $M_{medium} = 7.21$ $M_{high} = 7.61$. Higher educated respondents were on average also more negative about global warming after information than were medium educated respondents, who in turn were more negative than lower educated respondents, Mlow = 3.39, Mmedium = 3.13, Mhigh = 2.75.

3.8.3 Relation to donations to environmental NGO's

Of the 971 respondents, 435 (44.8%) stated not to have donated to Greenpeace, Milieudefensie, Stichting Natuur en Milieu or WWF. Of the other respondents, 65 stated to have just donated to Greenpeace, 2 stated to have donated just to Milieudefensie, 13 stated to have donated just to SNM, 239 stated to have donated just to WWF, and 217 stated to have donated to more than one of the environmental NGO's mentioned. (Without separation of the last group, 251 stated to have donated to Greenpeace, 46 to Milieudefensie, 82 to SNM, and 439 to WNF). There was a difference between average overall evaluations of the option "Improvement of energy efficiency and decreased use of material and energy", respondents who donate to Greenpeace or to multiple NGO's evaluate the second efficiency option more positively than respondents who do not donate or who donate to WWF (M= 6.42 and M=6.09 vs M=5.71 and M=6.09). There was a difference between average overall evaluations of the option "Electricity from wind turbines at sea", respondents who donate to Greenpeace evaluate wind energy more positively than respondents who donate to WNF (M=7.62 vs M = 7.0). There was a difference between the average overall evaluations of the option "Conversion of biomass to car fuel and electricity", respondents who donate to WWF evaluate energy from biomass more positively than respondents who do not donate (M=7.68 vs M=7.26).

Respondents who donate to multiple NGO's were more negative about global warming after being informed about the consequences, than were respondents who do not donate or who donate to WWF (M=2.7vs M=3.28 and M=3.18). Respondents who donated to multiple NGO's were also more likely than respondents who did not donate or who donated to WWF to be convinced of warming of the climate in the past century (M=5.69 vs M=5.27 and M=5.32), to be convinced of further warming of the climate (M=5.77 vs M=5.38 and 5.38), and to be convinced of anthropogenic global warming (M=5.51 vs M=4.95 and M = 5.02). Respondents who donate to multiple NGO's are also more likely to agree with the necessity of protection against consequences of global warming than respondents who do not donate (M = 6.07 vs M=5.73).

Furthermore, there was a difference in choice for certain options. Respondents who donate to Greenpeace, SNM or multiple NGO's choose the second efficiency option more often. There is also a difference in choice percentages of the option "Large plants where coal or gas is converted to electricity" and the option "Electricity from nuclear plants", but the numbers of respondents in the cells are too small to make statistical significance reliable. It seems that respondents who donate to Greenpeace, SNM or multiple are much less likely to choose nuclear energy though.

All respondents who donate score higher on the involvement scale than do respondents who do not donate (Mgreenpeace=4.6, Msnm=5.0, Mwwf=4.38, Mmilieudefense=4.88 vs Mn=4.12). Respondents who donate to multiple NGO's are also more involved than respondents who donate to WWF.

3.8.4 Relation to political preference

Respondents were asked which party they had voted for in the national election of November 2006, a few months before this questionnaire was filled in. We analyzed the differences in groups depending on the party they voted for, with analysis of variance. However, several groups of respondents were very small, for instance the groups that voted for very small parties, or did not vote, or did not want to tell what they voted. These groups of respondents have been omitted from the analyses because the results would have been unreliable due to the small number of respondents in the groups. The groups that remained were voters for CDA(Christian Democrats, 177 respondents), PvdA (Labour Party, 153), SP (Socialistic Party, 149), VVD (Liberal Party, 97), PVV (Party For Freedom, 45), GL(GreenLeft, 36), and CU(Christian Union, 42). Analysis of variance shows no statistical differences between these groups on their evaluation of the CCS options. There are no differences between the overall evaluations of the CCS options before information or after information, and no differences between percentages of choice for either of the CCS options. There are however differences between the overall evaluations of the nuclear energy option of groups of voters. After information, respondents who voted for PvdA (M= 4.86) are significantly more negative about the nuclear energy option than are voters for CDA (M=5.59), VVD (M=5.86), and PVV (M=6.07). Respondents who voted for GL (M=4.22) are also significantly more negative than these last three groups, and more negative than respondents who voted for CU (M=5.57). Respondents who voted for PvdA, SP or GL are also much less likely to choose the nuclear energy option.

We furthermore found differences on the evaluation of the first and second efficiency option. Respondents who voted for GL (M=7.89) are more positive about the first efficiency option after information than respondents who voted for PvdA (M=7.22). Respondents who voted for GL (M=6.67) are also more positive about the second efficiency option after information than the respondents who voted for CDA (M=5.59), for PvdA (M=5.75), or for VVD (M=5.65). Respondents who voted for GL are also much more likely to choose the second efficiency option as one of their three preferred options than any of the other groups.

Table 3.8.4 Average overall evaluations of the options (grades 1-10) after information per political preference

	GL	SP	PvdA	CDA	CU	VVD	PVV
Efficiency	7.89	7.32	7.22	7.49	7.62	7.29	7.47
Efficiency plus	6.67	5.99	5.75	5.82	5.91	5.65	5.93
Wind	7.47	7.28	7.13	7.15	7.14	7.0	7.18
Biomass	7.25	7.54	7.36	7.4	7.48	7.39	7.49
Powerplants + CCS	4.89	5.22	5.33	5.31	5.41	5.41	5.49
Hydrogen + CCS	5.83	5.85	5.86	5.82	6.19	5.84	6.22
Nuclear	4.22	5.01	4.86	5.59	5.57	5.86	6.07

Last but not least, the groups of voters differ in their average perception of global warming. Respondents who voted GL (M=2.39) are more negative regarding global warming after information than respondents who voted CDA (M=3.37).

3.9. Some uninformed opinions and perceptions regarding climate policy and CO_2 emission reduction options

The method of the ICQ uses expert information on the consequences of options to inform respondents and help them make a more rational decision. Because of this, there are no questions in the ICQ that address other possible arguments or misconceptions that respondents might also base their opinion on. However, during the development of the information, several experts mentioned possible arguments or misconceptions that they thought were frequent among lay people. We therefore made several additional questions to be asked after the ICQ concerning these kinds of arguments. These questions are by far not inclusive of all possible arguments of misconceptions that lay people might have. That would require an entire new study and questionnaire. We selected, in discussion with several experts and NGO representatives, a number of questions that we thought were most relevant. These include questions about policy, and about other energy technologies that reduce CO_2 emissions, such as the generation of electricity in solar plants in North Africa, which were outside of the scope of this Information-Choice Questionnaire. The questions are stated literally in Table 3.9. In Table 3.9, the percentages of respondents are given that have either answered 1, 2 or 3 on the seven point scale, 4 on the same scale, or 5, 6, or 7 on that scale. The response categories on the scales differed, on some scales 1 meant “not at all”, “not convinced”, or “completely disagree”, depending on the question. 1 was always a negative answer though, and 7 always positive (i.e. absolutely, very convinced, completely agree, etc.). For some questions, besides the seven point scale, “no opinion” was also a possible answer. Therefore, the percentages do not always add up to 100%. The missing percentage is the percentage of respondents that answered “no opinion” to that particular question.

Note that the opinions in Section 3.9 are all uninformed opinions. As described earlier, uninformed opinions regarding complex issues are easily influenced and unstable (Daamen et al., 2006), and therefore highly unpredictive of future opinions. Chances are high that a lot of the opinions in this section are pseudo-opinions.

3.9.1 Perceptions of global warming and CO_2 reduction

To study how the respondents think the Netherlands as a country should handle carbondioxide emissions, three statements were given to respondents to evaluate on a scale of 1 to 7, completely disagree to completely agree. More than half of the respondents somewhat to completely agreed with the statement that it is useless to reduce carbondioxide emissions in the Netherlands if other countries such as the United States or China do not reduce their carbondioxide emissions. Surprisingly, when confronted with the statement that if countries wait for each other to reduce carbondioxide emissions, we risk being too late, and therefore the Netherlands should start reducing carbondioxide, three quarters of respondents also quite agree. It seems that most respondents realize the social dilemma we are facing, and most propose to take the lead as a country and start reducing carbondioxide fast. Some might comment that such a thing is easier said than done, but one has to take into account that these respondents had just been well informed regarding the consequences of CO_2 reduction measures in the Netherlands, and most of them still propose to go ahead and start reduction.

3.9.2 Perceptions of financial aspects of CO_2 reduction

To further unravel how committed respondents were to reducing CO_2, several questions were asked regarding sources of funding. When confronted with the statement that the Dutch government should spend more on the development and

Table 3.9: Percentages of negative, neutral and positive evaluations of policy questions

Question:	Evaluation		
	1-3	4	5-7
It has no use to reduce CO_2 emissions in the Netherlands, if other countries in the world, such as the USA or China, do not reduce their CO_2 emissions. (completely disagree-completely agree)	32.1	9.5	57.3
If countries wait for each other to start reducing CO_2, there is a chance we will be too late, therefore the Netherlands should reduce CO_2, even if other countries don't. (completely disagree-completely agree)	10.3	12.0	75.9
The Dutch government should spend more on the development and implementation of technologies that reduce CO_2, even if this will be at the expense of policy areas such as health care or education. (completely disagree-completely agree)	35.2	24.0	38.5
The polluter should pay. In case of CO_2 emissions this means that for instance energy companies should themselves carry the extra costs they make to prevent CO_2 emissions when producing energy. (completely disagree-completely agree)	9.5	17.1	70.9
Every Dutch person contributes to production of energy via diverse taxes. Part of the tax money will flow back to energy companies via subsidies. This means that even people, who are very careful with spending energy, contribute majorly to energy production via these taxes. What do you think about that? (very bad - very good)	47.1	24.6	23.7
'The goverment should financially stimulate the prevention of pollution as well.' In case of CO_2 emissions this means that for instance energy companies are not solely responsible for the extra costs they make to prevent CO_2 emissions during energyproduction, but that the government reduces these costs via policy. (completely disagree-completely agree)	8.1	31.8	63.0
How do you feel about a financial aid from the government to the development of coal- and gasfired powerplants with CO_2 capture when this happens at the cost of the development of "green" energy (windenergy, solar power, biomass)? (very bad-very good)	61.2	17.5	18.4
How do you feel about a financial aid from the government to the development of nuclear powerplants when this happens at the cost of the development of "green" energy (windenergy, solar power, biomass)? (very bad-very good)	57.8	15.2	23.9
Before, you received information about biomass with and biomass without a certificate. Biomass that is produced in a responsible manner will in all likelihood get a certificate (comparable to for instance the quality mark for hardwood). The consequences of biomass are dependent in part on the way that it is produced (with or without certificate). How important do you think it is for the Netherlands to import only biomass with certificate? (not important-very important)	5.9	13.6	78.6
Would you give the option "Conversion of biomass to car fuel and electricity" a different grade when it would be certain that the Netherlands would import biomass without certificate? In which direction would you change your grade for the option "Conversion of biomass to car fuel and electricity"? (a much lower grade-a much higher grade)	70.9	13.5	15.5
Do you think it is important for the Netherlands to invest in research and development of green energy (windenergy, solar power, biomass)? (not important-very important)	3.0	7.8	87.3

Table 9 next page: Percentages of negative, neutral and positive evaluations of policy questions

Question:	Evaluation 1-3	4	5-7
Before, you have not chosen for one or both of the improvement of efficiency options. Was one of the reasons for you not to choose this, that you had little faith that all the measures in these options will secure the necessary CO2 emission reduction (for instance because companies or people will not use more efficient appliances, houses or cars?) (not a reason – a reason)	21.0	23.0	49.5
Do you think it is important for the Netherlands to invest in the development of technologies to produce energy from sunlight? (not important-very important)	3.1	6.5	88.3
In the next decades, it is possible to produce electricity using solar power in the countries around the equator, for instance in North Africa. How much do you agree with the statement, that the Netherlands should import solar power from Nort Africa? (completely disagree-completely agree)	11.5	19.5	61.8
Can you indicate how much of an energy saver you find yourself? (not at all – very)	9.4	16.4	73.8

implementation of technologies that reduce CO_2 emissions, even if this goes at the expense of other government funded areas such as medical care or education, a large minority of respondents agrees. A quarter of respondents neither agrees nor disagrees. When confronted with the statement that the polluter should pay, which in case of CO_2 emissions means that for instance the energy companies themselves should be responsible for the extra costs of preventing CO_2 emissions, three quarters of respondents agree. Respondents were furthermore asked how they felt about government funding of energy companies. It was stated that every Dutch person financially contributes to energy generation via diverse taxes. Part of the taxes go to energy companies via funding. This means that also people that use very little energy, still contribute substantially to the funding of energy generation. Three quarter of respondents perceives this as bad. Confronted with the statement that the government should financially stimulate the prevention of pollution, which in case of CO_2 emissions means that for instance energy companies are not solely responsible for the costs they would make to prevent CO_2 emissions, but that the government would implement policies to reduce these costs, more than half of respondents agree. As these questions were rather complicated, it is possible that not all respondents understood the questions fully, resulting in seemingly contradictory evaluations. It is also possible that respondents did fully understand the questions, but feel that individuals who use very little energy should not have to contribute financially to government funding of energy companies, and individuals who do use a lot of energy should contribute.

Respondents were furthermore asked how they felt about government funding of certain CO_2 reduction technologies if this would go at the expense of the development of “green” energy, such as energy from wind, sun or biomass. In case of coal and gas fired plants with CO_2 capture and storage, more than half of the respondents evaluated this as a bad. In case of nuclear power plants, more than half of the respondents also evaluated this as a bad. One sixth of respondents perceived this as neither good nor bad.

3.9.3 More perceptions of energy from biomass

In the information regarding the consequences of one of the options, "Conversion of biomass to car fuel and electricity", respondents were confronted with possible consequences that are dependent on regulations that are yet to be designed. Depending on the way biomass is produced, some consequences could turn out quite negative or quite positive. Respondents were asked to evaluate these consequences, with only minor clues as to the chance of occurrence. Three extra questions at the end of the questionnaire therefore addressed the perception of the biomass option if it was certain which consequences would occur. Respondents were asked how important it was to them that the Netherlands would only import biomass with certificate (for the consequences of biomass with certificate, see Figure 3.3.5 A large majority of respondents states to find it quite to very important for the Netherlands to import only biomass with certificate. Respondents were furthermore asked if they would change their evaluation of the biomass option if it was certain that the Netherlands would also import biomass without a certificate. More than a third of respondents says yes to this question, but another third of respondents says they would not change their evaluation. A quarter of respondents states not to have an opinion about changing their opinion. Of the respondents that had said they would change their evaluation, the majority states to evaluate the biomass option much more negatively in case uncertified biomass would also be imported.

3.9.4 Alternative energy sources

Respondents were asked how important it was to them that the Netherlands would invest in research and development of "green" energy (wind, solar, biomass). A large majority of respondents states this to be quite important to them. When respondents were asked specifically about the importance of investments in the development of technologies to generate energy from sunlight, a large majority also states that this is quite to very important. Almost three quarter of respondents also agree with the statement that the Netherlands should import solar power from North Africa, although a fifth of respondents neither agree nor disagree.

3.9.5 Perceptions of other people's perceptions

One of the arguments that respondents might have considered when evaluating the options, is how other people might think about these options. Two questions addressed this possibility. Respondents who did not choose either of the efficiency options were asked if one of the reasons not to choose either of these options, was that they had little faith that the proposed measures would secure the necessary CO_2 emission reduction (for instance because companies or people will not use energy efficient appliances, houses or cars). Almost half of the respondents that received this question, agree that this had been a reason for them not to choose these options. Respondents furthermore received the question: "Sometimes a lot of people are opposed to a certain possibility to produce energy. It is possible that you expect this for certain options in this questionnaire as well. Was the possible opposition of other people against an option an argument for you personally?" 14.9% of respondents says yes to this question. Few respondents furthermore answer that this was the case for the efficiency options, the wind energy option, and the biomass option, 1.6%, 2.2%, 1.8%, and 1.1% respectively. The CCS options are also mentioned by few respondents, 3.7% for the option “Large plants where coal or gas is converted to electricity with CCS” and 2.9% for the option “Large plants where natural gas is converted to hydrogen with CCS”. A more substantial percentage of respondents (10.9%) answer that public opposition was an argument for them regarding the nuclear energy option.

The last question of this series of questions was about respondents’ own energy use behavior. Three quarters of respondents state to find themselves rather to very careful with spending energy. As this is a representative sample, a more even distribution of people who are not careful with energy and people who are careful with energy would be expected. Although it is possible that most respondents in the sample are actually careful with energy, the Dutch term used in the question (zuinig) is hard to translate and rather implies a comparison to other people’s “zuinigheid”. As it is unlikely that three quarters of respondents are more “zuinig” than other Dutch people, it seems that a substantial percentage of respondents overestimate how careful they are with energy.

We want to repeat the warning in the introduction of section 3.9. We asked questions about complex issues for which people may very well lack enough information to have a (well-considered) opinion. When people do not refrain from evaluation of these issues, pseudo-opinions are likely. Research showed that pseudo-opinions are highly unstable (change within minutes) and are easily influenced by irrelevant context effects (Daamen et al., 2006). So, the reader is advised to attribute more values to the informed public opinion reported in the remainder of this report than to the uninformed opinions in this section 3.9.

3.10 Comparison evaluation CCS options 2004 ICQ - 2007 ICQ

In 2006, extensive research regarding the Dutch public perceptions of CCS options was made public (De Best-Waldhober, Daamen & Faaij, 2006). This study has investigated the choices the general public would make after having received and evaluated expert information on the consequences pertaining to these choices. The method used to collect these informed preferences was very similar to the current study. The ICQ mentioned above was administrated in the winter of 2004 and will therefore from hereon be referred to as the 2004 ICQ. This ICQ focused on six CCS technologies that may contribute to CO_2 emission reduction. An important reservation of this study therefore concerned the context of the choice problem that was presented to respondents. Because little was known about public perceptions of CCS, the choice problem restricted the choice of respondents for energy options to CCS technologies. This was useful to assess public perceptions of specific CCS technologies and their consequences. But although this gives us insight into the evaluation of specific consequences, it does not show how public perception of CCS overall compares to other CO_2 emission reduction options. When the CCS options are compared with other CO_2 emission reduction options, which is usually the case in real life, overall evaluations might change. The current study therefore addresses a broader choice problem. Comparing the results of the 2004 ICQ and the current (2007) ICQ gives us the opportunity to study the effect of context (the comparison with other possibilities) and time (e.g. the possibility of increased public awareness or knowledge regarding environment and energy).

First, we can compare awareness. Three years have passed between 2004 and 2007, during which there was a lot of attention for global warming. It is possible that more people have learned of the possibility of CCS, and therefore more respondents in the 2007 study might have already had some idea or opinion of CCS. However, the results of the awareness questions that were identical in both studies contradict this reasoning. In both the 2004 and the 2007 study, about 300 respondents were asked if they knew about CCS. In 2004, between 3.4 and 5.5 percent said yes to this question. In 2007, between 5.2 and 6 percent said yes. This increase in self-reported knowledge or awareness is very small, and statistically not significantly different.

Second, we can compare changes in the overall evaluation of CCS. In the 2004 ICQ, overall evaluation of CCS in general as well as different CCS options were measured. CCS in general (i.e. just the capture and storage of CO_2, which is not combined with technologies to produce energy, such as coal fired power plants or the conversion of natural gas into hydrogen) was evaluated 5.54 on a scale of 1 (very bad) to 7 (very good). In the current ICQ, CCS in general is evaluated on average 5.2 on the same scale. This evaluation is significantly lower, although the difference is small, as is the effect size ($F1,1216) = 5.62$, $p = .018$, eta square = 0.05). The difference could be due to the small changes that were made in the information regarding consequences of CCS in general. For the 2007 ICQ, some information was added to the information of the 2004 ICQ because of new insights. It is possible that this made respondents a bit less positive about CCS in general. However, it is also possible that the explanation regarding the choice between all seven options in the 2007 ICQ, which respondents received before the information regarding CCS in general, already brought about a different context, a frame of comparison to other possibilities than CCS.

When comparing the overall evaluations of the CCS technologies in the two ICQ's, one has to take into account that the 2004 ICQ had a different policy problem (20% CO_2 emission reduction versus 50% for one) which called for less deployment of technologies, and therefore the information regarding consequences was different as well. Although none of the CCS technologies in the 2004 ICQ study completely match one of the two CCS technologies in the current ICQ study, some technologies are very similar. These technologies in the 2004 study were evaluated on average between 6.23 and 6.51. In the current ICQ, the two CCS technologies were evaluated 5.34 and 5.92, significantly less positive. As the three years that have passed between the ICQ's hardly effected awareness and only slightly affected the overall evaluation of CCS in general, two explanations for these different overall evaluations of the CCS technologies remain. First, it is possible that the difference in information regarding the consequences causes the less positive evaluation. Second, it is possible that the CCS technologies are evaluated less positive due to the comparison with other mitigation options.

First, the difference in information regarding the consequences of the CCS technologies in the 2004 ICQ and the 2007 ICQ. When the evaluations of the consequences are compared, consequences in the 2007 ICQ that are very similar to consequences in the 2004 ICQ are also evaluated similarly in 2007 as they were in 2004. For instance, the consequence "need for new vehicles" has very similar information in both ICQ's, and is also evaluated similarly (-1.1 versus -1.19, on a scale of -9 to 9). However, as the technologies in 2004 are not exactly comparable to the technologies in 2007, consequently also some of the consequences were different. The first CCS technology of the 2007 ICQ ("Large plants where coal or gas is converted to electricity with CCS") has a smaller number of consequences that are evaluated positively than its counterparts in the 2004 ICQ. The other CCS technology of the 2007 ICQ ("Large plants where gas is converted into hydrogen with CCS") seems to be more comparable to two 2004 ICQ technologies, having almost the same number of consequences that are evaluated negatively and the same amount of consequences that are evaluated positively. Still, this technology ("Large plants where natural gas is converted into hydrogen with CCS") is evaluated significantly less positive overall than comparable options in the 2004 study. Looking more closely at how positive or negative the consequences are evaluated, it seems that the information in the 2004 ICQ is evaluated slightly more positive than the information in the 2007 ICQ (2007: -4, -1.1, -2.2, -0.9, -2,7, -3.6, -1,9 versus 2004: -2.2, -1.89, -1.59, -1.19, -2.95, -4.15). However; we would argue that these differences too small to explain the significantly less positive overall evaluation of CCS in the 2007 ICQ.

Another explanation that is related to the difference in information, is the difference in information processing. In the 2004 study, respondents saw a list of their evaluations of consequences before giving their overall evaluation of the technology. In the 2007 ICQ, respondents were asked to compute the total advantage and total disadvantage by adding their evaluations of advantage and disadvantages as well (and the computer assisted respondents with these additions). According to Neijens' (1987), the latter method should lead to more rational decision making, in the sense that respondents base their overall evaluation of a technology even more on their evaluations of the consequences. As described in section 3.6, the analyses of the relationship between evaluations of consequences and overall evaluations(grades) of the CCS options in the 2007 ICQ somewhat corroborates this explanation. Analyses show that overall evaluations in the current 2007 ICQ study were based on more elaborate processing of information regarding consequences. This could have contributed to less positive overall evaluations in the 2007 study. It has however also contributed to a better opinion quality.

The second explanation, that the overall evaluations in the 2007 ICQ are less positive because of the difference in context, is supported by the analyses of order effects, which are described in Appendix 5.1.3. When (the information in) one of the CCS options was evaluated before the other options, the overall evaluation of this CCS option was more positive than when the option was not evaluated first. This corroborates the context explanation; respondents become less positive about the CCS options when they are compared with other CO_2 reduction options. Only when the nuclear energy option is evaluated first and the second CCS option ("Large plants where natural gas is converted into hydrogen with CCS") follows right after the nuclear energy option, the evaluation of the second CCS option is even higher than when the option was evaluated after any of the other options.

DISCUSSION

As the Dutch government as well as the European Union have set themselves clear goals for the reduction of CO_2 emissions into the atmosphere, significant efforts are being made by many to achieve the desired CO_2 emissions reduction targets (e.g. 50% reduction in 2050 at the EU level). The development of knowledge and technologies relevant to the reduction of CO_2 emissions in the atmosphere only constitutes a first step towards the deployment of this knowledge. For the actual implementation of such new technologies the development of social support can be crucial. One of the goals of the CATO project was to learn more about the factors which affect societal support (or the lack of it) for CO2 capture and storage technologies.

This study has investigated the choices the general public would make after having received and evaluated expert information on the consequences pertaining to these choices. The choice to study informed opinions and choices was made for several reasons. Earlier research in the Netherlands (Huijts, Midden & Meijnders, 2007; De Best-Waldhober, Daamen & Faaij, 2009) as well as outside the Netherlands (Ashworth et al, 2006, 2008; Itaoka et al., 2008; Ha-Duong et al, 2008; Reiner et al, 2006; Sharp et al, 2006) showed that the majority of the general public has no knowledge of CCS. Several studies furthermore show that people are inclined to give their opinion when asked, even if they have no knowledge whatsoever on the topic at hand (Bishop, Oldendick & Tuchfarber, 1986; Schuman & Presser, 1981). These opinions proof to be easily influenced and highly unstable (Strack, Schwarz & Wänke, 1991; Daamen et al, 2006) and are therefore very unreliable as predictors for future public opinion. The current study therefore aimed at collecting informed as well as uninformed opinions. The method used to collect the informed preferences is called the Information-Choice Questionnaire (ICQ) (see e.g. Neijens, 1987; Neijens et al., 1992). The aim of the ICQ is not only to provide respondents with the necessary information to reach an informed opinion, but also to help them make use of this information to form opinions about different policy options: part of its' aim is to guide respondents' information processing. Before respondents choose between policy options, they receive information to make a more informed choice. First, the choice is explicitly framed as a decision problem and respondents are informed about the background of the decision problem (e.g. they are told why these specific options are included in the decision problem). Second, respondents are provided with information about the consequences of the different policy options. To stimulate information processing and to help respondents reach a decision, they are requested to give a quantitative evaluation of each consequences (a rating on a scale with nineteen response categories ranging from -9 "a very big disadvantage" via 0 "totally irrelevant" to +9 "a very big advantage"). On the basis of these quantitative evaluations, the subjective utility of each option may be determined, to evaluate each option overall and to choose which option is preferred and which option (s) is (are) unacceptable.

When informing lay people about such complex matter via an ICQ, several precautions are needed to guarantee that the public is presented with a relevant policy problem and with valid and balanced information regarding a restricted set of viable options to solve this problem. First, it is essential to define a clearly specified and policy relevant choice problem that is not overly demanding for respondents. Furthermore, only policy relevant options to solve the problem should be presented, that is, options which are according to experts viable and not unlikely to be implemented.

Diverse groups of stakeholders, including NGO representatives as well as experts in CCS, were consulted to establish the most probable policy problem regarding CO2 emission reduction in the Netherlands. This was finally defined as "*How can the Dutch demand for energy be satisfied in 2030 in such a way that emissions of carbon dioxide will be reduced by 50%?*". A group of researchers and stakeholders selected seven options. Three[9] of these seven options have to be employed fully to achieve a reduction of 50%:

1. Improvement of energy efficiency;
2. Improvement of energy efficiency and decreased use of material and energy;
3. Electricity from wind turbines at sea;
4. Conversion of biomass to car fuel and electricity;
5. Large plants where coal or gas is converted into electricity with CCS
6. Large plants where natural gas is converted into hydrogen with CCS;
7. Electricity from nuclear plants

To gather recent, accurate and balanced information about the consequences of these seven options, a literature study as well as consultation of many experts in each technological field was done. The information that was thus gathered was checked again in several rounds by an external group of experts, translated for lay people, checked by experts, tested on lay people, adjusted, tested again, and finally checked again by experts. Although this was a time intensive process which required significant effort from many people, it shows that it is possible for experts from very different organizations (like Shell or Greenpeace) to reach consensus on which information on each technological option is not only relevant and accurate but also well-balanced and comprehensible for lay people. The effort needed to gather accurate, balanced and comprehensible information for lay people paid off in more than one way. The effort is essential because it enables people to base their opinion on well-balanced information, hence informing them and not manipulating them. It seems this was recognized by the respondents, as the majority of respondents evaluated the information as impartial, not one-sided, clear and complete. The method of the ICQ itself was evaluated very positively by most respondents as well.

In 2006, extensive research regarding the Dutch public perceptions of CO_2 emission reduction options was made public (De Best-Waldhober, Daamen & Faaij, 2006, 2009). The survey method that is used in the current study was also used in this earlier study, which was administrated to a representative sample of the Dutch public end of 2004. The 2004 ICQ that is mentioned above focused on six CCS technologies that may contribute to CO2 emission reduction. For the 2004 ICQ on CCS, three leading experts on CCS were consulted (UU, Ecofys, ECN) to carefully define the policy problem and choose the most viable options. The policy problem was defined as:"*Which CCS options is the best to implement in the Netherlands by 2030 at the latest in order to reduce CO2 emissions by 20% compared to the status quo?*" Six

[9] There are some restrictions in the possibilities of combinations. The combination of three electricity generating options produces too much electricity, and the combination of two options generating fuel for transport would produce to much fuel for transport. A more elaborate explanation can be found in section 1.4

CCS technologies were chosen by the experts as most likely to be implemented on a large scale within 10 to 20 years in order to reduce CO2 emissions. Each of these options on it own would reduce CO2 emissions by 20% and thus solve the policy problem. To gather recent, accurate and balanced information about the consequences of these seven options, a literature study was done and 20 experts on CCS technology were consulted. The information that was thus gathered was checked again in several rounds by an external group of experts, translated for lay people, checked by experts, tested on lay people, adjusted, tested again, and finally checked again by experts.

The 2004 ICQ research showed that most people know little about the process of global warming and even less about the possibility of using carbon capture and storage technologies to reduce CO2 emissions. However, after processing valid and balanced information regarding the consequences of six CCS technologies, most respondents evaluated the technologies as adequate. Overall, the results suggested that after processing relevant information, people are likely to agree with large scale implementation of each of the six CCS technologies. However, an important reservation of this study concerned the context of the choice problem that was presented to respondents. Because little was known about public perceptions of CCS, the choice problem restricted the choice of respondents for energy options to CCS technologies. This was useful to assess public perceptions of specific CCS technologies and their consequences. But although this gives us insight into the evaluation of specific consequences, it does not show how public perception of CCS overall compares to other CO_2 mitigation options. When the CCS options are compared with other CO_2 mitigation options, which is usually the case in real life, overall evaluations might change. The current study therefore addresses a broader choice problem.

Evaluation of the options

After respondents had processed all information regarding the consequences of an option, they were asked to grade the option on a scale of 1 to 10. In the Dutch school system, grades are on a scale of 1 to 10, with 1 meaning the lowest possible score and 10 meaning the highest possible score. A “6” (i.e. 5.51) is considered a just acceptable score (“adequate”). This means in the Dutch grading system you did just good enough to pass but not any better. 5 or lower means you have failed the test. The two CCS options, “Large plants where coal or gas are converted into electricity with CCS” and “Large plants where gas is converted into hydrogen with CCS”, were evaluated somewhat negatively by most respondents. **The first CCS option was graded clearly below 6 on average (5.34), the second CCS option was graded just below 6 on average (5.92). Apparently, many respondents are not that enthusiastic regarding the two CCS options.** In comparison, respondents evaluated most of the other options in the questionnaire rather positively. The first efficiency option was evaluated 7.33 on average, the wind energy option was evaluated 7.15 on average and the biomass option was evaluated 7.41 on average. Respondents were also less positive about the second efficiency option and the nuclear energy option, which on average were evaluated 5.84 and 5.29 respectively. Nuclear energy was also the option that respondents were most divided about, as a substantial percentage of respondents evaluated this option very negatively, whereas an only slightly less substantial percentage evaluated this option very positively.

The overall evaluations of options were quite consistent with choice and rejection behavior for these options. The options that were evaluated less positively, were chosen by significantly less respondents than the options that were evaluated more positively. Nearly all respondents chose the first efficiency package as one of their three preferred options. The majority of respondents furthermore choose the wind energy option and the biomass option. The nuclear energy option was chosen by more than a fifth of respondents, but it was also deemed unacceptable by a similar percentage of people. Contrary to the divided evaluation of nuclear energy, the CCS options were neither chosen nor rejected by many people. The first CCS option ("Large plants where coal or gas is converted into electricity with CCS") is chosen as one of three preferred options by 6.9 percent of respondents. When asked if large scale implementation of this option is so unacceptable to the respondent that he or she considers taking action if this was planned, 11 percent of respondents state to find this option that unacceptable. The second CCS option ("Large plants where natural gas is converted into hydrogen with CCS") is chosen as one of three preferred options by 10.6 percent of respondents. Large scale implementation of this option is not acceptable to 6.8 percent. **It seems that, on the one hand, the large majority of respondents does not prefer either of the CCS options, but on the other hand, a large majority does not reject the options either.**

Evaluations of just transport and storage differ from evaluation of whole technologies

Respondents were given information and asked to evaluate the consequences of CCS technologies as well as consequences of CCS in general. The information regarding consequences of CCS in general contained information about consequences of CO2 transport and storage themselves, but not about the consequences of the whole chain necessary for a specific technology (i.e., consequences of use of coal, gas or hydrogen, etc.). Similar to the way all seven options were evaluated, CCS in general was evaluated overall on a scale of 1 to 10. It was overall evaluated on average 6.3. This is significantly higher than the first CCS option ("Large plants where coal or gas is converted into electricity with CCS") was evaluated (5.3). It is also higher, though not as much, as the overall evaluation of the second CCS option "Large plants where natural gas is converted into hydrogen with CCS", 5,8). **Contrary to the evaluation of CCS technologies, CCS in general (i.e. just the transport and storage of CO2) was evaluated somewhat positively.** In the current study, respondents were also asked to evaluate CCS in general on a scale of 1, very bad, to 7 (!), very good. On this scale, CCS in general was evaluated on average 5.2. This is consistent with the results from the 2004 ICQ study, where CCS in general was evaluated on average 5.5 on the same 1 to 7 scale.

Comparison between evaluations of CCS in the 2004 ICQ and in the 2007 ICQ

As mentioned before, an ICQ study with just CCS technologies was done two and a half years before the current study. This ICQ had a different policy problem (20% CO2 emission reduction versus 50% for one) which called for less deployment of technologies, and therefore the information regarding consequences was different as well. Although none of the CCS technologies in the 2004 ICQ study completely match one of the two CCS technologies in the current ICQ study, some technologies are very similar. These technologies in the 2004 study were evaluated on average between 6.23 and 6.51. Depending on the option, between 2.7 and 4.9 percent of respondents rejected the option. **So compared to the 2004 study, the overall evaluations of the two CCS technologies in the 2007 study are less positive**; There are several explanations possible for this difference. First, it is possible that the difference in information regarding the consequences causes the less positive evaluation. Second, it is possible that the difference is due to the fact that three years have passed between the two ICQ studies and the public opinion on both CCS options became less positive during this interval. Third, it is possible that CCS is evaluated less positive due to the comparison with other CO_2 mitigation options

The first possible explanation for the less positive overall evaluations of the CCS technologies in 2007 is the difference in information regarding the consequences of the CCS technologies in the 2004 ICQ and the 2007 ICQ. When the evaluations of the consequences are compared, consequences in the 2007 ICQ that are very similar to consequences in the 2004 ICQ are also evaluated similarly in 2007 as they were in 2004. However, as the technologies in 2004 are not exactly comparable to the technologies in 2007, consequently also some of the consequences were different. The first CCS technology of the 2007 ICQ ("Large plants where coal or gas is converted to electricity with CCS") has a smaller number of consequences that are evaluated positively than its' counterparts in the 2004 ICQ. The other CCS technology of the 2007 ICQ ("Large plants where natural gas is converted into hydrogen with CCS") seems to be more comparable to two 2004 ICQ technologies, having the same number of consequences that are evaluated negatively and the same amount of consequences that are evaluated positively. There is some difference in how negatively or positively these consequences are evaluated, the consequences of the aforementioned 2007 ICQ CCS option are evaluated slightly less positive. Still, this technology ("Large plants where natural gas is converted into hydrogen with CCS") is evaluated significantly less positive overall than comparable options in the 2004 study. **It seems that the difference in information regarding consequences cannot completely explain the less positive overall evaluation of CCS options in 2007 either.** Although the difference in information might not completely explain the differences between studies, the difference in information processing might. In the 2004 study, respondents saw a list of their evaluations of consequences before giving their overall evaluation of the technology. In the 2007 ICQ, respondents were asked to compute the total advantage and total disadvantage by adding their evaluations of advantages and disadvantages as well. According to Neijens'(1987), the latter method should lead to more rational decision making, in the sense that respondents base their overall evaluation of a technology more on their evaluations of the consequences. Analyses of the relationship between evaluations of consequences and overall evaluations (grades) of the CCS options in the 2007 ICQ somewhat corroborates this explanation. **There is some evidence that overall evaluations in the current 2007 ICQ study were based on more elaborate processing of information regarding consequences.** This could have contributed to less positive overall evaluations in the 2007 ICQ study.

Second, three years have passed between 2004 and 2007, during which attention for global warming has increased significantly. It might be that more people have learned of the possibility of CCS, and therefore more respondents in the 2007 ICQ study might already have had some idea or opinion of CCS. However, the results of the two surveys contradict this reasoning. The results from the questions regarding awareness show that there is no significant difference in awareness or knowledge of CCS between the 2004 and the 2007 study. In both studies, about 300 respondents were asked if they knew about CCS. In 2004, between 3.4 and 5.5 percent said yes to this question. In 2007, between 5.2 and 6 percent said yes. This increase in self-reported knowledge or awareness is very small, and statistically not significantly different. **The awareness and knowledge about CCS hardly increased between 2004 and 2007 and thus cannot explain the somewhat less positive overall evaluations of CCS technologies in 2007.**

The third possible explanation is that the CCS options are evaluated less positive in the 2007 study because of the context of the choice problem. The two CCS technologies are directly compared to other mitigation options such as improvement of efficiency, electricity from wind turbines at sea, fuel and electricity from biomass, and nuclear energy. In 2007, respondents may be more negative and slightly more eager to reject CCS technologies, but the majority of respondents is still neither enthusiastic nor opposed. They are however quite enthusiastic about the other options in the study. The effects of the order in which the options were evaluated in the 2007 ICQ also give a clue. When a CCS technology was evaluated first, its evaluation was more positive than when the technology was evaluated after one or more other options, with one exception: When the second CCS option was evaluated second after the nuclear option the overall evaluation of the second CCS option was more positive than when it was evaluated first. **The most plausible explanation for the less favorable evaluation of CCS technologies in 2007 is therefore that these options were evaluated in comparison with other mitigation options.**

The role of CCS consequences

Before respondents evaluated an option overall, they were asked to evaluate each consequence of the option separately. By analyzing the relationship between the evaluations of the consequences and the overall evaluation of an option, it becomes clear how respondents' evaluation of the consequences influences respondents' overall evaluation of an option. Several analyses show that the evaluation of the information regarding consequences moderately influences how options are evaluated overall. This means that although respondents base their evaluation of an option in part on the information about the consequences, part of their evaluation is not explained by the information. Although the consequences of the options in the ICQ were selected by experts as the most important consequences, it seems that not all the arguments that are important to respondents are stated in the given information. The information was limited to the consequences of options which experts deemed important to develop a well-considered opinion. However, respondents may also base their overall evaluations on trivial associations (such as "coal is dirty", or "a new technology unknown to me is scary"). Regarding quality of opinion, Price and Neijens (1997) mention consistency as an important indicator of quality. In this case, consistency is the extent to which an overall evaluation of an option is consistent with respondents own evaluations of attributes of that option. Explained variance is an indicator of this consistency. Before respondents processed information on consequences, the percentage of explained variance was very low for the two CCS options. The percentage of explained variance of the overall evaluation of an option increased with 15% for "Large plants where coal or gas is converted into electricity with CCS" after respondents processed the ICQ information on consequences of this option. For "Large plants where natural gas is converted into hydrogen with CCS" the increase of explained variance was 33%. This means that respondents do base their overall evaluation substantially on the information regarding the consequences of the CCS options. It also means that respondents are willing to reconsider their opinion when confronted with valid new information regarding consequences of an option, and change their evaluations to reflect an opinion based on their evaluation of this information. **A substantial part of the overall evaluation of each option is based on the information regarding the consequences.**

If all the consequences of an option together moderately predict the overall evaluation of an option, the next question is on which specific consequences respondents base their overall evaluation. Several consequences of the options are considered by most respondents to be a disadvantage, such as contribution to pollution due to coal mining", "increased price", "new pipelines needed", "new vehicles needed", "safety of hydrogen plants", and "economic consequences". The specific consequences of CCS, "safety of CO2 transport in pipelines", and "safety underground CO_2 storage" are evaluated negatively by most respondents as well. On the other hand, the consequences "less contribution to the greenhouse effect" "contribution to air quality" and "less contribution to noise" are evaluated very positively. The consequences "safety of hydrogen plants" and " reliability of energy supply" are evaluated somewhat positively. However, none of the specific consequences of the CCS options stand out as a major predictor of overall evaluation. Although the consequences of storage itself, such as consequences of possible leakage for the environment and humans, seem to have a slightly negative effect on the overall evaluation, this effect is rather small. Moreover, when respondents are asked for their overall evaluation of just capture, transport and storage, they are rather positive. **Given that the overall evaluation of CCS in general (i.e. just capture, transport and storage) is rather positive, one might conclude that the less positive evaluation of the two CCS technologies (i.e. the whole chain, from winning via conversion to end use, including consequences of use of coal, gas or hydrogen) is not caused as much by the consequences of CCS itself, but by the consequences of the rest of the chain.** However, each of these consequences has an equally small or much smaller effect on the overall evaluation of the CCS options than the consequences of CCS itself. **This suggests that it will be difficult to influence the public overall evaluations of the CCS technologies by changing single consequences of a CCS technology.**

Perceptions and evaluations of global warming

Throughout the questionnaire, respondents were asked several questions regarding global warming as well. Most respondents state that they are aware of global warming, and evaluate global warming quite negatively before receiving information regarding the consequences of global warming. Almost all consequences of global warming that were described in the questionnaire were evaluated very negatively as well. Consistently, respondents are on average very negative regarding global warming after receiving this information (average 3.09 on a scale of 1 (bad) to 7 (good). In comparison with the 2004 ICQ study (average 2.29 on the same scale), the average evaluation of global warming after information became more positive though. A possible explanation might be that in the information regarding consequences in the 2007 study, more consequences of global warming were mentioned that most people find positive (for instance the possible positive effects of global warming for colder regions).

As the unique goal of CCS is to reduce CO2 emission and thereby reduce global warming, one might argue that people's overall evaluation of global warming and their evaluation of CCS should be related. Some literature regarding public perception of CCS has hinted at this relationship (Shackley et al, 2005). A few studies have empirically proven a relationship between awareness of the need for CO2 reduction and the evaluation of CCS (Itoaka et al, 2006; Tokushige et al, 2007). People who do not perceive global warming as a problem, might be inclined to view CCS as unnecessary. On the other hand, people who evaluate global warming very negatively are expected to be more positive about CO2 mitigation options (CCS options being one of those). Contrary to this expectation, analyses of our data show that global warming perceptions do not affect evaluations of CCS (proportions of explained variance less than 2%). **Our results show hardly any relation between people's overall evaluation of global warming and their overall evaluation of the two CCS technologies and of CCS in general.**

Quality of opinions before the expert information in the questionnaire

A random selection of 291 (out of the total sample of 971) respondents received questions about the seven options before any information was given in the questionnaire. These respondents were asked if they were aware of an option and whether they could evaluate the option by giving it a grade. Especially the two CCS options were unknown to a majority of respondents. 51.2% admitted to have "never heard" of "Large plants where coal or gas is converted into electricity with CCS" and 67.7% had never heard of "Large plants where natural gas is converted into hydrogen with CCS". The efficiency options and the biomass option were unknown to about a quarter of respondents. However, most of the respondents that state not to know of an option, grade this option anyway. These kinds of opinions are called pseudo-opinions, and are known to be very unstable and easily influenced (e.g. Daamen et al, 2006; Strack et al, 1991). For the two CCS options, the percentages of respondents who first stated not to have heard of the option but then evaluated the option anyway was 79.2% and 75.6% respectively. In the current study, respondents that evaluated the seven options before they processed expert information in the ICQ also evaluated the options after they processed this information. The relationship between the evaluations before the ICQ information and the evaluations after information turned out to be very weak for most options (correlations of .31, .22, .29, .28, .06). Only the options nuclear energy and wind energy show a moderate relationship between the evaluations before ICQ information and the evaluation after (correlations of .48 and .60 respectively). Not coincidentally, these are also the most well-known options of the seven. It is possible that respondents that already have beliefs regarding an option, either do not let any new information influence their overall evaluation, or do not find any new information. Results of the current study seem to corroborate the latter hypothesis, as the evaluations of the consequences of nuclear energy and wind energy reasonably predict the overall evaluation of these options before ICQ information is given. Of course, in this case respondents do not base their overall evaluation before ICQ information on the information they will get later, but they base their overall evaluation before ICQ information on the information that they were already familiar with, which was in the ICQ as well. The most unknown option was the second CCS option ("large plants where gas is converted into hydrogen with CCS"). For this option, the relationship (correlation of .06) between the uninformed opinion and the informed opinion was close to nonexistent. For the first CCS option (" Large plants where coal or gas is converted into electricity with CCS"), this relationship was only slightly stronger than nonexistent (r=.28).**This means that overall evaluations of complex, new and to the public mostly unknown technologies such as CCS, are invalid predictors of informed opinions and nondiagnostic for support of an option.**

Future research

Altogether, the results from the current ICQ show that most people are not very enthusiastic, but that most people also do not reject CCS options either. In this study, CCS was evaluated by respondents in different contexts. The consequences of the whole chain of two CCS technologies ("Large plants where coal or gas is converted to electricity with CCS" and "Large plants where natural gas is converted to hydrogen with CCS") were evaluated after information. This information contained all consequences from the beginning of the chain (e.g. "pollution around coal mines") to the end of the chain (e.g. "end use of hydrogen in motorvehicles"). A smaller random sample of respondents evaluated also the consequences of just CCS (i.e. information on the consequences of capture, transport and storage of CO_2). The two CCS options containing the entire chain were evaluated less positive than just CCS in general. The two CCS options comprising the entire chain also differ from each other. The CCS option in which coal or gas is converted into electricity was evaluated less positive than the CCS option in which natural gas is converted into hydrogen. This last result is in line with earlier research regarding coal fired and gas fired power plants (without CCS), that shows that the Dutch public over the years has been consistently more negative about coal fired power plants than gas fired power plants (Daamen & Bos, 1999; Staats & Daamen, 2000). It seems that the evaluation of the transport and storage of CO2 depends significantly on the technology that it will be combined with. Currently, CCS is largely unknown to the Dutch public. However, when the public learns more about CCS in the near future, the technology that becomes publicly associated with CCS might be essential for the public opinion regarding CCS in general. If CCS in general becomes associated with coal in the minds of the public, the evaluation of CCS in general will probably be more negative than if CCS in general becomes associated with natural gas, hydrogen, or biomass.

To be able to monitor the development of public opinions regarding CCS and determine which arguments, associations, or misconceptions the public opinion regarding CCS is based on, a repetitive study using the current ICQ could be very useful. This would have multiple scientific and applied advantages. It would give insight in the trend of the public opinion of CCS over time. It would furthermore provide valuable insight in the effects of information in the media regarding CCS. If a substantial part of the general public share beliefs on attributes of CCS which are clearly false according to the experts, then this knowledge can be used to select the most convincing way to refute those false beliefs and to draft a targeted communication plan. Such a longitudinal study has been proposed for a follow-up program of CATO, named CATO2.

Because ICQ opinions need to be stable and resistant in order to be predictive for future public support, an important question for future research is which elements in the current ICQ procedure contribute to stability and resistance of ICQ opinions (compared to uninformed opinions assessed with conventional questionnaires). A second important question is, whether elements can be added to the ICQ procedure to further improve stability and resistance of ICQ opinions. Currently, an explorative experiment is being done on the stability and resistance of ICQ opinions by de Best-Waldhober and Daamen. A series of experiments to answer these more fundamental questions regarding the ICQ methodology has been proposed for CATO2 as well.

CONCLUSIONS

More and more scientists are suggesting CO_2 capture and storage as a viable option to reduce CO_2 emissions and thus reduce global warming. As technological knowledge regarding CCS is developing, the general public is largely unaware of this option and the question remains how the general public will view CCS. This study confirmed what several national and international studies (Ashworth et al., 2006; De Best-Waldhober, Daamen & Faaij, 2006; Reiner et al, 2006) in the past years have shown, that the general public is mostly unaware about CCS. However, most of the respondents that state not to know of an option, grade this option anyway. These kinds of opinions are called pseudo-opinions, and are known to be very unstable and easily influenced (e.g. Daamen et al, 2006; Strack et al, 1991). This means that overall evaluations of complex, new and to the public mostly unknown technologies such as CCS, are invalid predictors of informed opinions and nondiagnostic for support of an option. Therefore, the current study has investigated the evaluations and choices the general public would make regarding seven CO_2 mitigation options **after having evaluated expert information on the consequences** pertaining to these choices. The two CCS options in this study, “Large plants where coal or gas are converted into electricity with CCS” and “Large plants where gas is converted into hydrogen with CCS”, were evaluated somewhat negatively by most respondents. **The first CCS option was graded clearly below 6 on average (5.34 on a scale of 1 to 10), the second CCS option was graded just below 6 on average (5.92 on a scale of 1 to 10). Apparently, many respondents are not that enthusiastic regarding the two CCS options.** In comparison, respondents evaluated most of the other options in the questionnaire, efficiency, wind energy and biomass, rather positively. Respondents were also less positive about the second efficiency option and the nuclear energy option, which on average were evaluated 5.84 and 5.29 respectively.

The overall evaluations of options were quite consistent with choice and rejection behavior for these options. The options that were evaluated less positively, were chosen significantly less than the options that were evaluated more positively. Nearly all respondents chose the first efficiency package as one of their three preferred options. The majority of respondents furthermore chose the wind energy option and the biomass option. The nuclear energy option was chosen by more than a fifth of respondents, but it was also deemed unacceptable by a similar percentage of people. Contrary to nuclear energy, the CCS options were neither chosen nor rejected by many people. The first CCS option (“Large plants where coal or gas is converted into electricity with CCS”) was chosen as one of three preferred options by 6.9 percent of respondents. When asked if large scale implementation of this option is so unacceptable to the respondent that he or she considers taking action if this was planned, 11 percent of respondents stated to find this option that unacceptable. The second CCS option (“Large plants where natural gas is converted into hydrogen with CCS”) was chosen as one of three preferred options by 10.6 percent of respondents. Large scale implementation of this option is not acceptable to 6.8 percent. **It seems that, on the one hand, the large majority of respondents does not prefer either of the CCS options, but on the other hand, a large majority does not reject the options either.**

These evaluations of CCS are slightly less positive than evaluations found in a Dutch study with similar methodology, two and half years earlier (de Best-Waldhober, Daamen & Faaij, 2006). Although none of the CCS technologies in that study completely match one of the two CCS technologies in the current study, some technologies are very similar. These technologies in the 2004 study were evaluated on average between 6.23 and 6.51. Depending on the option, between 2.7 and 4.9 percent of respondents rejected the option. So compared to the 2004 study, the overall evaluations of the two CCS technologies in the 2007 study are less positive; However, there are several differences between the two studies, the main difference being that the earlier study compared six CCS technologies, whereas the current study compared seven CO2 mitigation options. Several results from the current study corroborate the hypothesis that CCS is evaluated less positive due to this comparison with other CO_2 mitigation option. **The most plausible explanation for the less favorable evaluation of CCS technologies in 2007 seems to be that these options were evaluated in comparison with other CO2 mitigation options.**

Comparing CCS technologies with other CO_2 mitigation options is not the only factor influencing people's opinion of CCS. The information regarding consequences of CCS influences proved to influence respondents' evaluation in several ways as well.

First, this influence became apparent by the difference in evaluations of CCS in general, the first CCS option and the second CCS option in the study. The information regarding consequences of CCS in general contained information about consequences of CO_2 transport and storage themselves, but *not* about the consequences of the whole chain necessary for a specific technology (i.e., consequences of use of coal, gas or hydrogen, etc.). CCS in general was overall evaluated on average 6.3. This was significantly higher than the first CCS option ("Large plants where coal or gas is converted into electricity with CCS") was evaluated (5.3). It was also higher, though not as much, as the overall evaluation of the second CCS option "Large plants where natural gas is converted into hydrogen with CCS", 5,8). This means that the evaluation of CCS can be influenced by the consequences of the whole chain, such as use of coal or gas. The results of this study suggest that the lower evaluation of the first CCS option ("Large plants where coal or gas is converted into electricity with CCS) and the higher rejection rate are associated with the use (and consequences) of coal, which is usually perceived negatively by most of the general public (Daamen & Bos, 1999; Staats & Daamen, 2000). **It seems that the general Dutch publics' evaluation of CCS might be influenced somewhat by an association with a specific technology (such as coal-fired powerplants), but not much.**

Furthermore, several analyses showed that the evaluation of the information regarding consequences moderately influences how options are evaluated overall. This means that although respondents base their evaluation of an option in part on the information about the consequences, part of their evaluation is not explained by the information. Although the consequences of the options in the ICQ were selected by experts as the most important consequences, it seems that not all the arguments that are important to respondents are stated in the given information. However, compared to how much respondents based their evaluation of a CCS option on the consequences of this CCS option before information is given, respondents do base their overall evaluation substantially on the information regarding the consequences of the CCS options. The current study also gave evidence that respondents are willing to reconsider their opinion when confronted with valid new information regarding consequences of an option, and change their evaluations to reflect an opinion based on their evaluation of this information. **Apparently, when people processed accurate, balanced and comprehensible information regarding the consequences of an option, they did base a substantial part of their overall evaluation of each option on this information.**

The next interesting would then be which specific consequences respondents base their overall evaluation on. If certain consequences are publicly perceived as especially advantageous or disadvantageous, this might be useful knowledge in the choice for a specific technology. Several consequences of the options are considered by most respondents to be a disadvantage, such as contribution to pollution due to coal mining", "increased price", "new pipelines needed", "new vehicles needed", "safety of hydrogen plants", and "economic consequences". The specific consequences of CCS, "safety of CO2 transport in pipelines", and "safety underground CO_2 storage" are evaluated negatively by most respondents as well. On the other hand, the consequences "less contribution to the greenhouse effect" "contribution to air quality" and "less contribution to noise" are evaluated very positively. However, none of the specific consequences of the CCS options stand out as a major predictor of overall evaluation. Although the consequences of storage itself, such as consequences of possible leakage for the environment and humans, seem to have a slightly negative effect on the overall evaluation, this effect is rather small. **This suggests that it will be difficult to influence the publics' overall evaluations of CCS technologies by changing single consequences of a CCS technology.**

All together, the results of the current study point out several important finds. For one, it is possible for experts of different backgrounds and affiliations to agree on what is valid, accurate and balanced information regarding the consequences of CO2 mitigation options. Moreover, after processing this information, people from the general public base their evaluation of an option for a substantial part on this information. Uninformed evaluations of CCS options did not predict informed evaluations at all. No specific consequences of CCS stood out as a critical influence on the evaluation or acceptance of CCS, but the results do hint at a possible negative influence of the association with aspects of specific technologies, such as the use of coal. The comparison with other CO2 mitigation options such as efficiency, wind energy and energy from biomass also leaves people slightly less positive about CCS. But most importantly, after people from the general Dutch public processed valid, accurate and balanced information regarding the consequences of CCS options, the majority is not enthusiastic, but does not seem to plan protest either.

REFERENCE

Alcser, K.H., Neijens, P.N., Bachman, J.G., 1996. Using an informed survey approach to assess public opinion on euthanasia and physician-assisted suicide: a cross-national comparison between Michigan (USA) and the Netherlands. ISR, Michigan.

Alsema E., Nieuwlaar E., 2001. *Icarus 4. A database of energy-efficiency measures for the Netherlands, 1995-2020*. Utrecht Center for Energy Research, Utrecht University.

ANP, 2005. 50*.000 vogels dood door molens.* NRC Handelsblad, 6 July 2005.

Ashworth, P., Carr-Cornish, S., Boughen, N.,Thambimuthu, K., 2008. *Engaging the public on Carbon Dioxide Capture and Storage: Does a large group process work?.* Energy Procedia 2008.

Ashworth, P., Pisarski, A., Littleboy, A., 2006. *Social and Economic Integration Report: Understanding and incorporating stakeholder perspectives to low emission technologies in Queensland.* Centre for Low Emission Technology.

Batidzirai B, Faaij A, Smeets E., 2005. *Biomass production potentials in Mozambique and supply chains for the export market.* Special Issue on International Bio-energy trade of the Journal Energy for Sustainable Development, May.

Beckjord E., Ansolabehere S., Deutch J., Driscoll M., Gray P., Holdren J., Joskow P., Lester R., Moniz E., Todreas N., 2003. *The future of nuclear powe*r. An interdisciplinary MIT study. Massachusetts Institute of Technology.

Beer J. de, Blok K., 2003. *Energietransitie en opties voor energie efficiencyverbetering*. Report EMAN03049, Ecofys.

Beer J., de, Blok K., 2003. *Energietransitie en opties voor energie efficiencyverbetering*. Report EMAN03049, Ecofys.

Bell, D., Gray, T., Haggett, C., 2005. *The 'Social Gap' in wind farm sitting decisions: explanations and policy responses.* Environment Politics 14, 460-477.

Beuzit, P., 2003. *Hydrogen economy and the automotive industry the Renault-Nissan view.* 1st European Hydrogen Energy Conference, 25 July 2003, copy: 20030725EHECpg29-15h05.pdf

Bishop, G.F., Oldendick, R.W., Tuchfarber, A.J., Bennet, S.E., 1980. *Pseudo-opinions on public affairs*. Public Opinion Quarterly 44, 189-209.

Bishop, G.F., Tuchfarber, A.J., and Oldendick, R.W. 1986. *Opinions on fictitious issues: The pressure to answer survey questions*. Public Opinion Quarterly 50, 240-250.

Bishop, G.F., Tuchfarber, A.J., Oldendick, R.W., 1986. *Opinions on fictitious issues: The pressure to answer survey questions.* Public Opinion Quarterly 50, 240-250.

Blok K., 2004. *Improving energy efficiency by 5% and more per year?* Copernicus Institute, Utrecht University.

Borderwind, 1998, *Offshore Wind Enery. Building a New Industry for Britain.* www.offshorewindenergy.org

Bruggink J., Zwaan B., van der., 2002. *The role of nuclear energy in establishing sustainable energy paths*. International Journal of Global Energy Issues 18, 2/3/4, 151-180.

Bunn M., Holdren J.P., Fetter S., Zwaan B. van der, 2005. *The economics of reprocessing versus direct disposal of spent nuclear fuel*. Nuclear Technology 150, June, 209-230.

Bütschi, D., 1997a. *How to shape public opinion, if possible at all? The example of the 'choice questionnaire'.* Paper prepared for the conference 'No opinion, instability and change in public opinion research', October 6-8, University of Amsterdam.

Bütschi, D., 1997b. *Information et opinions; promesses et limites de Questionnaire de Choix.* Université de Genève.

Chaiken, S., 1980. *Heuristics versus systematic information processing and the use of source versus message cues in persuasion.* Journal of Personality and Social Psychology 39, 752-766.

Chaiken, S., Eagley, A.H., 1983. *Communication modality as a determinant of persuasion.* The role of communicator salience. Journal of Personality and Social Psychology 45, 241-256.

Chestnut, R.W., 1976. *The impact of energy-efficiency ratings: selective versus elaborative encoding*. Lafayette: Purdue Papers in Consumer Psychology, no 160, 1976.

Cohen, J. (1973). *Eta-squared and partial eta-squared statistics in fixed factor ANOVA designs.* Educational and Psychological Measurement, 33, 107-112.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition). Hillsdale, NJ: Erlbaum.

Commission of the European Communities, 2005. *Green paper on energy efficiency or doing more with less*. COM (2005) 265 final, Brussels 22.6.2005

Converse, P.E., 1964. *The nature of belief systems in mass publics*. In: D.E. Apter (ed.) Ideology and discontent. New York: Free Press.

Converse, P.E., 1970. *Attitudes and non-attitudes: Continuation of a dialogue*. In: Tufte, E.R. (Ed.), The quantitative analysis of social problems, Addison Wesley, Reading, MA, pp 168-189.

Curry, T., Reiner, D.M., Ansolabehere, S., Herzog, H.J., 2004. *How aware is the public of carbon capture and storage?* In: Rubin, E.S., Keith, D.W., Gilboy, C.F. (Eds.), Proceedings of 7th International Conference on Greenhouse Gas Control Technologies, volume 1: Peer-reviewed Papers and Plenary Presentations, IEA Greenhouse Gas Program, Cheltenham, UK.

Daamen, D., de Best-Waldhober, M., Damen, K., Faaij, A., 2006. *Pseudo-opinions on CCS technologies.* Paper presented at GHGT-8, 8th International Conference on Greenhouse Gas Control Technologies, June 19-22, Trondheim, Norway.

Damen K., Faaij A., 2005. *A Life Cycle Inventory of existing biomass import chains for "Green Electricity" production.* Mitigation and Adaptation Strategies for Global Change (Special Issue).

Damen, K., Faaij, A., Turkenburg, W.T.C., 2003. *Health, safety and environmental risks of underground CO_2 sequestration. Overview of mechanisms and current knowledge.* Copernicus Institute (contracted by RMNO), Dept. of Science, Technology and Society, Utrecht University.

Damen, K.J., van Troost M., Faaij A.P.C, Turkenburg, W., 2004. *An integral comparison of hydrogen and electricity production systems with CO_2 capture and storage by means of chain analysis*. Copernicus Institute, Dept. STS, Utrecht University.

De Best-Waldhober, M., Daamen, D., Faaij, A., 2006. *Public perceptions and preferences regarding large scale implementation of six CO_2 capture and storage technologies. Well-informed and well-considered opinions versus uninformed pseudo-opinions of the Dutch public.* Leiden University, Leiden.

De Best-Waldhober, M., Daamen, D., Faaij. A., 2009. *Informed and uninformed public opinions on CO_2 capture and storage technologies in the Netherlands.* International Journal of Greenhouse Gas Control, in press.

De Bruijn, F.A., 2004. *The hydrogen economy possibilities and limitations. Presented at the ACTS-Sustainable Hydrogen Workshop*. 13^{th} October 2004, Nunspeet, The Netherlands.

De Groot, A., Jeeninga, H., 2003. *Hydrogen technology at ECN.* Petten, Energy Research Centre of the Netherlands.

Devezeaux J., 2000. *Environmental impacts of electricity generation*. 25^{th} annual international symposium. The Uranium institute.

Devine-Wright, P., 2005. *Beyond NIMBYism: towards an integrated framework for understanding public perception of wind energy.* Wind Energy 8, 125-139.

Dienel, P.C., 1978. *Die Planungszelle: Eine Alternative zur Establishment-Demokratie*. Der Bürger plant seine umwelt, Opladen, Westdeutscher Verlag.

Dienel, P.C., 1989. *Contribution to social decision methodology: Citizen reports on technological problems*. In: C. Vlek and G. Cvetkovich (eds.), Social Decision Making for Technological Problems, Dordrecht, Kluwer Academic Publishers, pp. 133-151.

Ecotec et al., (undated). *The Impact of Renewables on Employment and Economic Growth.* ALTENER contract 4.1030/E/97/009.

Electriciteits-Productiemaatschappij Zuid-Nederland (EPZ), 2005. *Jaarverslag 2004*. EPZ, Borssele.

European Commission, 2003. *External Costs. Research results on socio-environmental damages due to electricity and transport*. ExternE Project.

European Commission, 2003. *Saving at least 1% energy each year*. European Commission, Memo. Directorate General for Energy and Transport.

European Commission, 2005. *20% energy savings by 2020*. European Commission, Memo. Directorate General for Energy and Transport.

European Commission, 2007. *Eurobarometer 67.* Available online at: http://ec.europa.eu/public_opinion/archives/eb/eb67/eb67_en.htm

European Commission. *ExternE. Externalities of energy*. Available online at: http://externe.jrc.es

EWEA, 2003. *Wind Energy - The Facts. An Analysis of wind energy in the EU-25.* Volume 4 - Environment, EWEA: 1-60.

Faaij A. 2004. *Modern biomass conversion technologies*. Mitigation and Adaptation Strategies for Global Change January 2005, Special Issue on ACC workshop Paris September 30.

Faaij AP.C., Hamelinck, C., 2002. *Long term perspectives for production of fuels from biomass; integrated assessment and RD&D priorities.* 12th European Conference on Biomass for Energy, Industry and Climate Protection, Amsterdam, the Netherlands, 17-21 June.

Faaij, A., Daamen, D.D.L., De Best-Waldhober, M., Wolf, K.H., 2004. *Transition to sustainable use of fossil fuels: impact of CFF options and societal preferences.* Paper presented at GHGT-7, 7th international conference on Greenhouse Gas Control Technologies, September 5-9, Vancouver, Canada.

Fishkin, J.S., 1991. *Democracy and deliberation: New directions for democratic reform*. New Haven: Yale University Press.

Fishkin, J.S., 1995. *The voice of the people: Public opinion and democracy*. New Haven: Yale University Press.

Folkerts, D.L., 2005. *Personal Communications.* Utrecht, Wind energy group, Ecofys bv.

Gagnon L., Belanger C., Uchiyama Y, 2002. *Life cycle assessment of electricity generation options: the status of research in year 2001*. Energy Policy 30, 1267-1278.

Geurs et al., 1998. *Verkeer en vervoer in de Nationale Mileuverkenning 4.* Rappotnummer 773002011.RIVM, Bilthoven

Gielen D., Gerlagh T., Bos A., 1998. *Matter 1.0 A Markal energy and material systems model characterization*. ECN.

Ha-Duong, M., Nadaï, A., Campos, A.S., 2008. *A survey on the public perceptions of CCS in France.* Energy Procedia, 2008.

Hamelinck C., Faaij A., 200. *Outlook for advanced biofuels*. Energy Policy 34, 17, 3268-3283.

Hamelinck C.N, Suurs R.A.A., Faaij A.P.C., 2005. *Techno-economic analysis of International Bio-energy Trade Chains*. Biomass & Bioenergy, In Press; Available online 17 May 2005.

Hamelinck C.N., Faaij A.P.C., 2002. *Future prospects for production of methanol and hydrogen from biomass.* Journal of Power Sources 111, 1, 1-22.

Hamelinck C.N., Hooijdonk G. van, Faaij A.P.C., 2005. *Future prospects for the production of ethanol from ligno-cellulosic biomass.* Biomass & Bioenergy, 28, 4, 384-410.

Hamelinck, C., 2004. *Outlook for advanced biofuels.* Doctoral Thesis, Utrecht University, Department of Science, Technology and Society. ISBN: 90-393-3691-1.

Harmeling M., Blok K., Chang M., Graus W., Joosen S., 2005. *Mogelijkeden voor versnelling van energiebesparing in Nederland*. Report ECS05021, Ecofys.

Hart, D., Freund P., Smith, A., 1999. *Hydrogen- Today and Tomorrow.* IEA Greenhouse Gas R&D Programme, United Kingdom**:** 1-34.

Hendriks, C.A., Graus, W. Bergen, F. van, 2004. *Global Carbon Dioxide Storage Potential and Costs*, Ecofys and TNO-NITG, Utrecht, the Netherlands.

Hoogwijk M., Faaij A., Eickhout B., de Vries B., Turkenburg W., 2005. *Global potential of biomass for energy from energy crops under four GHG emission scenarios Part A: the geographical potential.* Biomass & Bioenergy, In Press; Available online July 2005.

Huijts, N.M.A., Midden, C.J.H., Meijnders, A.L., 2007. *Social acceptance of carbon dioxide storage.* Energy Policy 35, 5, 2780-2789.

IEA International Energy Agency, 2005. *Prospects for CO_2 capture and storage.* International Energy Agency, Paris: ISBN 92-64-10881-5.

Intergovernmental Panel on Climate Change, 2007. *Climate Change 2007, the fourth IPCC Assessment Report.*

IPCC Intergovernmental Panel on Climate Change, 2005. *IPCC Special Report. Carbon dioxide capture and storage.* Summary for policymakers and technical summary, IPPC and UNFCC: ISBN 92-9169-119-4.

Itaoka, K., Okuda, Y., Saito, A., Akai, M., 2008. *Influential information and factors for social acceptance of CCS: the 2nd round survey of public opinion in Japan.* Energy Procedia 2008.

Itaoka, K., Saito, A., Akai, M., 2004. *Public acceptance of CO2 capture and storage technology : A survey of public opinion to explore influential factors.* In: Rubin, E.S., Keith, D.W., Gilboy, C.F. (Eds.), Proceedings of 7th International Conference on Greenhouse Gas Control Technologies, volume 1: Peer-reviewed Papers and Plenary Presentations, IEA Greenhouse Gas Program, Cheltenham, UK.

Itaoka, K., Saito, A., Akai, M., 2006. *A path analysis for public survey data on social acceptance of CO2 capture and storage technology.* Paper presented at GHGT-8, 8th International Conference on Greenhouse Gas Control Technologies, June 19-22, Trondheim, Norway.

Junginger, H.M., 2005. *Learning in Renewable Energy Technology Development.* Department of Science Technology and Society. Doctoral Thesis, Utrecht University: 1- 206.

Kay, A.F., Henderson, H., Steeper, F., Lake, C, Greenberg, S.B., and Blunt, C., 1994. *Steps for democracy: The Many versus the Few*. Americans Talk Issues Foundation, St Augustine, Florida.

Kay, A.F., Henderson, H., Steeper, F., Lake, C, Greenberg, S.B., and Blunt, C., 1994. *Steps for democracy: The Many versus the Few*. Americans Talk Issues Foundation, St Augustine, Florida.

Klusmann, R., 2003. *Evaluation of leakage potential from a carbon dioxide EOR/sequestration project.* Energy Conversion and Management, 44, 12, 1921-1940.

Kooijman, H.T.J., M. De Noord, M.A. Uyterlinde, A.F. Wals, S.A. Herman, H.J.M. Beurskens, 2003. *Large scale offshore wind energy in the North Sea - technology and policy perspective.* Energy Research Centre of The Netherlands, Petten: 1-9.

Krewitt W., Mayerhofer P., Fiedercik R., Trukenmuller A., Heck T., Gresmann A., Raptis F., Kaspar F., Sachau J., 1998. *ExternE- externalities of ener*gy. National implementation in Germany. IER, Stuttgart.

Kruse, B., Grinna, S., Buch, C., 2002. *Hydrogen Status og Muligheter.* The Bellona Foundation; 6, 26 juni 2005.

Lako P., Seebregts A., 1998. *Characterization of power generation options for the 21st century.* Report on behalf of Macro task E1. ECN-C-98-085, ECN.

Mackie, D., 1987. *Systematic and nonsystematic processing of majority and minority persuasive communications.* Journal of Personality and Social Psychology 53, 41-52.

Martin N., Worrell E., Ruth M., Price L., 2000. *Emerging energy efficient industrial technologies*. Berkeley National Laboratory, LBNL 46990.

McGregor, D., 1960. *The human side of enterprise.* McGraw Hill, New York.

Meier P., Wilsom P., Kulcinski G., Denholm P., 2005. *US electricity industry response to carbon constrain: a life-cycle assessment of supply side alternatives*. Energy Policy 33, 1099-1108.

Menkveld M., 2004. *Energietechnologieën in relatie tot transitiebeleid*. Factsheets. ECN, Vroomraad and Energieraad. ECN-C-04-20.

Menkveld, M.(red.), 2004. *Energietechnologieën in relatie tot transitiebeleid.* By order of AER and VROM-raad, ECN-C--04-020.

Ministerie van Economische Zaken, 2004, *Innovatie in het Energiebeleid.*

Ministry of housing, spatial planning and the Environment (Vrom). *Convention on nuclear safety, 2004*. Dutch national report 2005. Third review Conference. The Hague.

National Academy of Engineering, Board of Energy and Environmental Systems (NAE). 2004. *The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs.* The National Academies Press, Washington D.C., www.nap.edu http://www.nap.edu/books/0309091632/html/85.html

Neijens P.C., 1987. *The Choice Questionnaire. Design and Evaluation of an Instrument for Collecting Informed Opinions of a Population.* Free University Press, Amsterdam.

Neijens, P., de Ridder, J.A., and Saris, W.E., 1988. *Informatiepresentie in een enquête*. Mens en Maatschappij, 63, 77-86.

Neijens, P., De Ridder, J.A., and Saris, W.E., 1992. *An instrument for collecting informed opinions*. Quality and Quantity, 26, 245-258.

Nie, N.H., Verba, S., Petrocik, J.R., 1976. *The changing American voter.* Harvard University Press, Cambridge, MA.

Ogden, J.M. 2002. *Review of small stationary reformers for hydrogen production.* Princeton, Princeton University**:** 1-52

Petty, R.E., Cacioppo, J.T., 1986. *The elaboration likelihood model of persuasion*. In: Berkowitz, L. (Ed.), Advances in Experimental Social Psychology 19. Academic Press, New York.

Price, V., Neijens, P., 1998. *Deliberative polls: Toward improved measures of "informed" public opinion?* International Journal of Public Opinion Research, 10, 145-75.

Price, V., Neijens. P.C., 1997. *Opinion quality in public opinion research.* International Journal of Public Opinion Research 9, 4, 336-360.

ProtonChemie, 2005. http://www.protonchemie.com, 30-11-2005.

Ramirez Ramirez, A., Faaij, A., Hendriks, C., de Visser, E., de Best-Waldhober, M., Daamen. D., 2005. Decision support NGO's. Problem analysis and expert information on carbon dioxide emission reduction options for the Netherlands. Interim report CATO.

Reiner, D., Curry, T., de Figueredo, M., Herzog, H., Ansolabehere, S., Itaoka, K., Akai, M., Johnsson, F., Odenberger, M., 2006. *An international comparison of public attitudes towards carbon capture and storage technologies.* Paper presented at GHGT-8, 8th International Conference on Greenhouse Gas Control Technologies, June 19-22, Trondheim, Norway.

Rostrup-Nielsen, Sehested, and Nørskov, 2002. *Hydrogen and Synthesis Gas by Steam- and CO_2 Reforming*.

Rothwell G., Zwaan B van der., 2003. *Are light water reactor energy systems sustainable?* The Journal of Energy and Development 29, 1, 65-79.

Rubin, E.S., Taylor, M.R., Yeh S., Hounshell, D.A., 2004. *Learning curves for environmental technology and their importance for climate policy analysis*. Energy 29, 1551–1559.

Sailor W.C., Bodansky D., Braun C., Fetter S., Zwaan B., van der, 2002. *A nuclear solution to climate change?* Science 288, May 19, 2000, 1177-1178.

Saris, W.E., Neijens, P.C., De Ridder, J.A., 1983a. *Keuze-enquête.* Vrije Universiteit, Amsterdam.

Saris, W.E., Neijens, P.C., De Ridder, J.A., 1983b. *Kernenergie: Ja of nee?* SSO, Amsterdam.

Schuman, H., Presser, S., 1981. *Questions and answers in attitude surveys.* Academic Press, New York.

Shackley, S., McLachlan, C., Gough, C., 2005. *The public perception of carbon capture and storage in the UK: results from focus groups and a survey.* Climate Policy 4, 4, 377-398.

Sharp, J., Jaccard, M., Keith, D., 2006. *Public attitudes toward geological disposal of carbon dioxide in Canada.* Paper presented at GHGT8, the 8th International Conference on Greenhouse Gas Control Technologies, June 19-22, Trondheim, Norway.

Slingerland, S., Bello, O., Davidson, M., van Loo, K., Rooijers, F., Sevenster, M., 2004. *Het nucleare landschap: Verkenning van feiten en meningen over kernenergie.* Werkdocument 94, Den Haag.

Smeets E.M.W., Faaij A.P.C., Lewandowski I., 2005. *An exploration of the impact of the implementation of sustainability criteria on the costs and potential of bioenergy production applied for case studies in Brazil and Ukraine.* Report prepared for NOVEM and Essent, Copernicus Institute – Utrecht University, NWS-E-2005-6, ISBN 90-73958-00-8, February .

Smeets E.M.W., Faaij A.P.C., Lewandowski I.M., Turkenburg W.C, 2005. *A quickscan of global bio-energy potentials to 2050. Part B: regional bioenergy potential and an assessment of underlying variables.* Global Environmental Change, August.

Smeets E.M.W., Faaij A.P.C., Lewandowski I.M., Turkenburg W.C., 2005. *A quickscan of global bio-energy potentials to 2050. Part A: review of data and studies and development of a bottom up calculation model.* Global Environmental Change, August.

Strack, F., Schwarz, N., and Wänke, M., 1991. *Semantic and pragmatic aspects of context effects in social and psychological research*. Social Cognition, 9, 111-125.

Strack, F., Schwarz, N., Wänke, M., 1991. *Semantic and pragmatic aspects of context effects in social and psychological research.* Social Cognition 9, 111-125.

The Netherlands Ministry of Economic Affairs, 2004. *Policy Workshop: Development of Offshore Wind Energy in Europe.* Egmond aan Zee.

Tijmensen M.J.A., Faaij A.P.C., Hamelinck C., Hardeveld M.R.M. van, 2002. *Exploration of the possibilities for production of Fischer Tropisch liquids via biomass gasification.* Biomass & Bioenergy, 23, 2, 129-152.

Tokushige, K., Akimoto, K., Tomoda, T., 2007. *Public perceptions on the acceptance of geological storage of carbon dioxide and information influencing the acceptance.* International Journal of Greenhouse Gas Control 1, 101-112.

Turkenburg W., 2004. *Energietransitie richting duurzaamheid: het technologish perspectief.* Vromraad, Energieraad, Copernicus Institute.

Turkenburg, W.T.C., Hendriks, CA., 1999. *Fossil fuels in a sustainable energy supply system*, on request of the Dutch Ministery of Economic Affairs, Dept. of Science, Technology and Society and Ecofys, Utrecht.

U.S. Department of Energy, (Last updated 24/06/2005). *Hydrogen, fuel cells & Infrastructure Technologies Program.* http://www.eere.energy.gov/ hydrogenandfuelcells/

Utrecht Centre for Energy Research, Netherlands Energy Research Foundation, Ecofys and National institute of public health and the Environment, 2001. *DACES 2050. Database clean energy supply 2050.* Final report. Project number 98140090. UCE, Utrecht.

Van den Hoogen, W., 2007. *From "biowhat?" to "biowatt!". Contextual influence on the formation of attitudes towards novel energy technologies.* Dissertation, Technical University Eindhoven.

Van der Salm, C.A.,Van Knippenberg, D.L. and Daamen, D.D.L., 1995. *A critical test of the choice questionnaire for collecting informed public opinions.* Quality and Quantity 31, 193-197.

Van Dijk J.W. and P.J. Stollwerk, 2002. *CRUST – CO_2 reuse through underground storage.* Zwolle, the Netherlands.

Van Knippenberg, D., Daamen, D.D.L., 1994. *De Energie-Keuze-Enquête. De invloed van informatie van deskundigen op voorkeuren van het publiek met betrekking tot de toekomstige elektriciteitsvoorziening.* Report of Centre for Energy and Environmental Studies, Leiden University.

Van Knippenberg, D., Daamen, D.D.L., 1996. *Providing information in public opinion surveys: Motivation and ability effects in the information-and-choice questionnaire.* International Journal of Public Opinion Research 8, 70-82

Van Raaij, W.F., 1977. *Consumer choice behavior: An information-processing approach.* Doctoral Dissertation, Catholic University Brabant.

Verplanken, B.,1991. *Persuasive communication of risk information: A test if cue versus message processing effects in a field experiment.* Personality and Social Psychology Bulletin, 17, 190-195.

VROM, 2004. *Cijfers over wonen 2004. Feiten over mensen, wensen, wonen.* Den Haag, Ministerie van Volksgezondheid, Ruimtelijke Ordening en Milieu**:** 39.

Wade J., Wilshire V., Scrase I., 2000. *National and local employment impacts of energy efficiency investment programs*. Final report to the Commission. Association for the Conservation of Energy, London.

Whitelegg J., Cambridge H., 2004. *Aviation and Sustainability*. Stockholm Environmental Institute.

Wichers V.A., 2005. *Inzicht in de nieuwe mogelijkheden en de opbrengsten daarvan*. Top mananagement briefing Kernenergie, European Business Studies, August 31, 2005, Amsterdam.

Wijk A. van, Meuleman B., de Beer J., Blok K., Turkenburg W., Worrell E., 1994. *Sustainable energy system; technologies to reduce CO_2 emission*. NWS- Utrecht University.

Wildenborg, A.F.B., Wees, J.D., van Hendriks, C.A., Floris, F., Meer, L.G.H. van der, Schuppers J., Parker-Witmans, N., 1999, *Kostencalculatie van CO_2-opslag (cost calculations of CO_2 storage).* TNO and Ecofys Energy and Environment, Utrecht.

Williams R., Bunn M., Consonni S, Gunter W., Holloway S., Moore R., Simbeck D., 2000. *Advance energy supplies.* In: UNDP. World energy assessment. Energy and the challenges of sustainability. UNDP, New York.

Wolsink, M., 2006. *Invalid theory impedes our understanding: a critique on the persistence of the language of NIMBY.* Transactions of the Institute of British Geographers 31, 85-91.

Wolsink, M., 2007. *Wind power implementation: the nature of public attitudes: equity and fairness instead of 'backyard motives'.* Renewable and Sustainable Energy Reviews 11, 1188-1207.

Worrell E., Laitner J., Ruth M., Finman H., 2003. *Productivity benefits of industrial energy efficiency measures*. Energy 28,1081-1098.

Zwaan B. van der, 2004. *Nuclear power and global climate change: security concerns of Asian developing countries*. Resources, Energy and Development 1, p 1-18.

APPENDICES

APPENDIX 1: EXPERT INFORMATION

Option 1: Energy Efficiency Improvement

The *goal* of this option is to reduce 40 million tons CO_2 in 2030 by increasing energy efficiency 1% per year. This 1% is additional to the 1% per year that is expected to occur as a consequence of autonomous developments (changes that would happen regardless of the policies applied).

Description of the option

Energy efficiency is defined as the reduction on the energy used to produce one unit of activity. In this option, it is only considered energy efficiency savings at the end-user side. For instance, in the energy used to heat one m^3 of heat space (e.g. by increasing isolation and implementing better temperature control systems, it will be technically possible to reduce fuel consumption in buildings by 50% in 2015 and 100% in 2050), to produce a ton of steel (e.g., by using best available technologies) or to travel one kilometer by car (e.g., by decreasing the consumption of fuel per kilometer from 8 liters per 100 km to 3 or less liters per 100 km).

In this option, it is not taken into account improvements in energy efficiency in power generation plants; energy savings because less material is produced or because services are used in different ways (e.g., taking the train instead of a car or turning off lights when leaving a building, etc.).

How much energy can we save in the long term?

In the next 50 years energy efficiency in the Netherlands can be improved by a factor of 3 to 4 (industrial processes 1.5-2, offices and household buildings 5-10, personal cars 2-3). Not all of such energy efficiency measures pay back rapidly. However, even if only measures are considered which result in net savings once the necessary investments are taken into account, by 2020 already 70 million tons CO_2 could be saved (compared to the year 1995; technical potential), largely more than the 40 million required in this option by 2030. To achieve the 40 million tons strong governmental intervention is required which is able to stimulate private action. A strict energy efficiency policy will be followed, resulting in accelerated development and high penetration rates of energy efficiency technologies in all economic sectors.

Benefits of the option

Energy efficiency improvements reduce air pollution and carbon dioxide emissions by avoiding burning of fossil fuels. In many cases, it can also reduce noise, increase water savings and minimize waste. Many energy efficient appliances, devices and technologies also have a longer life than inefficient equivalent. The longer time span has environmental benefits in reducing extraction and processing of natural resources. Improvements in energy efficiency can also enhance the reliability of energy supplies by reducing system loads and stresses (for instance, by reducing consumer peak demand) and therefore decreasing the likelihood of blackouts and power shortages. It can also reduce the need for investments in energy infrastructure (plants and power lines). The general economy can benefit as well from improving energy efficiency since the money saved on fossil fuels can be spend otherwise and can create local employment. A calculation made for the European Union, based on the value of the energy saved from an energy efficiency increase of 1% per year for a period of 10 years, shows that this could lead to over 2 million man-years employments.

Policy measures at the sector level.

Consequences vary depending of the sector. In all cases, time and effort will have to be invested in finding and implementing energy efficient measures. This option requires strong government intervention in all sectors. Following there is a description of *possible* consequences:

Transport: There will be binding EU legislation requiring passenger autos to increase fuel consumption per liter from 12.5 km/l in 2005 to about 30 km/l in 2030. Additional measures such as road tolls, fiscal incentives for clean car, etc., will be in place. Car prices will be initially higher but it is expected that prices will decrease on time as a consequence of large-scale introduction of efficient cars. Heavy cars (e.g., SUV) will become more expensive.

Industry: Trading of CO_2 emissions among energy intensive industries, which has already entered into force, will stay and allowed emissions will go down by e.g., 1% p.a. There will be obligations for the non-energy intensive industry to increase energy efficiency. Possible measures are: binding standards for auxiliary equipment such as compressors units; market-based mechanisms for energy savings (white certificates), promotion of audit schemes and/or inclusion into emission trading. All industries will need to increase investments in energy efficiency but this will be compensated by fewer expenses for fossil fuels. No direct consequences for the consumer are predicted.

Buildings (service sector, households): There will be strict regulation for new buildings and for electrical appliances. Energy efficiency in old buildings/houses will be taxed according to performance (the less efficient the less benefits). Financial incentives will also be necessary (e.g., for insulation of existing buildings). Several types of measures will be accompanied by an increase in energy prices, which initially will reduce demand but in the longer term will encourage greater energy efficiency. The 40 million tons required in this option can be achieved using cost-effective measures (involving zero or negative costs), which mostly have payback periods shorter than 3 years. Hence, it is expected that energy savings in this option will lead to net cost savings for energy consumers. Analyses for the European Union show that an average EU household could save between €200 and €1000 per year in a cost-effective manner, depending in its energy consumption.

Sources: See Reference Section

Option 2: Energy Efficiency And Volume Reduction

The goal of this option is to reduce 40 million tons CO_2 in 2030 by increasing energy efficiency a further 1% per year (additional to the 2% p.a. of Option 1. The total energy efficiency improvement will therefore be 3% p.a.).

Description of the option

This option is composed, in first place, of the energy efficiency measures applied in Option 1 but with more strength. Additionally, this option includes the implementation of breakthrough technologies (e.g., introduction of new technologies in the industrial sector can reduce energy use by half or more; the use of light vehicles can reduce energy consumption from 8 to 0.8 liter/100 km); energy efficiency improvements in the material chain (e.g., by implementing material cascading, material substitution, including the use of biomass-derived materials); and energy savings due to changes in consumption (e.g., by reducing the amount of material produced in the manufacturing sector, by using public transport, by reducing consumption of energy intensive products, etc.). In this option, improvements in energy efficiency in power generation plants are not included.

Situation in 2030

Energy efficiency will be a main development criterion for new technologies. Low operation costs, combined with strict legislation restricting the use of energy, encourage users to implement new technologies. This results in an enhanced penetration rate of energy-efficiency technologies. This option also requires strong governmental intervention in other aspects of daily life, for instance, for steering certain forms of behavior (e.g., encourage the use of public cars, increase recycling rates, etc.).

Benefits of the option

Besides the benefits already named in Option 1, a substantial decrease in the energy demand can make the transition to an energy system with a substantial share from renewable sources much easier. In addition, by increasing the use of energy efficient products, decreasing the amount of products manufactured, and changing consumer behavior, fewer natural resources are required for manufacture, transport and distribution.

Policy measures at the sector level

A stricter energy policy than in Option 1 will be applied to all economic sectors. Following there is a description of some of possible consequences by sector.

Transport: For passenger transport, only light vehicles will be available, therefore limiting the choice of the consumer. Measures, such as road pricing, will promote the use of public transport and affect freight transport, which in turn will increase the price of goods. Additional taxes could also be applied to non-seasonal, non-regional products (e.g., kiwis from New Zealand or bananas from Guatemala). External costs will be included in the price of air tickets, for instance, by raising air passenger duty, introducing VAT on the prices, or considering emission trade for aviation. It has been calculated that levying emissions in a transatlantic flight will increase the price of a round ticket London- New York by 190 Euros.

Industry: Increasing energy efficiency by 2% p.a. in the industry will require the development and implementation of breakthrough technologies, involving higher investment costs than Option 1 (Option 1 was composed of the cheapest energy efficient technologies). An important challenge is to create a financial environment where is attractive to invest in complete process revisions/changes. Since breakthrough technologies tend to be more expensive than current designs, the implementation of these technologies will initially increase production costs. However, due to high end-use energy prices these measures could still be cost effective or implemented at low costs. These costs, or part of them, could be transferred to the consumer (e.g., by increasing the price of goods). There is no information available about the potential impact of high costs and future price uncertainty on economic growth.

There will be binding legislation that will assign to industries the responsibility for the waste produced after factory-gate (i.e., used products will go back to the industry for recycling) and reduce the use of unnecessary packaging. Legislation will also be in place that forces the consumer to recycle.

Buildings (service sector, households): Strict legislation will demand that new buildings are designed with almost zero fuel consumption and that old buildings diminish their consumption significantly, for instance, by more than 70% if compared to current consumption. This implies that consumers will have to modernize their buildings, with the consequent high investments, and/or suffer from loss of comfort (e.g., use less fuel by decreasing the temperature at which houses are heated in winter). Additional economic measures could be in place to encourage the use of the most efficient appliances. For instance, by assigning a cap for electricity consumption to each household (consumption over the cap will be more expensive). In any case, the price of energy will be higher than for Option 1.

Sources: See Reference Section

Option 3: Electricity Produced By Offshore Wind Turbines.

The goal of this option is to reduce 40 million tons of CO_2 in 2030 by installing offshore wind turbines with a total generation capacity of 17.000 MWe.

Description of the current situation

Wind power is renewable, which means that we won't run out of this energy source. Most wind turbines are grouped together and are located at windy places where steady and strong winds blow. Currently, most wind turbines are situated on land. A relatively new development is to place them offshore. To date, 620 MW offshore and near shore wind power capacity is operating, which is 2% of total wind power capacity installed in the European Union (EWEA, 2003). The international wind energy market grows by 30% each year.

In the Netherlands, no offshore capacity is installed yet. Future offshore wind parks will be built in the North Sea. The first Dutch offshore wind park is planned near the coast at Egmond aan Zee. This near shore wind park, located at a distance of 8 km from the coast, has an installed capacity of 108 MW (36 turbines with a capacity of 3 MW) and will become operational end of 2006. Over one hundred thousand households can be supplied with electricity from the wind park. Another wind park, Q7, is planned some 23 kilometers outside the coast of IJmuiden. This 120 MW wind park will become operational in 2007.

The Dutch government had set targets for offshore wind energy capacity. The target of 6000 MW offshore capacity in 2020 is left behind, but a gradual implementation of offshore wind is aimed at. Onshore wind energy should be increased to 1500 MW in 2010.

Situation in 2030

40 Mt reduction of the greenhouse gas CO_2 in 2030 can be achieved by the installation of 17.000 MW_e offshore wind power capacity. The average size of wind parks may increase to 200 MW by 2020 (ECN, 2005) to 500 to 1000 MW by the year 2030 (Personal communication, 2005). Especially on locations in the deeper sea larger wind parks can be built. With an expected average capacity for offshore wind farms of 750 MW in 2030, about 23 wind farms need to be installed in the North Sea. The 17.000 MW offshore wind capacity generates 60 TWh[10], which is about 30% of the total electricity production in the year 2030.

Technology development

Average size of wind turbines will increase in the future, from 3 MW_e at the moment to about 10 MW_e in 2030 (Personal communication, 2005). Today, prototypes with a capacity of 5 MW are already built.

The technology of wind turbines is still improving. Research and development efforts are mainly related to the re-design of wind turbines, such as smart electronics and tower improvements. Also, the prediction of short-term wind-electricity production and the integral design of wind farms are being subject to studies. Other trends next to the ongoing technology improvements are the mass production and standardization of wind turbines. Offshore wind technology is not mature and we are just in a starting phase. Further development and research is needed on turbines (dedicated offshore turbines) and infrastructure.

Changes in the infrastructure

Wind energy is a variable energy source, which means that the amount of electricity produced varies according to the supply of wind (wind speed). In a period with lack of wind supply, an alternative source of energy is required. Supply can be secured by implementing also other renewables, improvement of European grid connections, increasing back-up capacity or apply temporal storage, e.g., compressed air, batteries or hydrogen. The electricity grid is designed for and used to deal with these variations in load and supply. It is expected that the existing electricity grid is able to cope with an extra feed of a few hundred MW of electricity. The feed of higher capacities requires construction of extra and reinforced grids to assure the stability and transport capacity of the grid. Improved European interconnection will be required to better match demand and supply of wind energy. Storage of wind energy is a further possibility to cope with the variable supply. Several concepts to store wind power

[10] Based on 3500 full load hours per year as of 2006 (ECN, 2005)

during a certain period in time are being developed, like compressed air storage and hydrogen storage.

Long-term perspective

Two third of Europe's wind energy potential is situated in the North Sea (The Netherlands Ministry of Economic Affairs, 2004). The large areas of shallow water, which facilitates the construction of wind turbines, and the large wind resources make the Dutch part of the North Sea, with a surface area of about 57.000 km^2, a suitable area for wind energy capacity (Kooijman et al., 2003). A capacity of 17.000 MW_e offshore wind requires a surface area of somewhat more than 2000 km^2, which is about 6% of the surface area of the Netherlands (35.054 km^2). Figure shows a situation of what 17.000 MW_e offshore wind capacity in the North Sea could look like. Theoretically, the North Sea area is available, but other competitive claims, of which ships and military training zones are most important, have to be taken into account. More spatial claims for the North Sea comprise pipes and cables for the production of oil and gas, telecom, sludge dumping and the location of several areas with particular ecological value (Friese Front, de Klaverbank and Doggersbank).

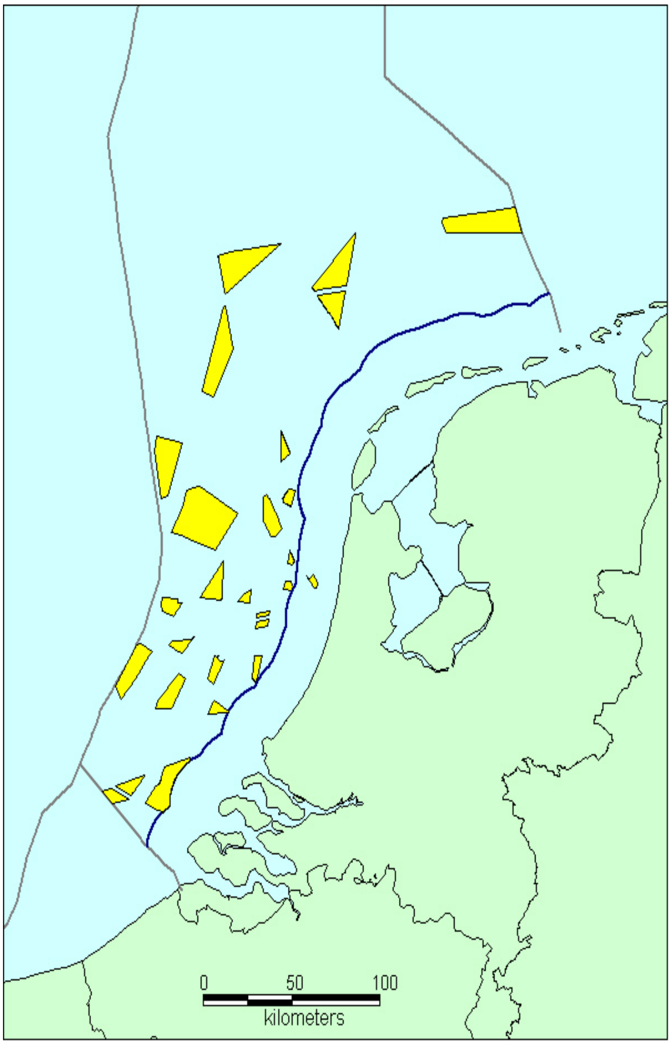


Figure 1 overview of 17.000 MW offshore wind in the Dutch part of the North Sea

If a total capacity of 17.000 MW offshore wind has to be installed, other priorities need to be set for the North Sea area than have been in place up to now (Personal communication, 2005). However, with careful study and sitting, wind energy should be able to complement other functions.

Environmental consequences

Impacts on birds and visual effects are the most important concerns with regard to offshore wind as it is assumed that for sea mammals and fish the effects will be minor or positive.

Bird and wildlife impacts. Bird impacts are very site specific and involve collision with wind turbines and interruption of migration routes. A study on bird fatalities by wind turbines in the Netherlands shows that 1.700 wind turbines cause about 50.000 bird deaths a year (ANP, 2005). For comparison, over one million birds are killed in the traffic in Denmark, and that the total number of staging and migrating birds in Denmark is 400 - 500 millions.

Besides bird fatalities due to collision with wind turbines, the habitat of birds could also be disturbed. Disturbance of birds occurs to birds that have their local habitat (resting, breeding etc.) or to flying birds. The effects of wind turbines on the habitat of birds are site and species specific. The distance at which disturbance plays a role is generally limited to 250-800 meters. Long barricades of wind turbines might prolong flying distance both during feeding and migration. Therefore, long uninterrupted wind farms are not favorable. Studies so far show that movements of mammals and fish are not affected by wind turbine foundation (aside from the period that the park is built), providing that their habitat is not fragmented by placing the wind parks. There is also a lot of discussion on the electromagnetic interference with fish from the submarine cables. Consequences for marine ecology are not very well known at the moment.

Fishery. Placing wind turbines in the North Sea might reduce the area that is available for fishing. The presence of wind turbine parks and the exclusion zones around them make that the area available for fishery becomes smaller. These wind turbine structures might have a positive impact on the recovery of fish stock when functioning as artificial reefs and safe havens (Greenpeace, 2003).

Flickering and noise. Other environmental effects are flickering and noise. Rotating turbine blades can cast moving shadows, which cause a flickering that can affect residents living nearby (EWEA, 2003). This argument might be of less importance for human beings because most wind turbines could not be seen from the coast. The effect of flickering on mammal, fish and birds is not known at the moment.

Noise from wind turbines comes from turning blades and from the gearbox, generator and hydraulic systems, but this mechanical noise is reduced to almost zero in modern wind turbines. There is evidence that noise will affect fish.

Economic aspects

Investment costs. Investment costs for offshore wind farms are currently 1200-1850 €/kW (Junginger, 2005), but will reduce in 2030 by approximately 35 to 50%. For the deep North Sea investment costs are higher. Widespread application of wind power, such as 17.000 MW, may reduce the costs even further. A range of final electricity costs for existing offshore wind farms is given by Junginger (2005) and ranges from 6-12 €ct/kWh. Current electricity production costs of 10.3 €ct/kWh are given by the

Dutch wind energy association and somewhat higher costs are presented in the Reference Projection 2005-2020, namely 12-14 €ct/kWh.

Compared to a current production costs of 3-5 €ct/kWh for fossil fuel-based electricity, electricity from wind tends to be about two to three times as expensive as electricity produced by conventional power plants. Electricity from wind power becomes competitive to conventional power in the period 2015 to 2020 when large capacities of wind power are installed and conventional power costs increase, e.g. if the current high level of oil continues ($60/bbl) or even increases. With a goal of 17.000 MW_e offshore wind energy capacity additional investments need to be made for new infrastructure that transports the generated electricity to the mainland and further into the mainland. The feed of extra electricity to the grid will impose high demands on the grid onshore. However, adjustments are needed anyway because of the higher consumption and the change of the electrical organization in the power sector. Possibilities exist to implement changes jointly, such as improvements in transport capacity between countries. Wind power is a variable source of power production, which actually says that the output varies with the wind speed. The variable nature of wind power supply and the varying loads ask for additional provisions. Costs need to be made to cope with these aspects, e.g. by adding storage capacity, adding back-up power and/or by enforcement of the (international) grid connections. Storage concepts are costly at the moment and technology is not mature.

External costs. The costs of electricity from wind cannot easily be compared to the cost of electricity from conventional sources when external costs are not dealt with. External costs are the costs to human health and environment that are not accounted for in the price of electricity alone. Wind energy technology is environmental friendly with respect to emissions of pollutions like SO_2, NO_x and dust particles and with respect to greenhouse gas emissions. The variability of external costs of wind energy depends on noise, amenity impacts and the upstream processes (production). The external costs of wind energy vary between 0 and 0.25 €ct/kWh. For comparison, the external costs of coal are lowest in Finland with 2-4 €ct/kWh and highest in Belgium with 4-15 €ct/kWh (European Commission, 2003).

Creation of jobs

Studies show that offshore wind is likely to have a positive effect on employment. Jobs created in construction and installation depend on the rate of installation of new wind turbine farms. Jobs in operation and maintenance will exist for the time wind farms are operating. In a study that Borderwind for Greenpeace estimates are given of direct employment to develop offshore wind farms. All sectors together, like project design and development, component supply, assembly, installation and operation and maintenance, result in 4.52 full time jobs per MW offshore wind installed (Borderwind, 1998). Meaning that with the installation of 17.000 MW offshore wind over 75.000 jobs are created in all sectors together.

Sources: See Reference Section

Option 4: Biomass

The goal is to have 6000 MWe capacity in 2030 for biomass-fired power plants (primary biomass fuel use about 260 PJ) and 200 PJ for car fuels (primary biofuel use about 340 PJ) (shares of each can be adjusted).

Global outline

Biomass is organic material such as wood, grass, organic waste, straw, etc. It can be used as fuel for the production of electricity, heat and as a fuel for cars such as ethanol (an alternative for gasoline) or (synthetic) bio-diesel. When biomass is produced in a sustainable manner, its use does not contribute to CO_2 emissions due to the fact that during their growth plants take as much CO_2 from the atmosphere as it is released when converting them into energy.

In 2030, less than 10% of the national energy demand in The Netherlands can be supplied by the efficient use of available organic waste, residues and, for a small part, by wood (i.e., willows) cultivated in The Netherlands on agricultural ground no longer in use (e.g., buffer areas in nature reservation areas and in water retention areas close to rivers).

To be able to obtain in the year 2030 a CO_2 emission reduction of 40 Mt, an (extra) contribution of about 600 PJ from biomass is needed (this on top of the current use of biomass). In 2030, this amount of biomass (or fuel produced from biomass) will have to be imported because the Netherlands does not have the land needed for the cultivation of large-scale energy crops. The production of biomass will, therefore, take place in regions such as Brazil-Uruguay, the South of Africa (e.g., Mozambique and Zambia), and East Europe (e.g., Ukraine, Rumania and Russia).

Most of the imported biomass (in the form of pellets or raw biofuels produced in the exporting country) will be efficiently converted into high quality transport fuels and, for a smaller part, into electricity in a couple of big plants in seaports like Rijnmond, Eemshaven, or Terneuzen. An important share of the current oil refinery capacity will be replaced. About two thirds of the demand for transport fuels in The Netherlands will be replaced by biofuels. A part of the energy production from biomass will take place in modern coal-fired power plants, in efficient waste treatment units based on gasification, and a part of biogas production by means of anaerobic fermentation.

Economic Impacts

In 2030 the production costs of biofuels will be roughly the same as the cost of gasoline and diesel made from oil. Bio-electricity will also be competitive.

Environmental impacts

If compared with gasoline and diesel, the use of biofuels will lead to significant lower emissions of dust, carcinogenic hydrocarbons (soot), NOx, SO_2 material and smog produced by cars. Electricity production will be as clean as that produced from fossil fuels and it will comply with the strict environmental regulations of 2030.

Biomass production in other world regions will require large cultivation areas. The ecological and social-economic impacts of energy crops can be positive if biomass is cultivated in a responsible manner within strict criteria. This can be achieved by implementing an internationally accepted certifying system, which should be in place and widely accepted in 2030. This certification, in conjunction with good practice guidelines, must guarantee the principles of sustainable use of land, water management, nature conservation and ‘fair trade’. At best, biomass production can lead to abatement of poverty in rural regions, regenerate degraded lands and lead to more sustainable agriculture. If this cannot be guaranteed, large-scale biomass production could, in the worst of cases (e.g., by introduction of large scale monocultures), generate serious consequences in relation to water reserves, increasing pressure on agricultural land and forests, as well as the exclusion of small farmers.

LAND USE FOR ENERGY PRODUCTION

Biomass production requires land. Relatively conservatively, the productivity for a perennial crop (like Willow, Eucalyptus or Switchgrass) lies between 8 - 20 tons dry matter per hectare per year depending on location, climate and soils. The heating value of dry clean wood amounts about 19 GJ/ton (HHV). This is gross energy yield, and the energy inputs for cultivation, fertilizer, harvest, etc, amounting about 5%, should be deducted). One hectare can therefore produce about 150 – 350 GJ/ha net per year. 1 PJ would require 3,000 - 7,000 ha.

The amount of fuel needed to fire a 600 MWe base load power plant (7000 full load hours) with 40% efficiency is 38 PJ per year. This would require 115,000 - 260,000 ha.

Supplying one quarter of the world’s current energy consumption, i.e. about 100 EJ, would require about 300 - 700 million hectares (Mha), which is a quarter to half of the present worldwide land use for agriculture and equals 2% - 5% of the total world land surface. The total land surface of the Netherlands amounts 3.4 Mha, and the present Dutch energy demand is about 3000 PJ. Covering one quarter (750 PJ) of the national energy demand with (imported) biomass would require about 2 – 5 Mha.

Energy balance: By transforming biomass into materials with a high density (like pellets or oil) or direct fuel production in the producing countries, the energy balance is positive; production and international transport of biomass demands no more than 10 % of the total energy produced (which is comparable coal or gas production chains).

Energy supply reliability

Increasing the share of biomass in the Dutch primary fuel mix will increase diversity, which is advantageous for the reliability of the energy system. In particular, the dependency on oil will decrease. This is of great strategic importance given the expected oil world shortage during the first half of this century.

Furthermore, it is possible to produce biomass in different parts of the world. Potentially, important export regions will be: Latin America, The South and East of Africa, East Europe/Russia and Oceania.

Changes in infrastructure

Biofuels can be introduced in the main sea harbors without fundamental changes. However, the required conversion capacity will have to be aligned with the capacity of existing refineries. With a gradual introduction over the coming decades, there should not be fundamental problems.

In the coming decennia, large scale availability of high quality fuels for transport will make possible the introduction of more efficient and cleaner cars into the market (with the so-called flexible fuel concept). Policies are needed to support the introduction of such cars and fuels into the market. Also the conversion technology development will need support, be it that technologies are especially developed by companies outside the Netherlands. It is important that logistic capacity is developed in seaports for the transport and conversion of biomass and biomass products.

Total potential of this option/ long term perspective

Within this century, the potential for the production of biomass on a global scale is very large. Estimations for 2050 are in the range of 20 to 50 % (200 to 500 EJ) of the global energy demand. If produced in a sustainable way, biomass as a renewable energy source, is a desirable alternative in the long-term.

The potentially most important constraint lays on the stagnation of efficiency improvements in the agricultural sector, especially in developing countries. Lower efficiency developments imply that land requirements to fulfill food demand stay high. A part of the long-term potential of biomass is thus dependent on the speed at which such efficiency improvements will be implemented. In turn, however, the introduction of biomass production can also accelerate this development process.

The potential technical developments and experience with (sustainable) production systems can decrease the production costs of biofuels, and the price may become lower than that of gasoline and diesel fuel at this moment (i.e., 60 US$/barrel). Biofuels can also be used in new generation cars, for instance cars that drive on fuel cells

Technology innovations

The technology development that is necessary (for conversion and pre-treatment) will take place in the coming 10 to 20 years in the international arena, with a potentially interesting role for the Dutch industry.

The most important condition for this option is the implementation of an international market for biomass (that is sustainable produced). Various (trade) barriers need to be removed and an international level playing field created. Also, sufficient logistic capacity (ships, transfer and storage capacity in harbors) must be available.

Sustainable production should be integrated in the current agriculture of different regions and circumstances in the world. The introduction of internationally recognized certificates and monitoring, the development of a global market and the implementation of logistic capacity in potentially important export regions, are the major boundary conditions. This is an area where the Netherlands could play a leading an innovative role.

Development costs

These costs are not of fundamental importance. The development trajectories for key technologies are relatively certain. In addition, there is already vast (commercial) experience with bioenergy.

Macroeconomic consequences

In 2030, imported biomass will not necessarily be more expensive than gas or oil. It is expected a 'more stable' price once companies offer their products in the world market, leading to stable energy prices, which on the long-term can be more advantageous for the economy.

For a considerable group of developing countries (Africa and Latin-America) and East Europe, the possibility of large-scale export of renewable fuels could represent a source of significant revenues as well as increasing working opportunities in rural areas. However, when biomass demand competes with food production, also increases in land and subsequently food prices could be observed. This should be avoided and secured by certification.

The value of 600 PJ imported and processed biomass (equivalent to the possible Dutch demand in 2030) amounts over one billion Euro (in the range of 40-60 Euro/ton). In particular, the chemical industry and the transport sector can benefit in economic terms from large-scale imports and the construction of new factories that also produce renewable materials such as biochemicals.

Sources: See Reference Section

Option 5: Carbon Capture And Storage From Power Plants

The goal of this option is to reduce 40 million tons of CO_2 in 2030 by capturing and storing the emissions from power plants with a total capacity of 8000 MWe.

Description of the current situation

Carbon dioxide can be isolated from a combustion process and subsequently stored in underground layers instead of today's situation of emitting it into the atmosphere. Storage concepts have been proven by several projects. Since 1996 a Norwegian oil company stores annually one million tons of CO_2 in underground layers in the North Sea. Monitoring is carried out to find out what happens with the carbon dioxide. In the Dutch part of the North Sea, Gaz de France stores annually 20.000 tons in a nearly empty gas field. CO_2 is also pumped underground in oil reservoirs to enhance the recovery of oil. Although not for the purpose of reducing CO_2 emissions, this process is frequently used in the United States. Capture of CO_2 is common practice in the chemical industry and gas industry. Large-scale capture from power plants has not yet been demonstrated. Transport of CO_2 is regularly applied and is technically possible.

Situation in 2030

The 40 Mt emission reduction of the greenhouse gas CO_2 in 2030 will be achieved by equipping 8000 MW_e of power plant capacity with capture facilities. This is about 15-20% of the total installed capacity of power plants in 2030. Capturing technology is mainly integrated in new established plants. A small part of the target could also be achieved at existing power plants by retrofitting the plant. This however is a less economic operation.

Technology development

Capture of carbon dioxide from large-scale power plants has not been applied yet on a commercial scale. Demonstration projects are going on to see if carbon capture and storage is practically applicable. Worldwide there are about 100 geologic storage projects ongoing and proposed. Over 40 demonstration projects focus on the capture of CO_2. In most of these projects existing capture technologies are applied (IEA, 2005). No major technological bottlenecks are expected, although uncertainties exist regarding costs and energy use of the capturing process. Transport of the captured CO_2, especially by pipelines, is technically feasible and demonstrated in various countries.

The injection of carbon dioxide in underground reservoirs poses little technical problems, because the same technologies are used in oil and gas exploration and production. Once the CO_2 is injected it is stored in the underground. Well-drilling, injection, computer simulation of storage reservoir dynamics and monitoring methods are well developed. There is however much uncertainty on the behaviour of the stored CO_2 on the longer term (leakage) and substantial research and development efforts should be dedicated to this issue.

Changes in the infrastructure

No major infrastructural changes are needed for or expected for the implementation of capture to power plants. The energy system will continue to rely on fossil fuels. Carbon capture and storage is a viable option to contribute to mitigation of CO_2 in the way that it creates flexibility in achieving greenhouse gas emission reductions.

In principle, CO_2 can be captured from all installations that combust fossil fuels provided that the scale of the emission source is large enough. Carbon capture from electricity plants offers the best initial potential for capturing CO_2, because large streams of CO_2 become available (IEA, 2005). A possible shift towards small-scale units will become less attractive. For the planning of new plants also possible storage locations for CO_2 need to be taken into account.

The application of carbon capture technology does not affect the transmission of electricity. But next to the power infrastructure, also a CO_2 transport infrastructure will be required to transport the captured CO_2 to the reservoirs. Large-scale application in the Netherlands will require thousands of kilometers of pipelines. The underground infrastructure could disturb normal life when for example, streets are blocked during construction of underground pipelines.

Long-term potential

Over 80% of the Dutch energy supply relies on fossil fuels. For the next decades, fossil fuels will remain the dominant energy source to meet the energy demand. CCS will make it possible to continue using fossil fuels with reduced emissions of CO_2. Fossil fuels are abundantly available. Studies show that worldwide 3000 Gt C (equal to 11.100 Gt CO_2) can be extracted at costs less than 20 € per barrel (Turkenburg and Hendriks, 1999). Globally, emissions of CO_2 from fossil fuel use in the year 2000 were about 23.5 Gt CO_2 per year (6 GtC per year)[11] (IPCC, 2005). Power generation, represented mostly by large point sources, is responsible for circa 40% (IEA reports 29%) of these global CO_2 emissions.

Less certain is how much storage capacity for CO_2 is available. Studies show that it is likely[12] that there is a global storage capacity of at least 2000 Gt CO_2 (IPCC, 2005). This capacity is sufficient to store 80 times the global CO_2 emissions in 2005 from fossil fuel use. In the Netherlands there are many empty gas and oil fields relatively nearby. Gas fields have by far the largest potential in the Netherlands. Up to 2040 the proved potential of empty gas fields is calculated at 1200 $MtCO_2$. When the gas field in Groningen is exhausted, after 2040, some additional amount of 6500 Mt CO_2 can possibly be stored (Van Dijk and Stollwerk, 2002). The capacity of oil fields is rather limited with 54 Mt CO_2 to be stored. The storage potential in saline aquifers might be in the order of hundreds to thousands Mt CO_2. Storage capacity could turn out to be somewhat less if reservoirs if alternative uses are planned, e.g., for underground gas storage (UGS).

Environmental consequences

Capture of CO_2 from power plants will not only reduce emissions of CO_2 but could lead to reduction of many other pollutants such as SO_2, NO_x and particulates, depending on the technology applied. It is technically possible to construct near-zero emission plants, without harmful emissions, but 80-90% capture of CO_2 on a per plant basis is more attractive from an economic point of view. Extraction and transporting fossil fuels causes greenhouse gas emissions, mainly methane from coal mining. Depending on the mine, this is 5 to 10% of total greenhouse gas emissions per produced kWh.

Safety issues

Extraction. When applying carbon capture and storage the use of fossil fuels is continued. At the start of the chain for fossil fuel use, fossil fuels are extracted from the earth. Health and safety issues are mainly related to coal mining. When half of the Dutch plants, equipped with carbon capture and storage, will run on coal, mining will cause yearly about three deaths.

[11] 1 Gt C = 1 billion metric tons of carbon equivalent = 3.7 Gt CO_2
[12] 'likely' suggests a probability of 66% to 90%

The risks related to carbon capture and storage can be divided into two categories. Local risks are related to possible impacts of CO_2 release on people, animals and the local environment. The effectiveness of carbon capture and storage to reduce global carbon dioxide is an indication for the global risks of the process of CO_2 capture and storage.

Capture process. In industry the process steps of absorption and compression of CO_2 are common practice. CO_2 is used in various applications like cooling, drinking water treatment, foam production etc. The risks associated with capturing carbon dioxide from the production process are well known and manageable using standard engineering controls and procedures (IPCC, 2005).

Transport of CO_2. The main risk involved with transportation of carbon dioxide is leakage. Carbon dioxide might leak gradually from pipelines or escape in a short time by large amounts, e.g. because of a pipeline rupture. CO_2 leaking from a pipeline is a potential asphyxiate for humans and animals. Concentrations of 7-10% of CO_2 in air can cause lethal effects in human beings (IPCC, 2005). A characteristic of CO_2 that needs to be considered when selecting a pipeline route is the fact that CO_2 is denser than air. The CO_2 accumulates at the point of emission and might also accumulate to potentially dangerous concentrations in low-lying areas. Since CO_2 is not explosive or inflammable, the consequences in case of leakage are expected to be smaller than natural gas.

The incidence rate of pipeline failure is relatively small. Studies show that the incidence of failure has markedly decreased, and most of the incidents refer to very small pipelines, principally in gas distribution systems. When CO_2 escapes from a pipeline it will be dispersed by the prevailing wind. This behavior of the released CO_2 might be a positive circumstance for the Dutch situation. Statistics on pipeline incidents indicate that CO_2 pipelines are no less prone to incidents than natural gas pipelines. In the United States, where a 3100 km CO_2 pipeline infrastructure lies (in not densely populated areas), some 14 accidents happened between 1990 and 2004 without any injuries or deaths, corresponding to a frequency of approximately 3.10^{-4} incidents per km year (Gale and Davison, 2003).

Injection of CO_2. The major risk associated with injection is a wellhead failure, which could have different causes like, unsuitable construction, leaking pipe connections, defective materials and collapse of the well. Corrosion of injection equipment is one of the reasons for leakage during injection. Blocking of the wellbore (e.g. by formation of ice or hydrates) represents a different risk. In the majority of failures the amount of CO_2 released would equal the content of the well. Monitoring systems detect the leak and prevent the CO_2 from escaping the well. The frequency of blowouts from CO_2 wells is considered equal to those from natural gas and is calculated. The probability of a well blow-out is calculated at once per 10.000 years (CMPT, 1999) or once per 1000 years (DNV, 2003). The potential consequences from a well blow-out are casualties (lethal, injuries) among operators and economic damage caused by temporal disruption of the system.

Storage. The stored CO_2 in the geological reservoir might migrate out of the reservoir through the subsurface into the atmosphere. The likelihood of accidental releases of

CO_2 from geological storage reservoirs has not been quantified today, especially for the longer term. Effects on the quality of groundwater, soil, energy and mineral sources are less understood compared to health effects on humans. CO_2 leakage may also harm flora and fauna, drinking water reservoirs and the environment. Fresh, potable ground water, located at 100-200m below the surface, could be contaminated by leakage of CO_2. Leakage into surface water would increase acidity (pH is lowered) and could therefore affect ecosystems.

On a global level, leakage of CO_2 would become a diffuse source of greenhouse gas, which is difficult to control. The effectiveness of storing CO_2 in the underground is being reduced when CO_2 migrates out of the reservoir. In several countries studies are done, to develop more knowledge on leakage from underground reservoirs. For example, soil gas measurements taken at the Rangely Weber oil field, where CO_2 is injected for enhanced oil recovery, indicates that about 3,800t/y of CO_2 leak out of the reservoir over an area of 78 km^2, which corresponds to 0.012% of the overall annual CO_2 injection rate. The mechanisms involved are not understood (Klusman 2003). Monitoring of current storage locations did not yet observe any leakage (Weyburn and Sleipner project). Large uncertainties still do exist on the long-term consequences of CO_2 storage. Experts believe that careful selection of the sites and adequately regulated monitoring will reduce leakage rate considerable.

Economic aspects

Electricity production costs will increase from 30-45 €/MWh without CO_2 capture to 45-70 €/MWh with CO_2 capture, including transport and storage costs. The electricity price for small consumers will increase by between 10 and 25%, assuming all other costs remain equal.

The capture step bears the largest costs; about 60 to 80% of the costs. Transport is costly when the CO_2 has to be transported over large distances to the storage location, through difficult accessible areas (e.g. highly populated areas) or when only small volumes are transported. The cost for storage is relatively small compared to the other cost components. Sometimes even existing infrastructure could be used.

Commercial experience is limited in configuring the various components into an integrated carbon capture and storage system. Costs of carbon capture and storage will reduce over time by improvements in performance or finding less expensive ways to build and operate the capture equipment. Improvements in performance refer to the separation and compression step, which are the most important cost factors.

Cost reduction of carbon capture and storage systems is driven by the experience gained with the technology during commercial deployment. Experts expect that carbon capture and storage systems show similar cost reductions compared to other emission control systems in related industries. An average learning rate of 12% is assumed for the expected capital cost decline of carbon capture and storage technologies, which says that with every doubling of installed capacity the capital costs decline with 12% (Rubin, 2004). Largest cost reductions however could be obtained by changing the method of capturing or to change the entire process. On the long term, economies of scale in plant construction and plant sizes can reduce the costs further. Some authors expect cost reduction up to 25% towards 2030 and 50%

towards 2050 when full- scale application of carbon capture and storage is applied (Hendriks et al., 2004).

Sources: See Reference Section

Option 6: Carbon Capture And Hydrogen Production

The goal of this option is to reduce 40 million tons of CO_2 in 2030 by capturing and storing the emissions from hydrogen production plants for use in cars and in households

Description of the current situation

Large-scale hydrogen plants use the Steam Methane Reforming (SMR) process for the production of hydrogen from natural gas. This is the most common and least expensive method. Worldwide 48% of the hydrogen is produced from natural gas (U.S. Department of Energy, 2005). Hydrogen is also produced by gasification of coal and in small amounts by electrolysis of water. Carbon dioxide is already separated from the hydrogen production process. To capture the carbon dioxide for storage underground, these processes need minor modifications to collect the carbon dioxide in pure and compressed form.

In the chemical industry, hydrogen gas is used to make chemicals, such as ammonia and methanol. Refineries are also a large market for hydrogen. For these large-scale chemical processes such as oil refining, steam reformers produce 25 to 100 million standard cubic meters of hydrogen per day. To compare, with this amount of hydrogen a fleet of about 225.000 to 900.000 fuel cell vehicles, each driving 11,000 km a year, could be powered (Ogden, 2002). An extended pipeline infrastructure is present in the south of the Netherlands and Belgium. Use of hydrogen in households and cars is virtually non-existent. In households, hydrogen could be added to the natural gas up to a percentage of 10-20 volume-% (Protonchemie, 2005) safely and without need for modifications of appliances. Higher hydrogen content in the gas mixture requires new or modified appliances. Cars equipped with fuel cells are in an early stage of development; some demonstration vehicles are on the road.

An important feature of a hydrogen use is that CO_2 is no longer produced by the end-user, for instance by the car, but is produced during the hydrogen production process. Carbon capture techniques downscaled to individual cars might be very expensive, but carbon capture at plant level, where a large stream of CO_2 is emitted, is viable. In a hydrogen plant with carbon dioxide capture emissions are reduced with 85% or more compared to the use of natural gas or the use of gasoline. The captured carbon dioxide is compressed and stored underground. The consequences of this are described in option E.

Situation in 2030

In the Netherlands potential markets for hydrogen are the transport sector (passenger cars), households and industry. In order to avoid 40 Mt CO_2 emissions per year, 675 PJ natural gas and motor fuels[13] have to be replaced by hydrogen. Half of the 40 Mt target is achieved by replacing motor fuels by hydrogen in the transport sector and half by introducing hydrogen to replace natural gas in households. Hydrogen based fuel cells and micro CHP systems have higher efficiencies compared to the technologies they substitute. On the other hand, handling of hydrogen (compression, storage and transport) are less efficient than natural gas. This option is based on the assumption that 1 PJ hydrogen replaces 1 PJ natural gas. With these assumptions projections up to 2030 are more straightforward, but efficiency improvements in underlying technologies are not covered.

Large hydrogen production units typically have a capacity of 1000 MW and produce about 30 PJ per year. The number of plants needed to fulfill the demand of 675 PJ accordingly is about 20 to 25.

Hydrogen in the transport sector. The total Dutch fleet of passenger cars in the year 2004 amounts to 7 million, emitting about 20 Mt CO_2. According to projections of RIVM, the car fleet may increase to over 10 million in 2020. If this trend continues, the passenger car fleet might be over 11 million by the year 2030. Accounting for efficiency improvement in cars the emissions rise to between 23 and 27 Mt of CO_2 in 2030. A reduction of 20 Mt CO_2 emissions emitted by passenger cars could be achieved by fuelling between 75 and 85% of the cars on hydrogen in 2030.

Hydrogen in residential areas. By replacing natural gas use in households with hydrogen, the net emission reduction is calculated at 2500 – 3800 kg CO_2 per dwelling (De Groot & Jeeninga, 2003). To reduce 20 Mt of carbon dioxide between 5.4 and 8.0 million households need to shift from natural gas to hydrogen use. The number of households in the Netherlands is forecasted to grow from 7.1 million in 2005 to 8.3 million in the year 2030 (VROM, 2004). According to these numbers, 65% to 97% of the households need to shift from natural gas to hydrogen use to achieve the 20 Mt reduction target.

The transition from a fossil fuel based energy system to a hydrogen based energy system needs time. The time horizon for the hydrogen economy, comprising new ways of energy production, distribution and storage, is at least 20 years away for developed countries. Conversely, demonstration projects of carbon capture and storage are already going on.

Technology development

Technologies are used in various steps in the hydrogen chain: production, transport, and (intermediate) storage of hydrogen. Towards 2030 the efficiency will improve and costs will reduce for each step of this chain.

[13] With an average emission factor of 66 kg CO_2/GJ_{LHV} and a capture efficiency of 90%.

Production of hydrogen: currently hydrogen is produced mainly from natural gas with efficiencies varying from 70% to 85%. In 2030, optimization of the hydrogen production process results in efficiencies up to 90%. Radical improvements in hydrogen production technologies with CO_2 capture are foreseen in the use of inorganic membranes, replacing the pressure swing absorption unit for hydrogen separation and absorption columns for CO_2 separation.

Transport of hydrogen: Before the hydrogen is transported it is compressed or liquefied. Transport of the hydrogen could be done by pipeline or truck, depending on the quantities to be transported and distances.

Storage of hydrogen: Because of the relatively low energy content per volume for hydrogen, the storage volume needs to be large. If there are no limitations to the scale of storage, no stringent problems exist. Hydrogen storage in cars with fuel cells is more problematic, because of the volume needed to store an amount of hydrogen with the same energy content as petrol, is much larger. The weight of the storage tank is much larger compared to the weight of the hydrogen that is stored. This problem especially plays with ‘onboard’ storage of hydrogen in cars. Development will focus on the improvement of the storage capacities. Pressurized hydrogen or hydrogen captured in hybrids are promising storage technologies for future applications.

End-use of hydrogen: Fuel cells that convert hydrogen into electricity could be used to facilitate the use of hydrogen in the transport sector. Fuel cell technology is in the early stage of commercialization; in Japan, US and Europe some cars are already on the road. The proton exchange membrane (PEM) fuel cell, with typical efficiencies of 50% to 68%, is the most likely candidate for application in vehicles.

The conversion efficiency from hydrogen in a fuel cell vehicle is 38%. The fuel efficiency is 16% for a gasoline vehicle. However, for each 100 GJ of natural gas extracted, 58 GJ hydrogen is delivered to the tank, while for each 100 GJ oil 88 GJ gasoline is delivered to the tank (‘well-to-tank’ efficiency). In the end, fuel cell vehicles use less energy per kilometer driven (ECN, 2004).

In the period 2020-2030 fuel cell vehicles might be introduced in substantial numbers. Experts believe that beyond 2030, hydrogen fuelled vehicles could increase in numbers and take over conventional cars. The European vision on a hydrogen economy stipulates that in 2020 fuel cells become competitive for passenger cars and by 2040 fuel cell technology is dominant in transport (EC, 2003). The most important barriers that prohibit large-scale commercialization of the fuel cell technology in vehicles are the current high costs, the lack of a refueling infrastructure and the limited storage capacity in vehicles (De Groot & Jeeninga, 2003).

Changes in the infrastructure

Additional infrastructure and supporting facilities are required for the large-scale implementation of hydrogen in society. Storage facilities, pipelines, refueling stations for hydrogen supply, but also trained personnel are necessary. A fine knitted pipeline network might be constructed, especially when hydrogen is transported to residential areas and refueling stations. The most pinching problem is that the success of hydrogen strongly relates to the large-scale use of this energy carrier. For example, people will not buy a fuel cell driven- vehicle while there is just one refueling station in the near surroundings. Large investments have to be made in a system that will not be used by its full potential during the start-up phase. This issue could partly be solved by decentralized production of hydrogen, which matches the supply and demand in a better way.

Environmental consequences

The conversion of hydrogen in fuel cell vehicles and household appliances only produces water vapor that is emitted to the atmosphere. This improves the local air quality to a significant extent. Also, fuel cell vehicles do not produce engine noise. Sound levels in urban and residential areas are brought down from 85 dB (average road way noise) to 70 dB or less and as a consequence sound pollution is reduced.

Safety issues

Hydrogen differs in physical properties from conventional fuels like gasoline and oil. Therefore, new ways of storage, distribution and use of the hydrogen are required. The immediate dangers are those of fire and explosion, since hydrogen burns over a wide range of concentrations in air. In confined spaces hydrogen is highly explosive, but in open areas an explosion is almost impossible because it dissipates rapidly into the atmosphere. When hydrogen is used in the built environment it is transported to the residential area and stored close to or in houses and buildings. Especially in the built environment the risk of leakage of the hydrogen should be addressed. The high diffusivity of the hydrogen makes that hydrogen leakage occurs more easily than natural gas leakage. Possibly, in houses this might involve higher risks and therefore more safety measures should be taken. It is important to develop equipment standards for hydrogen systems in residential areas. At the moment, experts do not agree on safety aspects of transport systems for hydrogen in residential areas (Hoogenraad, 2004). Risks associated with hydrogen storage in cars are considered equal to risks associated with natural gas and LPG.

Economic aspects

Production costs. The estimated cost of hydrogen produced by large-scale steam reforming with CO_2 capture is 8-10 €/GJ, but varies strongly depending on the gas price and location. Carbon capture increases the costs of hydrogen production with 11 to 21% depending on the case (NAE, 2004). Carbon capture reduces the efficiency of large-scale plants by about 10% (NAE, 2004). Main part of the costs, up to 50-75%, is made up of the fuel costs (natural gas). The costs of hydrogen are approximately three times as high as compared to the costs of natural gas.

Transportation. The cost of hydrogen is not solely determined by the production costs, but also the storage and distribution of hydrogen add to the costs. Costs for distribution of the hydrogen vary widely according to the method used. Hydrogen transport via pipelines is the lowest cost option when high volumes need to be transported. A large-scale hydrogen network could be similar to an existing natural gas network. Costs might be 50% higher due to the use of different materials and special design of pumping stations. Also pipelines should have a larger diameter because hydrogen has a lower volumetric density than natural gas. Other studies suggest that the costs for pipeline transport could be similar to the costs of pipeline transport of natural gas.

Infrastructure. The shift to a hydrogen economy definitely has infrastructural consequences in the way that large investments are required for implementation of a hydrogen infrastructure. A new infrastructure brings with it additional costs that are not counted for in the ‘business-as-usual’ scenario. The government would have to intervene to allow accounted investment in a new infrastructure for hydrogen.

End use. Typical costs of hydrogen (in €/GJ) for house-holds, including compression and transport costs, might be about 25-35% higher than costs for natural gas. Hydrogen costs might be 13-16 €/GJ, whereas costs of natural gas for house-holds were about 10 €/GJ in 2002 (De Groot & Jansen, 2004).

The end use costs of hydrogen for transportation might result in higher costs because of additional requirements as storage and liquefaction of the hydrogen. Costs of gasoline (without taxes) is about 8-10 €/GJ and over 40 €/GJ including taxes (2005). The additional costs to produce and deliver hydrogen at the fuelling stations are about 10 to 20 €/GJ; but the exact costs are not clear yet.

Fuel cell vehicles will be more expensive than gasoline based internal combustion engine vehicles (ICEV), due to the cost of the fuel cell and necessary electricity system. In 2005, a fuel cell vehicle costs 27.000 € more than a conventional diesel or gasoline hybrid car. In the year 2030 a fuel cell vehicle will cost 1.500 to 2.000 € more than a diesel or gasoline hybrid car (Menkveld, 2004). Projected costs per kilometer driven are more or less the same for both types of cars.

Reliability of energy supply

The energy supply remains relying on fossil fuels when hydrogen will be produced from natural gas, oil or coal. Importing fossil fuels from other countries might become less reliable in the future, especially from geopolitical unstable regions. Importing LNG from other countries can enhance the security of supply. On the longer-term also renewable energy sources, such as biomass, wind, hydro and solar, could be introduced for conversion to hydrogen.

Societal aspects

Introducing hydrogen as an energy carrier affects people’s personal lives, when the electricity and heat supplied into their houses comes from hydrogen combustion or when they drive fuel cell vehicles. People will have to get familiar with new vehicle technology and for example refueling techniques. Also the implementation of hydrogen combustion technology in houses and companies ask for acceptance of the users. In urban areas new installations have to be placed in all houses to replace the existing central heating systems.

Sources: See Reference Section

Option 7: Electricity Produced By Nuclear Power.

The goal of this packet is to reduce 40 million tons CO_2 in 2030 by increasing the amount of electricity produced by nuclear power, from 450 MW_e in 2004 to 7350 MW_e in 2030.

Comparison Current Situation-Situation in 2030

In the Netherlands there is one working nuclear facility: Borssele. In 2004, the electricity production of Borssele was 3.6 TWh_e (4% of the total electricity produced in the Netherlands). Current plans are to keep the Borssele unit open until the end of 2013. Since Borssele is 32 years old, extension of the life span of the plant beyond 2013 is uncertain. A reduction of 40 Million tons CO_2 in 2030 would, in any case, require that new nuclear plants should be installed with a total capacity of 7350 MW_e. This could be done in 5 large plants. The most possible technology to be in operation in 2030 in the Netherlands is an Advanced Light Water Reactor (ALWR). Trends in the design of ALWR are the use of passive safety systems (do not require immediate operator intervention in case of malfunction) and the long life span of the plants (e.g., 60 years). Examples of ALWR are the European pressurized water reactor (now being built in Finland) and the ABMR (in operation since 1995).

Long- term potential

For the next century there are no resources constraints concerning uranium. Known exploitable reserves of uranium available at less than $40/kgU are calculated to be about 2 million metric tons and between 16-24 million metric tons for total uranium resources available at less than $130/kgU (current use is about 68000 tons/year; current prices for uranium are 26-35$/kgU). The latter amount includes speculative resources such as commercial inventories, excess defense inventories, re-enrichment of depleted uranium tails, etc. In the future, new exploitable mines are likely to be discovered and in case of shortages, uranium could be exploited from seawater (uranium can be found in the world's ocean at a concentration of about 3 ppb, with a estimate cost of recovery of $175-350/kgU).

Environmental consequences

Emissions. Nuclear energy emits zero emissions of greenhouse gases during operation. If the total chain of activities for nuclear power production is accounted for (mining operations, nuclear fuel conversion, nuclear power plant operation, decommissioning, transportation and waste disposal) life cycle analyses estimate CO_2 emissions are between 0.5-20% of the emissions in a natural gas combined cycle plant. Nuclear energy does not produce local or regional air pollution (NO_x or SO_x). It releases, however, radioactive emissions from nuclear power plant operation and fuel cycle facilities. These emissions are strictly regulated and are found to be below natural background radiation. Due to this, the effects of accumulation of radioactive emissions in the atmosphere have received little attention up to now and are not completely known.

Land use. Nuclear energy has low land requirements. An ALWR (1000 MWe) would occupy an area of no more than 3 football fields. This amount is in the same order of magnitude that those required by fossil fuel plants but it is significantly lower than for power generation based on renewables (for the generation of 1000 MWe, it is required solar parks between 20-50 km^2 or, in the case of on-shore wind fields, areas between 50-150 km^2).

Nuclear Waste Disposal. The management of high-level radioactive spent fuel is a main problem of nuclear energy. Although it is a relatively small amount (in 2004, Borssele produced about 1.3 m^3 of high-level radioactive spent fuel), this kind of waste generates heat until years after having been de-loaded from the reactor core while remaining highly radioactive for several thousand years. No country has yet successfully implemented a system for permanently disposing of this waste. Plans for future waste disposal will most probably be based on reprocessing and eventual placement in deep geological repositories. The main issue concerning geological storage is whether geological isolation offered by underground layers will be sufficient in the very long-term (over hundred thousand years). The main fear is that canisters will start to leak as a result of corrosion after many centuries or thousands years, and consequently if there is lack of geological containment, contaminate ground water. In the short term (centuries), no uncertainties on either geological or container integrity seem to exist. In theory, technology can be used to decrease the time that nuclear waste will remain radioactive (e.g., from 100.000 years to 200-300 years). These technologies are at an experimental stage and some estimate that when (if) available in the market they will increase the electricity price by about 20% per kWhe.

Safety risks

Nuclear Reactor Safety. If compared with other fuel cycles, the consequences of a nuclear accident can be significantly larger: more fatalities per accident; hereditary effects; radioactive contamination of areas surrounding the reactor with the consequent loss of land and land use, and impact on the populations of existing ecosystems. ALWRs have been designed with the specifications that the consequences of such an accident should be limited to the reactor premises. It is estimated that in case of an accident, about 1.5 km around the reactor should be evacuated and that 20*40 km^2 of land around the reactor will be unusable for several years (one year being the most optimistic scenario). The probability that such an accident happens is rather small. Statistically, the risk of a core damage accident in a current LWR has averaged 1 per 1.000.000 per reactor per year. Furthermore, since ALWRs operate with passive safety systems, they are expected to operate with even lower levels of risk to the public than current LWRs. Due to these low levels of risk probability, the total mortality of a nuclear fuel cycle is estimated to be significantly lower than for other fuel cycles (e.g., 0.9 deaths/TWh_e for nuclear, 3 deaths/TWh_e for gas, 25 deaths/TWh_e for coal).

Nuclear Weapon Proliferation. Some experts hold that increasing world civil nuclear power could increase weapon proliferation (fusion devices and radiological ‘dirty’ bombs), whereas others hold that there is no causal relation. The risk is associated with the development of nuclear knowledge, nuclear installations (including enrichment facilities) with inadequate controls, transfer of technologies and increase availability of separated plutonium that could be used for weapons. A nuclear weapon can be produced with materials separated from the spent fuel of civilian power reactors or, more likely, from uranium enrichment facilities. It is, however, recognized that the elimination of civil nuclear power does not eliminate the possibility of a country embarking on a nuclear weapons program. An additional source of concern has risen since ‘September 11’: the possibility of terrorist attacks on nuclear installations (power plants and spend fuel cooling ponds).

Economic aspects

The plant construction costs of an ALWR are about 2-3 times more than an equivalent capacity conventional power plant based on natural gas (investments costs for a LWR range from 1500 euro/kWe to 2200 euro/kWe). The competitiveness of nuclear energy produced by ALWRs in 2030 will depend in the capacity of the industry to lower investment costs and construction time as well as the inclusion of external costs in the electricity prices of all fuel cycles. It is estimated that, if the price of electricity were to include the consequences of health and environmental damage, the price of electricity produced by nuclear power would increase about 0.4 euro cents/kWh (0.2-0.7 cent averages in different European countries), while for coal would be over 4.0 cents (2-10), gas ranges 1.0-4.0 cents and only wind shows up better than nuclear, at 0.05-0.25 cents/kWh.

Nuclear energy is less subject to supply security issues than fossil fuels both with respect to supply disruptions (uranium supply is geographically and politically diverse) and price volatility. For instance, a doubling of natural gas price would generate a 66-75% increase kWhe price, while doubling uranium price would only increase the kWhe price by 2-9%.

Sources: see Reference Section

APPENDIX 2: INFORMATION FOR LAY PEOPLE (ENGLISH)

Consequences of the increase in temperature caused by the greenhouse effect.

Drought
The expected increase in temperature has consequences for the climate of the entire world. Some regions of the world may experience extreme drought as a result of global warming. The chances are fair to high that global warming will lead to an increase of failed crops and famine, especially in regions where temperatures are already high.

Warmth
In areas where the temperature is currently low, for instance Siberia, the climate may be less cold. Earnings from agriculture may become higher there. New wildlife area's may develop in some parts of the world.

More extreme weather
The greenhouse effect may lead to changes in extreme occurrences such as heavy rainfall, snowfall and storms. Experts expect the violence, duration and intensity of these occurrences to increase. Storms all over the world, including hurricanes, will in all probability become more violent en cause more damage. The chance of floods will increase in many areas due to heavy rainfall, snowfall and storms.

Sea level rise
The increase in temperature will cause part of the polar cap to melt and the oceans to expand, which will cause the sea level to rise. The sea level in the entire world may rise 18 to 59 centimeter on average between 2007 and 2099. In some area's local sea currents can cause a higher sea level at the coastline. Around The Netherlands the rise in sea level may accumulate to 85 centimeter between 2007 and 2099. Area's in the world that are just above sea level now may be submerged. For example, countries that consist of groups of small islands are expected to be partially or completely submerged in the course of this century as a result of the rise in sea level. Nature will be affected all over the world, and natural habitats will disappear as a result of the increase in temperature and the rise in sea level. As a result, many species of plants and animals may face extinction. Coral reefs are very vulnerable and may disappear because of the global rise in temperature. In the Netherlands, the Wadden isles and surrounding natural habitats may be lost. Overall, vulnerable countries or wildlife area's may be affected or may disappear.

Rising water in and around the Netherlands
In the Netherlands, the increase in temperature on earth could mean that the Dutch will more often be confronted with rivers flooding because of heavy rains, which will diminish the area available for living and working. To avoid this, the government has decided to dedicate areas as flood meadows to cope with temporary excesses of river water. The establishment of these area's and the increase in flood-risk areas will diminish the areas available for living and working. Measures will have to be taken to protect the coastline from the rise of the sea level and the heavy storms. The coastal defences must be strengthened, for instance by increasing the height of the dykes. In addition, river dykes will need to be built up to prevent flooding. Overall, protective

measures may be necessary and the Dutch areas for living and working may be diminished.

Victims in poorer countries
Not all countries will have the possibilities to make adjustments. The poorest countries of the world are probably the least able to take adequate preventative measures. They will therefore suffer the most from the consequences of the increase in temperature. Floods, for example, already cause tens of thousands of deaths worldwide on an annual basis, and this number may increase exponentially over the course of the century. These deaths will, for the most part, occur in poorer countries. Developing countries will also be increasingly exposed to threats such as famine and infectious diseases. Because of this, many people in poorer countries may be forced to emigrate.

Summers in The Netherlands
In The Netherlands, the summers will be warmer due to an increase of extreme weather situations. There will be more heat waves. People in poor health (for example the elderly) will more often be ill and die of heat and of the increase in germs. The warmer summers may cause an increased incidence of tropical diseases in the Netherlands. Expectations are that more allergies will occur and that more diseases will be spread by insects, such as Lyme's disease.

Winters in the Netherlands
The winters in The Netherlands will be less cold. There will be fewer cold fronts, so that less people will fall ill or die because of the cold.

Consequences of CO_2 capture, transport and underground storage in the Netherlands (general)

1. In the transportation of CO_2 through pipelines, leakages can occur, releasing CO_2 into the air. The chance of this happening is very small and comparable to the present chance of gas leakage in underground pipelines in The Netherlands. By ensuring that good systems are in place to monitor the leakage of CO_2, major CO_2 leakages can be prevented. It is expected, that good monitoring systems make the risk of leakages occurring in CO_2 pipelines very small.

2. Too much CO_2 in the air is hazardous and can even be lethal. There may be too much CO_2 in the air if large amounts of CO_2 are quickly released and are not dispersed, such as in a mountain valley. This scenario is highly unlikely to occur in The Netherlands. In the first place, it is highly unlikely that such a large amount would be released at once. In the second place, The Netherlands are flat, so CO_2 is not likely to build up or remain undispersed.

3. Once CO_2 is stored in the underground storage space, it might leak away through poorly sealed wells, and tears and cracks in the sealing layer of the underground storage space. Although experts are not sure how much CO_2 would be released into the air, quantities are likely to be extremely small. Good systems monitoring CO_2 leakage would be able to prevent much leakage. Good monitoring of CO_2 pipelines would make the risk of leakage from underground storage space very small.

4. CO_2 leakage from pipelines or underground storage may entail various risks. There is a small chance that CO_2 leakage acidifies the surrounding groundwater. If this is used for drinking water, it will no longer be potable. In addition, there is a very small chance that the leaked CO_2 would accumulate in low lying closed spaces such as cellars. This would be hazardous and possibly lethal for humans, animals and plants occupying this type of space.

5. Subsoil storage of CO_2 can cause minor earthquakes similar to those caused by natural gas extraction. This might cause small ruptures in buildings in the area. Subsidence caused by extraction of natural gas may be counteracted by injecting CO_2 underground. Some experts think this may decrease the local risk of earthquakes.

6. CO_2 which is captured and stored underground will not enter the atmosphere, and will therefore not contribute to the increase in temperature caused by the greenhouse effect.

Improvement of energy efficiency

This package aims to reduce CO_2 emissions by 40 million ton in 2030, by making appliances, cars, houses and the production of goods more energy efficient. "Energy efficiency" is the decrease of energy that is necessary for an equal result. For instance, the energy that is necessary to heat a medium house. Or, the energy needed to produce a ton of steel; or the energy needed to drive 1 kilometer with a car. For instance, by developing more efficient technologies or better isolated houses or more efficient cars there is less energy needed for the same result. Without extra measures the energy saving improves every year. To save 40 million ton of CO_2 emission, extra energy efficiency of 1% per year on appliances, cars, houses and factories has to be established. To achieve this 1 % of energy saving per year, the government has to take mandatory measures. These measures will have to make sure that companies and civilians make an effort to create more energy efficient appliances, cars, houses and to optimize the production of goods. Because this package requires less energy for the same result, there is less fuel needed to generate energy.

Contribution to air quality
When this package of measures for energy efficiency is applied, the amount of air pollution caused by the use of energy will decrease, because less fuel will be used for cars, electricity and industry. Due to this package people's health will improve because of cleaner air.

Use of natural sources
For this package appliances and machines will be developed which are not only more efficient, but also have a longer life span. By doing so, appliances and machines have to be replaced less often. This reduces the use of materials needed to make these appliances and machines. It also reduces the amount of waste, because materials are used more efficiently and because appliances and machines are not discarded as quickly as before.

Reliability of the energy supply
Because less energy will be needed for appliances, houses and manufacturing, The Netherlands will become less dependent of the import of fuel from other countries, such as the Middle-East.

Economic consequences
Because of the decreasing demand for energy, less money will have to be invested in new power plants and power cables. The consumption of crude oil, gas and coal will also decrease. The money that will come available with these efficiency measures can be used for other purposes. Some experts think that this package will possibly create 200.000 additional employments within the European Union every 10 years. Others think that this is a very optimistic view.

Measures to reduce fuel use for transportation
This package will lead to European legislation demanding that cars can drive for 30 kilometers on 1 liter of fuel by the year 2030. Nowadays cars can drive approximately 12,5 kilometers on 1 liter of fuel. At first the price for these efficient cars will be much higher, but experts predict that with mass-production of these cars, prizes will eventually drop. These cars are more efficient in use. Heavy cars (like for instance SUVs) will become more expensive. Instating toll roads and additional taxes for polluting cars are other examples of government policies which can be taken to reduce fuel use. Taking everything into account, for people using a lot of fuel the costs for car use will probably increase.

Consequences for manufacturers
By implementing this package manufacturers will be forced by strict rules and legislation to improve the efficiency of their equipment and technologies. For instance equipment used for propulsion and cooling will have to be made more efficient. These kinds of equipment and technologies will be more expensive but because of the decreased energy use, overall they will be equally expensive as less efficient technologies and equipment.

Consequences for houses and buildings
This package will result in strict policies which will force new houses and buildings to be built more efficient. By providing allowances for isolation or by applying taxes the improvement of existing, badly isolated houses and buildings will be stimulated.

Price
This package will result in additional taxes being applied in order to stimulate people to reduce the energy consumption. This will result in higher energy prices, but to what account is not known. It’s possible that the government will use the increased income from these taxes to lower other taxes. Houses and equipment will become more efficient and therefore use less energy. Because of this decrease in energy consumption experts think that households will be presented with lower energy bills, but it’s also possible that these bills will be higher.

Contribution to the greenhouse effect
The contribution to the greenhouse effect of CO2 emissions would be greatly reduced by this package. The emission of CO2 into the air would be 17% less than the amount that is currently being emitted.

Improvement of energy efficiency and decreased use of materials and energy

This package aims to reduce the emission of CO_2 by forty million tons in 2030. This package is an addition to the first package “Improved energy efficiency”. This first package aims to reduce the emission of CO_2 by forty million tons, by improving the efficiency of appliances, cars and houses with 1 percent per year. This second package is an addition to the first package and aims to reduce another forty million tons of CO2 by improving efficiency another 1 percent per year. The first and second package together lead to a reduction of CO_2 emission by eighty million tons in 2030. To implement this package the government has to take extremely tough and stringent measures, even tougher than necessary for the first package. These measures have to make sure that companies as well as individuals will do their absolute best to make their appliances, cars and houses more efficient. In addition, strict government policies such as deposits, taxes and fines will have to force people to reduce the use of energy and materials.

Contribution to air quality
Because in this package less energy is required for the same kind of use, less fuel is needed to generate energy. When this package of efficiency measures will be implemented the air quality will be improved because less car fuel will be burned. Around five thousand people a year die early in the Netherlands due to consequences of poor air quality caused by traffic exhaust gasses. When this package will be implemented, people’s health will be improved, even more than with the first efficiency package.

Economic consequences
Because of the decreasing demand of energy, less money has to be spent for new power plants and power cables. The use of coal, gas and oil will decrease. It’s not certain that these cost reductions will have a positive effect because of the need of great investments in houses, industrial sector, appliances and cars.

Consequences for transportation
For this package car engines will not only have to become much more efficient, but cars also have to be made out of different, lighter materials. Cars can therefore become more expensive but consume less fuel. Toll roads will be instated so that public transportation will cost people less than traveling by car. Also the goods-traffic will have to deal with these increasing costs. Products imported from far away like kiwis and bananas for instance will become more expensive. Prices of Air travel will also rise because of the obligation to use more efficient but therefore more expensive airplanes, which costs will be recharged to the ticket prizes. Taking everything into account, most ways of transportation will be more expensive.

Consequences for manufacturers
To be able to implement this package, very innovative technologies are needed. These will cost more money and will therefore be more expensive for the manufacturing industry. It’s possible that because of the extra costs involved for production, some products will be more expensive for the consumers.

In this package the manufacturers are held responsible for disposing and recycling of packing materials and end products. One example is the institution of a deposit, not only for sodabottles, but for more sorts of packaging materials. Also measures have to be brought in place to make people increase their level of recycling, for instance by informing the people or implementing fines when people don't recycle their waste.
To make sure that this package will be effective, strict rules have to be applied to manufacturers.

Consequences for consumers
Because consumer products have to be much more energy efficient for this package, it's possible that certain products will be difficult to bring to market or become very expensive. Products possible will become less luxury, smaller in size or less beautiful. For instance very large cars, jacuzzis or waterbeds will be very hard to get a hold off or be very expensive.

Consequences for houses and buildings
By implementing this package strict measures have to be taken to force the improvement of energy efficiency of houses and buildings. New houses and buildings will be designed in such a way that energy consumption is brought back to an absolute minimum. For older buildings the energy consumption has to be drastically reduced (for example between 70 and 90%). The modifications needed will cost quite a lot of money. For this package people either have to invest largely in energy efficiency measures, or drastically change their behavior (for instance by lowering the temperature in their houses).

Price
By implementing this package higher taxes will be applied to energy in order to stimulate people to reduce energy consumption. As long as a household doesn't cross a certain level of energy consumption, an energy unit is not that expensive, but when a household rises above this level, energy will become a lot more expensive per unit. The pricelevel of energy will be higher than the level mentioned in the first efficiency package. Expectations are that electricity will be at least 20 to 40% percent more expensive than nowadays.

Contribution to the greenhouse effect
The contribution to the greenhouse effect would be greatly reduced by this package. The emission of CO_2 into the air would be 17% less than the amount that is currently being emitted.

Electricity from windturbines at sea

This package aims to reduce the emission of CO_2 by forty million tons by the year 2030 by generating electricity using approximately twenty-three clusters of windturbines in the Dutch Northsea. These clusters will be placed at several locations in the sea along the whole Dutch coast at least twenty kilometers from the coast.

Effects to the view
For this package 23 parcs of windturbines with a total of 3500 windturbines will be placed in the Dutch Northsea. These windturbines will be approximately 150 meters in height, including the up to 60 metres long wings. During a few days per year that

are very clear, it's possible that some of the windturbines will be visible from the coast.

Consequences for birds.
Sometimes birds fly into the wings of windturbines located on land and most of the times, they don't survive this. Nowadays approximately 50.000 birds die each year because they fly into windturbines. As a comparison: every year more than 2 million birds die in traffic. By implementing this package the amount of windturbines will increase, but because of their location far from the coast, expectations are that these windturbines will kill less birds than the windturbines currently located on land.

Consequences for ocean fish and mammals
Research shows that the movements of ocean fish and sea mammals are not influenced by windturbines at sea, as long as their habitat isn't interrupted too much by large clusters of windturbines. It is yet unknown which amount of interruption causes hinder to fish and mammals. Windturbines can act as artificial reefs en offer protection to fish, which can lead to an increased fish population in the Dutch Northsea.

Consequences for the fishery
By placing parcs of windmills at sea, the amount of Dutch fishing grounds decreases. The windmill parcs will approximately take up one twentieth of the Dutch Northsea. There is a chance that the whole area in which the windturbines are placed, including a safety zone, won't be accessible for the fishery any more. The most important consequences for the fishery will be loss of parts of the fishing grounds and possible increase of sailingtimes to reach areas where fishing is allowed.

Dealing with fluctuations in electricity production
Because of the wind-dependency of windturbines, sometimes they don't produce enough electricity, sometimes too much. It's possible to intercept an electricity surplus by pumping water in a buffer area. When more electricity is needed than can be produced, water can be released from the buffer through a turbine which produces electricity. To transport an electricity surplus the electricity infrastructure has to be improved. A small amount of additional power cables will be necessary.

Consequences for employment
To implement this package, approximately 3500 windturbines have to be built and maintained. Some experts think that around the your 2030 this will have resulted in tens of thousands additional full-time jobs, mainly in The Netherlands.

Price
In the year 2030 electricity produced by windturbines will be approximately 10-20% more expensive than nowadays. The Dutch industry will have to pay approximately 40% more for electricity.

Contribution to the greenhouse effect
The contribution to the greenhouse effect would be greatly reduced by this package. The emission of CO_2 into the air in the Netherlands would be 17% less than the amount that is currently being emitted.

Conversion of biomass tocar fuel and electricity

This package aims to reduce the emission of CO_2 by forty million tons by making a share of the cars use fuel converted from biomass and by making power plant use biomass as a fuel for the generation of electricity. Biomass is a term which defines a variety of organic material such as wood, grass, organic waste, etc. Biomass can be used to generate electricity but also to create fuel for cars. During the growing process plants withdraw CO_2 from the air. This CO_2 is released again when biomass is being burned. By burning plants, the amount of CO_2 that is released is not lager that the amount of CO_2 that has been withdrawn by the plants during growth. Therefore biomass is CO_2 neutral. This package is not completely CO_2 neutral because of the need for transportation and handling of the biomass. To be able to reduce forty million tons of CO_2 by using biomass by the year 2030, approximately eighty percent of the biomass will have to be imported. Most of this biomass will be converted into modern biofuel for cars, partly abroad, partly in The Netherlands. For the conversion of biomass into fuel, biofuel factories have to be built. Also there's a change that a portion of currently used oil refineries, where crude oil is converted to petrol and diesel oil, slowly will be converted to or replaced by biofuel factories. In that case in The Netherlands a small portion of this biomass will be converted into electricity by three or four large power plants in seaports like Rijnmond, Eemshaven or Terneuzen.

Contribution to air quality
Vehicles burning biofuel emit less toxic gasses and this leads to better air quality in cities compared to the current situation. In The Netherlands around 5000 people a year die early from the consequences of poor air quality caused by traffic exhaust gasses. When this package is realized on a large scale by the year 2030, air quality in The Netherlands will be greatly improved. This may improve the health of many people.

Use of land for biomass with certificate
Land is needed to obtain biomass. To be able to obtain sufficient amounts of biomass for this package, land is needed in amounts which vary from half of the surface of The Netherlands to a surface larger than The Netherlands. Therefore most of the required biomass will have to be imported from regions such as Latin America, South and Eastern Africa, Eastern Europe/Russia and the vicinity of Australia. Biomass which is produced in a responsible manner (for instance by using grass or trees) will be certified (just like the certificates for hardwood). Responsibly produced biomass can result in an increase of income and employment and a decrease in poverty for the afore-mentioned regions. In addition the cultivation of these kind of crops can result in an improvement of the cultivating ground which in turn can result in a more lasting and during form of agriculture.

Use of land for biomass without certificate
Some experts think that The Netherlands will be able to import sufficient amounts of certified biomass needed for this package. Other experts think that this may become problematic, especially when other countries start importing large amounts of biomass too. Uncertified biomass isn't always produced in a responsible way which can have serious implications for the areas where the biomass is being produced. Worst case

scenarios include exhaustion of water reserves, destruction of other cultivating grounds and/or forests and the banishment of small independent farmers.

Influence on food production

When a large amount of countries start using biomass, there is a possibility that the need for cultivated land will be of such proportions that the amount of cultivated land available for food production will become too small. By improving agriculture in areas where the production is low, the same amount of food can be grown with a smaller amount of land so that more land will become available for the cultivation of biomass. Biomass can also be bred on grounds which are unusable for food growth. By cultivating biomass on these grounds, in some cases the breeding of biomass results in an improved quality of the cultivated land in such a way that it becomes possible to cultivate food on grounds which were not suitable before. The surpluses of forestry and agriculture which normally aren't used (such as leftover wood, saw-dust, straw) can be used as biomass.
Cultivation of biomass can lead to rivalry with the cultivation of food, but breeding biomass can also lead to improved management of cultivating grounds and stimulate an improved efficiency when it comes to cultivating food.

Reliability of the energy supply

Experts place a great deal of importance on the reliability of the energy supply. This means that there should, at any given time, be enough energy available. The fuels needed for energy production partly have to be imported, but without being dependent of a small number of supplying countries (such as our current dependency of the Middle-East when it comes to crude oil). Biomass can be imported from lots of different countries on different continents. Some experts think that certified biomass can be imported from less countries. The change that the biomass needed for this package can't be imported in sufficient amounts is very small. Because biofuels replace crude oil the dependency towards the import of crude oil decreases. Therefore the reliability of the energy supply is reasonably good.

Expansion of seaports

To be able to import and process the biomass necessary for this package larger seaports are required. Therefore the available seaports have to be expanded. The expansion of the seaports will result in additional employment. The increase in employment by this package will be larger than the decrease in employment resulting from a decreased use of coals and oil.

Necessity of new vehicles

Most of the current cars are equipped to handle fuel which is partly biofuel (for these cars the biofuel is mixed with petrol or diesel). For this package approximately two thirds of all cars gradually have to be replaced by the year 2030 with cars that are equipped to handle pure biofuel. These cars have already been developed and are identical to the current cars apart from the fuel needed.

Economic consequences

In this package biofuel replaces crude oil. Because biofuels, in time, will be less expensive than crude oil, less money will leave The Netherlands. This will have a positive result on the future trade balance of The Netherlands. This can have positive results on the Dutch economy.

Price
The price of electricity produced from biomass is expected to be equal. The price of car fuel based on biofuel is expected to be a little lower. When the same level of taxes will be applied, in 2030 biofuel will be priced the same or possible 20% per liter lower than petrol currently is.

Contribution to the greenhouse effect
The contribution to the greenhouse effect of CO_2 emissions would be greatly reduced by this package. The emission of CO_2 into the air would be 17% less than the amount that is currently being emitted.

Large plants where coal or gas is converted into electricity with capture and storage of CO_2

This option aims to decrease CO_2 emissions by 40 million ton, by capturing CO_2 that is produced by coalfired and gasfired power plants and storing it underground in The Netherlands or under the Dutch part of the North Sea. CO_2 capture can take place at existing power plants or be fitted into new plants. It is expected that by 2030 about half of the power plants with CO_2 capture and storage will be coal fired and the other half will be gas fired. This package can be implemented temporarily because the space available for CO_2 storage will get full and natural gas and coal will eventually run out. The current knowledge of the subsoil leads to the expectation that there will be storage space for about 100 to 300 years. More research into the safety and availability will be needed to determine if all this storage space can be used. Research might however show that there is more space available than currently expected.

Contribution to pollution due to coal mining
The coal needed for the 20 plants will be mined abroad. The area around the coal mines is highly polluted in some countries, less in others. The degree of pollution of the land, water, and air will vary from little to very high in the area surrounding the mines, depending on the countries from which The Netherlands imports the coal needed for this package.

Safety of CO_2 transport in pipelines
Too much CO_2 in the air is hazardous and can even be lethal. During the transportation of CO2 in pipelines, the pipeline may spring a leak, causing the CO_2 to be emitted into the air. There is a small chance that a cloud of CO_2 which is dangerous for people, animals and plants, will keep hanging in the air without dispersing. The chance of leakage is comparable to the chance of gas leakage in the current underground gas pipelines in The Netherlands. Approximately 2000 kilometers of pipelines will be needed for this package. For this amount of pipelines, it can be expected that accidents will occur about once every two years, but this will not always lead to the escape of CO_2. Expectations are that by placing good systems for monitoring the chance of leakage of CO_2 from pipelines will become very small.

Safety of underground CO_2 storage
Subsoil storage of CO_2 can cause minor earthquakes similar to those caused by natural gas mining. This might cause small ruptures in buildings in the area. Once CO_2 is

stored in the underground storage space, it might leak away through poorly sealed wells, and tears and cracks in the sealing layer of the underground storage space. When an underground storage space keeps leaking for years, this will for the most part undo the emission reduction effect of this package. Although experts are not sure how much CO_2 would be released into the air, quantities are likely to be extremely small. In addition, there is a very small chance that the leaked CO_2 would accumulate in low lying closed spaces such as cellars. This would be hazardous and possibly lethal for humans, animals and plants occupying this type of space. There is a small chance that CO_2 leakage acidifies the surrounding groundwater. If this is used for drinking water, it will only be potable after additional treatment. Expectations are that good monitoring will make the risk of CO_2 leakage from underground storage space very small.

Reliability of the energy supply

Experts place a great deal of importance on the reliability of the energy supply in that it is important that we will always be able to generate enough energy. Part of the fuels necessary for this must be imported from other countries. We do not wish to be dependant on the politics of only a few countries, such as the dependence on the Middle East for oil. Coal can be imported from several countries in several parts of the world. The chance that the coal needed for part of this package cannot be imported is therefore very small. The reliability of the energy supply from part of the power plants is, therefore, high. The use of natural gas as fuel is less reliable if it has to be imported from other countries.

Price

If electricity is generated in power plants with CO_2 capture and storage, businesses will have to pay about 20% more for their electricity in 2030. Households will have to pay approximately 5% to 10% more.

Contribution to the greenhouse effect

The contribution to the greenhouse effect of CO_2 emissions in the Netherlands would be greatly reduced by this package. The emission of CO_2 would be 17% less than the amount that is currently being emitting.

Conversion of natural gas into hydrogen in large plants with CO_2 capture and storage.

This package aims to reduce CO_2 emissions by 40 million ton, by producing hydrogen and by capturing and storing the CO_2 that is produced in this process. Hydrogen is a gas that releases energy in the process of combustion. Hydrogen can be used to generate electricity. It can also be used as fuel for cars, and in households to replace natural gas. About 20 to 25 large hydrogen factories will be built for this package. The CO_2 that is produced during the conversion of natural gas into hydrogen, will be captured and stored underground in The Netherlands and under the bottom of the North Sea. The hydrogen from the 20 to 25 factories will be used in part to provide most of the cars in the Netherlands in 2030 with fuel. Current fuel stations will have to be altered for this in such a way that hydrogen can be stored and withdrawn there. The hydrogen will also be used in part to provide the majority of households and industry with hydrogen, where the hydrogen can be converted into electricity and warmth in small installations. In households, such an installation is comparable to a central-heating boiler. This package can be implemented temporarily because the space available for CO_2 storage will get full and natural gas and coal will eventually run out. The current knowledge of the subsoil leads to the expectation that there will be storage space for about 100 to 300 years. More research into the safety and availability will be needed to determine if all this storage space can be used. Research might however show that there is more space available than currently expected. It is likely that the infrastructure (such as installations, fuel stations and the pipeline grid) can be used after this time, because by then other ways will have been developed to produce hydrogen without natural gas.

New pipelines needed
The hydrogen would have to be transported to businesses and to hundreds of thousands of homes and buildings. This would necessitate a dense network of many underground pipelines. The realization of this network will be massive and time-consuming, and will cause inconvenience due to excavations, including in residential areas.

New vehicles needed
The implementation of this package necessitates the replacement of all cars by hydrogen fuelled cars. These cars could be more expensive in 2030 than a car that runs on gas, but it is expected that fuel cell cars will become less expensive over time.

Contribution to air quality
Vehicles powered by hydrogen emit almost no poisonous substances, and improve the air quality in the cities greatly. In The Netherlands, approximately 5000 premature deaths are caused by poor air quality due to traffic exhaust. When this package is realized on a large scale in The Netherlands around 2030, thousands of lives will be saved annually in the Netherlands because of the cleaner air.

Contribution to noise
Engines from cars and other vehicles that run on hydrogen, do not make any noise. The implementation of this package will lead to a decrease in the level of noise in cities and residential areas from 85 decibel to 70 or less decibel. (For example: 85 decibel is about the level of noise from a crowded intersection in the city, 70 decibel is about the level of noise from a calm intersection).

Safety of hydrogen plants
There has been a lot of experience gained in the last decades in the industry with the conversion of natural gas into hydrogen. The designs of these factories and the necessary safety precautions are standard. Experts do not always agree if hydrogen factories can be made as safe as current gas fired plants.

Safety of use of hydrogen in daily life
Experts believe that transporting hydrogen through pipelines and using hydrogen in homes can be made as safe as the existing transport and use of natural gas. Costs for technical safety measures are, however, probably higher. Accidents caused by asphyxiation, fire or explosion will not occur more often than at present. Safety measures would make the use of hydrogen in fuel stations, buses and trucks just as safe as the current use of petrol.

Safety of CO_2 transport in pipelines
Too much CO_2 in the air is hazardous and can even be lethal. During the transportation of CO_2 in pipelines, the pipeline may spring a leak, causing the CO_2 to be emitting in the air. There is a small chance that a cloud of CO_2 which is dangerous for people, animals and plants will keep hanging in the air without dispersing. The chance of leakage is comparable to the chance of gas leakage in the current underground gas pipelines in the Netherlands. Approximately 2000 kilometers of pipelines will be needed for this package. For this amount of pipelines, it can be expected that accidents will occur about once every two years, but this will not always lead to the escape of CO_2. Expectations are that by placing good systems for monitoring the chance of leakage of CO_2 from pipelines will be very small.

Safety underground CO_2 storage
Subsoil storage of CO_2 can cause minor earthquakes similar to those caused by natural gas mining. This might cause small ruptures in buildings in the area. Once CO_2 is stored in the underground storage space, it might leak away through poorly sealed wells, and tears and cracks in the sealing layer of the underground storage space. When an underground storage space keeps leaking for years, this will for the most part undo the emission reduction effect of this package. Although experts are not sure how much CO_2 would be released into the air, quantities are likely to be extremely small. In addition, there is a very small chance that the leaked CO_2 would accumulate in low lying closed spaces such as cellars. This would be hazardous and possibly lethal for humans, animals and plants occupying this type of space. There is a small chance that CO_2 leakage acidifies the surrounding groundwater. If this is used for drinking water, it will only be potable after it additional treatment. Expectations are that good monitoring will make the risk of CO_2 leakage from underground storage spaces very small.

Reliability of energy supply
Experts place a great deal of importance on our being able to generate enough energy. Parts of the fuel necessary for this package must be imported from other countries. We do not wish to be dependent on the politics of only a few countries, such as the dependency on the Middle East for oil. In order to ensure high reliability it is possible to store reserves of gas for later use. It is also possible to produce hydrogen from other fuels than natural gas, such as coal or biomass.

Economic consequences
The Netherlands would have to invest a great deal of money in all of the changes necessary for the implementation of this package, including new installations and vehicles, and numerous CO_2 pipelines. It is unknown what the effect of these investments would have on the economy.

Price
The costs of hydrogen for households will be approximately 25-35% higher than that of natural gas. Producing hydrogen is about twice as expensive as petrol. Because of this, the car fuel price will rise with about 20%. Electricity generated from hydrogen with this technology will cost the industry approximately twice as much as it does now. The fuel costs for road traffic will probably rise much less because hydrogen fuelled cars will be more efficient. It is expected that the costs for driving a hydrogen fuelled car in 2030 will be equal to the costs of driving a diesel car.

Contribution to the greenhouse effect
The contribution to the greenhouse effect of CO_2 emissions in The Netherlands would be greatly reduced by this package. The emission of CO_2 would be 17% less than the amount that is currently being emitting.

Electricity from nuclear plants

This package aims to reduce the emission of forty million tons of CO_2 by generating electricity in five large nuclear power plant by the year 2030. In nuclear power plants uranium is used as fuel. Uranium is dug from uranium mines. Generating electricity by using uranium doesn't produce CO_2. The amount of uranium required for this package will be available for at least one hundred years, even when more countries will start to use uranium and with that the global use increases. It's very likely that new uranium sources will be discovered, in which case the nuclear power plants can be supplied for a long time.

Background radiation during normal operation
During normal operation of a nuclear power plant very small particles are released which produce very small amounts of radioactive radiation. The amount of radiation is even less than normally present in the area by nature. This amount of radiation will not cause any health problems on the short term. Some experts think that on the long term there will not be any risk of health problems due to this very small amount of radiation. Other experts think that we do not have enough knowledge to make predictions about this.

Nuclear waste
In the process of preparing uranium for the use in nuclear power plants, but especially when using uranium in the actual power plants, nuclear waste is produced. A portion of this nuclear waste will be very radioactive for thousands of years; it will produce a lot of radiation. In this package the nuclear waste will probably be stored in heavily secured barrels in deep underground storage facilities. Experts know that this method of storage is safe for the first couple of centuries and that there will be no leakages of any kind. Experts think that after this initial period the risk of leakage is very small, but they acknowledge the existence of uncertainties, because it's hard to predict what happens underneath the ground. Some experts think that as of 2030 it will be possible to treat nuclear waste in such a way that it will be strongly radioactive for a maximum period of 200 to 300 years. Other experts doubt whether this technology of nuclear waste treatment will be developed enough in 2030 to be able to use it at that time. Leakage of nuclear waste can produce health problems with plants, animals and people in cases where for instance the leakage occurs in the vicinity of the ground water. This may be prevented by making sure that the storage of the nuclear waste does not take place in the vicinity of ground water, but there's no way to be sure that in thousands of years the ground water will not get closer to the nuclear waste. Taking everything into account, experts predict that the risk of health problems for plants, animals and people caused by leakage of nuclear waste is very small.

Safety of nuclear power plants
The nuclear power plants mentioned in this package are build in such a way that human interference is unnecessary regarding checking the system for failures or

resolving these failures. A protective dome will be constructed around the nuclear power plant. Therefore these power plants are safer than the current nuclear power plants and much safer than for instance the former nuclear power plant in Tsjernobyl. The nuclear power plants mentioned in this package are just as safe as the current chemical industry in The Netherlands. The chance of a serious accident is very small. An example of a very serious accident with the power plant in this package is an accident with the reactor. People living within one and a half kilometer of the power plant have to be evacuated. An area with a radius of 20 by 40 kilometers around the power plant will be completely unusable for at least one year, but possibly a lot longer. The chance of an accident like this happening is less than once in two hundred thousand years. The chance of accidents with even more serious consequences is much less.

Protection of power plants against terrorist attacks
Some people are concerned about terrorist attacks on nuclear power plants with devastating results. The power plants mentioned in this package are very efficiently protected. Accidents with the reactor using bombs or airplane crashes on top or in the close vicinity of the power plant are very hard to accomplish. Sabotage by employees is not impossible, but difficult.

Nuclear power plants en nuclear weapons
Spreading of nuclear weapons means that either countries currently not in possession of nuclear arms will be enabled to produce them or that nuclear weapons fall into the hands of terrorists. According to some experts, the spreading of nuclear arms will be more likely because of the development and use of nuclear power plants. Some experts think that when knowledge is being developed about nuclear technology for power production, this generates more knowledge about nuclear weapons as well. In addition to that, some expert think that the development of materials needed for the power plants leads to availability of materials used in the production of nuclear weapons. Other experts state that there is no connection between the development and deployment of nuclear power plants and the spreading of nuclear weapons.

Reliability of the energy supply
Experts place a great deal of importance on the reliability of the energy supply. This means that there should, at any given time, be enough energy available. The fuels needed for energy production have to be imported, but without being dependent on a small number of supplying countries (such as our current dependency of the Middle-East when it comes to crude oil). Uranium can be imported from lots of different countries on different continents. Therefore the chance will be very small that the uranium needed for the nuclear plants cannot be imported. Besides that, building reserves of uranium is very easy because of the small amount of space uranium takes. Taking this into account, the overall reliability of energy coming from these plants will be good.

Price
Some experts expect that the price of electricity produced by nuclear power plants will be roughly the same as the current price of electricity produced by coalfired power plants. The price will increase when additional security measures have to be taken or when the nuclear waste from the plants has to be treated to reduce the period of radio-activity. Some experts estimate that due to these measures the price of

electricity coming from nuclear power plants will be twenty percent higher. The costs involved in building a nuclear power plant are very high, but if and in what amount this has an effect on the price of electricity is unknown.

Contribution to the greenhouse effect

The contribution to the greenhouse effect of CO_2 emissions would be greatly reduced by this package. The emission of CO_2 into the air would be 17 % less than the amount that is currently being emitted.

APPENDIX 3: QUESTIONNAIRE (DUTCH)

VRAAG 5001
Er zijn de volgende versies (Dit wordt als 'SPLIT1' aangeduid):

1 ❑ 1 - zonder voormeting en zonder CCS
2 ❑ 2 - met voormeting
3 ❑ 3 - Stukje ICQ 2004

VRAAG 5002
Er zijn de volgende volgordes van de technologieen:
(in deze print staat alleen de volgorde 1234567)

1 ❑ Versie 1 - technologieen 1234567
2 ❑ Versie 2 - technologieen 4761235
3 ❑ Versie 3 - technologieen 7654312
4 ❑ Versie 4 - technologieen 5126374
5 ❑ Versie 5 - technologieen 3547126
6 ❑ Versie 6 - technologieen 6412753

VRAAG 7100 **INFORMATIE SCHERM**
In Nederland wordt veel energie gebruikt. Bijvoorbeeld verwarming, licht, elektrische apparaten en vervoer kosten allemaal energie.
Naar verwachting gaan we in Nederland steeds meer energie gebruiken.
Bijna alle manieren waarop we momenteel energie opwekken zijn schadelijk voor het milieu en beïnvloeden het klimaat. In de toekomst is het nodig meer vormen van energie te gaan gebruiken die minder schadelijk zijn voor milieu en het klimaat niet beïnvloeden.
Wat vinden Nederlanders er van?
Wat er precies moet gebeuren staat echter nog niet vast.
De Universiteit van Leiden voert een onderzoek uit waarin de Nederlandse bevolking in de gelegenheid gesteld wordt haar mening te geven over enkele nieuwe mogelijkheden om energie op te wekken.
De resultaten van dit onderzoek worden in een rapport verwerkt, dat bijvoorbeeld regering en parlement kan helpen beslissingen te nemen.

VRAAG 7101 **INFORMATIE SCHERM**
Deze beslissingen zijn belangrijk, omdat de keuzes bepalend zijn voor de levensomstandigheden in Nederland in de nabije toekomst.
Dit onderzoek biedt u de mogelijkheid uw mening te laten horen.
Omdat we een volledig beeld van de in Nederland heersende meningen nastreven, is het belangrijk dat iedereen die wij benaderen, dus ook U, aan het onderzoek meedoet.
Uw mening zal strikt vertrouwelijk verwerkt worden.

VRAAG 7110
Voor u aan het onderzoek begint, willen we u graag op de hoogte stellen van de lengte en de aard van het onderzoek. Het kost mensen gemiddeld vijf kwartier om deze vragenlijst in zijn geheel af te ronden. In het onderzoek wordt veel informatie gegeven, die lastig gevonden kan worden. Daarom raden wij u aan pas met de vragenlijst te beginnen op een moment dat u daar tijd en rust voor heeft.
U kunt nu verder gaan met de vragenlijst of hem afbreken en later verder gaan

1 ❑ Verder met de vragenlijst
2 ❑ Vragenlijst afsluiten, ik wil hem later beantwoorden
↳ *EINDE VAN INTERVIEW, SCHRIJF NON-RESPONSCODE "00"*

VRAAG 7111 **INFORMATIE SCHERM**
Sommige mensen pauzeren tussendoor graag. Dat is natuurlijk geheel aan uzelf. In het kader van het onderzoek zouden wij u vriendelijk willen verzoeken om eventuele pauzes pas te houden nadat u de eerste mogelijkheid voor energiegebruik in Nederland heeft beoordeeld. Verderop in de vragenlijst zal nogmaals aangegeven worden welk moment wij hier bedoelen.

VRAAG 7102 **INFORMATIE SCHERM**
LET OP
[Prog: Dit vragenblok, tot vraag 6002, alleen indien SPLIT1 = 2]

De onderwerpen die in dit onderzoek aan bod komen, zijn voor de meeste mensen geen dagelijkse kost. De onderwerpen die aan bod komen zijn bijvoorbeeld het broeikaseffect en verschillende mogelijkheden voor energiegebruik in de toekomst.
Een manier om mensen te helpen een mening te vormen over een onderwerp, is door informatie daarover aan te bieden.
In dit onderzoek krijgt u dan ook uitgebreide informatie over verschillende mogelijkheden voor energiegebruik in de toekomst en over aanverwante onderwerpen.
Daarnaast is het echter ook noodzakelijk vast te stellen welke mening mensen hebben wanneer zij deze informatie nog niet hebben gekregen.
Zo kan onderzocht worden welke mening mensen nu, zonder de informatie in deze enquête, al hebben over deze onderwerpen.
Ook kan zo onderzocht worden, hoeveel mensen zelf al weten van deze onderwerpen.

VRAAG 7103 **INFORMATIE SCHERM**
Voordat u informatie krijgt, stellen we u daarom een aantal vragen, welke verderop in de enquête nogmaals gesteld worden.
Omdat aan deze vragen de eerste keer dus geen informatie vooraf gaat, zou het kunnen dat deze vragen nogal vreemd overkomen.
Van sommige onderwerpen in de enquête is het zelfs waarschijnlijk dat de meeste mensen er niets van weten, en er dus ook geen vragen over kunnen beantwoorden.

VRAAG 7104 **INFORMATIE SCHERM**
Nu leggen we u een aantal onderwerpen voor, omdat we willen weten van welke onderwerpen u misschien toch wel eens gehoord heeft.
Veel hiervan is nog onbekend bij de meeste mensen, dus wees niet bang om aan te geven wanneer u weinig van een onderwerp weet.
U krijgt steeds eerst de vraag of u van het onderwerp weet. U kunt dan kiezen uit de antwoorden "nee", "een beetje", of "ja". Daarna krijgt u steeds de vraag, wat u van het onderwerp vindt.
U kunt daar uw antwoord geven door een rapportcijfer te geven.
U kunt echter ook invullen dat u geen mening over dit onderwerp heeft.

VRAAG 500
Weet u, wat het broeikaseffect inhoudt?

1 ❑ Nee
2 ❑ Een beetje
3 ❑ Ja

VRAAG 511
Wat vindt u van dit broeikaseffect?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 513
Kunt u het broeikaseffect een rapportcijfer geven?

1	❑	1
2	❑	2
3	❑	3
4	❑	4
5	❑	5
6	❑	6
7	❑	7
8	❑	8
9	❑	9
10	❑	10
99	❑	Geen mening

VRAAG 1001 **INFORMATIE SCHERM**
Let op: Bij een aantal van de komende vragen is het waarschijnlijk dat de meeste mensen er niets van weten. Wees dus niet bang in te vullen dat u ergens niets van weet, de kans is groot dat bijna niemand van de ondervraagden het weet!

VRAAG 501
Weet u van "verbetering van energiezuinigheid"?

1	❑	Nee, nooit van gehoord
2	❑	Een beetje
3	❑	Ja, daar weet ik redelijk wat van af

VRAAG 601
Kunt u "verbetering van energiezuinigheid" een rapportcijfer geven?

1	❑	1
2	❑	2
3	❑	3
4	❑	4
5	❑	5
6	❑	6
7	❑	7
8	❑	8
9	❑	9
10	❑	10
99	❑	Geen mening

VRAAG 502
Weet u van "verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik"?

1	❑	Nee, nooit van gehoord
2	❑	Een beetje
3	❑	Ja, daar weet ik redelijk wat van af

VRAAG 602
Kunt u "verbetering van energiezuinigheid en vermindering
materiaalgebruik en energiegebruik" een rapportcijfer geven?

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10
99 ❑ Geen mening

VRAAG 503
Weet u van "elektriciteit van windmolens op zee"?

1 ❑ Nee, nooit van gehoord
2 ❑ Een beetje
3 ❑ Ja, daar weet ik redelijk wat van af

VRAAG 603
Kunt u "elektriciteit van windmolens op zee" een rapportcijfer geven?

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10
99 ❑ Geen mening

VRAAG 504
Weet u van "omzetting van biomassa naar autobrandstof en elektriciteit"?

1 ❑ Nee, nooit van gehoord
2 ❑ Een beetje
3 ❑ Ja, daar weet ik redelijk wat van af

VRAAG 604
Kunt u "omzetting van biomassa naar autobrandstof en elektriciteit" een rapportcijfer geven?

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10
99 ❑ Geen mening

VRAAG 505
Weet u van "Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen"?

1 ❑ Nee, nooit van gehoord
2 ❑ Een beetje
3 ❑ Ja, daar weet ik redelijk wat van af

VRAAG 605
Kunt u "Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen" een rapportcijfer geven?

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10
99 ❑ Geen mening

VRAAG 506
Weet u van "Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen"?

1 ❑ Nee, nooit van gehoord
2 ❑ Een beetje
3 ❑ Ja, daar weet ik redelijk wat van af

VRAAG 606
Kunt u "Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen" een rapportcijfer geven?

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10
99 ❑ Geen mening

VRAAG 507
Weet u van "elektriciteit uit kernenergie"?

1 ❑ Nee, nooit van gehoord
2 ❑ Een beetje
3 ❑ Ja, daar weet ik redelijk wat van af

VRAAG 607
Kunt u "elektriciteit uit kernenergie" een rapportcijfer geven?

1	❑	1
2	❑	2
3	❑	3
4	❑	4
5	❑	5
6	❑	6
7	❑	7
8	❑	8
9	❑	9
10	❑	10
99	❑	Geen mening

VRAAG 7105 **INFORMATIE SCHERM**
Zoals gezegd kunt u in dit onderzoek uw oordeel geven over mogelijkheden voor energie in de toekomst en aanverwante zaken.
U heeft dit zojuist gedaan zonder dat u van te voren informatie kreeg.
In het vervolg krijgt u wel informatie. U krijgt informatie over zeven verschillende mogelijkheden voor energiegebruik in de toekomst in Nederland.
Al deze mogelijkheden hebben bepaalde kenmerken en brengen natuurlijk ook bepaalde gevolgen met zich mee.
U krijgt informatie over die kenmerken en gevolgen.
Ook krijgt u informatie over de gevolgen van de huidige manieren om energie op te wekken, en hoe deze het milieu en het klimaat beïnvloeden.
U kunt straks aangeven in welke mate u die gevolgen voordelig of nadelig vindt.
Op die manier kunt u zich een beeld vormen van elk van de zeven mogelijkheden voordat U uw totaaloordeel bepaalt over elke mogelijkheid.
Bovendien kunt u zo uw mening over die gevolgen kenbaar maken.

VRAAG 6002 **INFORMATIE SCHERM**
LET OP
[Prog: Dit vragenblok, tot vraag 6004, alleen indien SPLIT1 = 1 of SPLIT1 = 3]

In dit onderzoek kunt u uw oordeel geven over zeven verschillende mogelijkheden voor energiegebruik in de toekomst in Nederland.
Al deze mogelijkheden hebben bepaalde kenmerken en brengen natuurlijk ook bepaalde gevolgen met zich mee.
U krijgt informatie over die kenmerken en gevolgen.
Ook krijgt u informatie over de kenmerken en gevolgen van de huidige manieren om energie op te wekken, en hoe deze het milieu en het klimaat beïnvloeden.
U kunt aangeven in welke mate u die gevolgen voordelig of nadelig vindt.
Op die manier kunt u zich een beeld vormen van elk van de zeven mogelijkheden voordat U uw totaaloordeel bepaalt over elke mogelijkheid.
Bovendien kunt u zo uw mening over die gevolgen kenbaar maken.

VRAAG 6004 **INFORMATIE SCHERM**
LET OP
[Prog: ALLEN]

Er wordt u nu eerst verteld hoe u uw mening over die kenmerken en gevolgen kunt geven.
Dit gebeurt aan de hand van een aantal voorbeelden.
Deze voorbeelden hebben vaak niet met energie te maken.

VRAAG 6005 **INFORMATIE SCHERM**
Maatregelen of activiteiten kunnen nadelen hebben.
Op dit scherm staat een aantal mogelijke nadelen van willekeurige maatregelen.
Leest u ze eens door.
1. Een ongeluk met als gevolg enkele doden
2. Een ongeluk met als gevolg een paar duizend doden
3. Een zeer geringe kans op een ongeluk met als gevolg een paar duizend doden
4. Een zeer kleine kans op duizeligheid bij het gebruik van een pijnstiller

VRAAG 6006 **INFORMATIE SCHERM**

Waarschijnlijk vindt u deze voorbeelden niet alle vier een even groot nadeel.
Het is de bedoeling dat u voor ieder gevolg aangeeft hoe groot u het nadeel vindt door een getal tussen 1 en 9 in te vullen.
Het getal 1 staat hierbij voor een zeer klein nadeel, het getal 9 staat voor een zeer groot nadeel.
Hoe groter u een nadeel vindt, hoe hoger het getal dat u invult.
Omgekeerd geldt: hoe kleiner u het nadeel vindt, hoe lager het getal dat u invult.
Op het volgende scherm kunt u achter ieder gevolg op het scherm invullen hoe groot of hoe klein u het nadeel vindt.

VRAAG 7011_1

Een ongeluk met als gevolg enkele doden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7011_2

Een ongeluk met als gevolg een paar duizend doden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7011_3

Een zeer geringe kans op een ongeluk met als gevolg een paar duizend doden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7011_4

Een zeer kleine kans op duizeligheid bij het gebruik van een pijnstiller.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 6011 **INFORMATIE SCHERM**
Er is wat voor te zeggen om een ongeluk met als gevolg een paar duizend doden als een groter nadeel te zien dan een ongeluk met als gevolg enkele doden.
Dat kunt u in uw beoordeling aangeven door een hoger getal in te vullen achter een ongeluk met als gevolg een paar duizend doden.
Probeert u in uw beoordeling rekening te houden met dergelijke verschillen.
Het zou kunnen dat u in de enquête gevolgen tegenkomt, die u als groter nadeel wil beoordelen dan vorige gevolgen die u als 'zeer groot nadeel' had beoordeeld.
In dit geval kunt u altijd terug gaan om uw eerdere antwoord te veranderen.

VRAAG 6012 **INFORMATIE SCHERM**
Het is u waarschijnlijk wel opgevallen dat in sommige voorbeelden wordt gezegd dat iets zeker gebeurt, terwijl in andere voorbeelden wordt gezegd dat er bijvoorbeeld een zeer kleine kans is dat een nadeel optreedt.
Waarschijnlijk heeft u daar ook rekening mee gehouden in uw beoordeling.
Het is immers erger wanneer het optreden van een nadeel zeker is dan wanneer de kans klein is dat het nadeel zal optreden.
Straks zult u ook dergelijke onzekere gevolgen tegenkomen.
Probeert u daar rekening mee te houden.

VRAAG 6013 **INFORMATIE SCHERM**
U weet nu hoe u aan kunt geven hoe groot of hoe klein u nadelen van een maatregel vindt. In dit onderzoek krijgt u straks niet alleen nadelen maar ook voordelen te beoordelen.
Hoe dit in zijn werk gaat zullen we duidelijk proberen te maken aan de hand van voorbeeldvragen die niet met energievoorziening te maken hebben.

VRAAG 6014 **INFORMATIE SCHERM**
De voorbeeldvragen gaan over een pijnstiller. Voordat u aangeeft wat u van deze pijnstiller vindt, krijgt u informatie over de pijnstiller.
We willen u vragen om deze informatie op de volgende manier te beoordelen:
Wanneer u een gevolg geheel onbelangrijk vindt, kunt u dit aangeven door op het vakje voor onbelangrijk te klikken.
Het kan ook zijn dat u het gevolg een nadeel of voordeel vindt.
Dan kunt op het vakje voor nadeel of voordeel klikken.
Als u het gevolg niet onbelangrijk, maar een nadeel of voordeel vindt, kunt u vervolgens aangeven in welke mate.
Eerder vertelden we dat u altijd kunt terug gaan om uw eerdere antwoord te veranderen.
Dit geldt niet voor de vraag of u iets onbelangrijk, een voordeel of nadeel vindt.
Dat kunt u niet achteraf veranderen, omdat andere ingevulde antwoorden dan weer uitgewist worden.
De mate waarin u iets een voordeel of nadeel vindt kunt u wel veranderen.

VRAAG 7041_1
De pijnstiller van Merk X kost € 9,55 per 24 tabletten.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_1 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_1 , 1]
De pijnstiller van Merk X kost € 9,55 per 24 tabletten.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_1 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_1 , 2]

De pijnstiller van Merk X kost € 9,55 per 24 tabletten.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_2

Het gebruik van Merk X brengt een zeer kleine kans op duizeligheid met zich mee.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_2 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_2 , 1]

Het gebruik van Merk X brengt een zeer kleine kans op duizeligheid met zich mee.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_2 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_2 , 2]

Het gebruik van Merk X brengt een zeer kleine kans op duizeligheid met zich mee.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_3

Het gebruik van Merk X kan in combinatie met alcohol tot misselijkheid leiden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_3 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_3 , 1]

Het gebruik van Merk X kan in combinatie met alcohol tot misselijkheid leiden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_3 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_3 , 2]

Het gebruik van Merk X kan in combinatie met alcohol tot misselijkheid leiden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_4

Veel pijnstillers zorgen ervoor dat mensen zich niet goed kunnen concentreren en suf worden.
De pijnstiller van Merk X heeft deze bijwerking zeer veel minder.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_4 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_4 , 1]

Veel pijnstillers zorgen ervoor dat mensen zich niet goed kunnen concentreren en suf worden.
De pijnstiller van Merk X heeft deze bijwerking zeer veel minder.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_4	**STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_4 , 2]

Veel pijnstillers zorgen ervoor dat mensen zich niet goed kunnen concentreren en suf worden.
De pijnstiller van Merk X heeft deze bijwerking zeer veel minder.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 6020	**INFORMATIE SCHERM**

Het is u daarnet misschien opgevallen dat in het laatste gevolg van Merk X eerst een nadeel werd beschreven, en daarna werd aangegeven dat dit nadeel bij de pijnstiller van Merk X veel minder voorkomt. Dit gevolg van Merk X is dus minder nadelig dan na het lezen van de eerste zin lijkt.
In het eigenlijke onderzoek zult u straks ook dergelijke gevolgen tegenkomen, waarbij een vroeger nadeel nu opgeheven of verminderd is.
Hoewel een dergelijk gevolg dus eerst een nadeel lijkt, hoeft dat niet zo te zijn.
Probeert u daar rekening mee te houden.

VRAAG 6021	**INFORMATIE SCHERM**

U heeft waarschijnlijk wel gezien dat één van de voorbeeld-nadelen over een zeer kleine kans op duizeligheid ook in de voorbeeldvragen staan.
We kunnen kijken wat u toen geantwoord heeft.

VRAAG 6022	**INFORMATIE SCHERM**

De getallen zijn gelijk. Dat lag ook voor de hand: het is immers het zelfde gevolg.
OF:
De getallen zijn niet gelijk. U heeft wellicht uw redenen gehad om een andere beoordeling te geven. U kunt zich mogelijk ook voorstellen dat dezelfde gevolgen met het zelfde getal beoordeeld kunnen worden.

VRAAG 6023	**INFORMATIE SCHERM**

U krijgt nu achtergrondinformatie over energiegebruik in Nederland en de gevolgen daarvan.
U kunt altijd één of meer schermen terug gaan als u iets nog eens wilt lezen of iets wat u heeft ingevuld wilt verbeteren.
Door op het vakje 'Terug' te klikken kunt u een scherm teruggaan.
Onthoudt u hierbij nog wel dat u niet kunt veranderen of u iets onbelangrijk, een nadeel of een voordeel vindt.

VRAAG 6024	**INFORMATIE SCHERM**

Achtergrond informatie
De universiteit Leiden heeft deze enquête samengesteld onder begeleiding van een breed samengestelde groep van energiedeskundigen.
U krijgt informatie over de verschillende mogelijkheden om aan de groeiende vraag naar energie te voldoen. Deze informatie en de keuze die we u voorleggen zijn goedgekeurd door deze groep van deskundigen. Dat betekent dat deze deskundigen het er over eens zijn dat de informatie een betrouwbaar beeld geeft van de problemen rond energie en van de mogelijkheden die er zijn om in de toekomst aan de vraag naar energie te voldoen.
Energiedeskundigen hebben een schatting gemaakt van de vraag naar energie in het jaar 2030. Zij verwachten dat mede door de verwachte economische groei deze vraag groter zal zijn dan op dit moment.
Er zijn verschillende mogelijkheden om in de groeiende vraag naar energie te voorzien.

VRAAG 6025	**INFORMATIE SCHERM**

Hoe komen wij aan onze energie en waar gebruiken wij energie voor?
Energie wordt verkregen uit energiebronnen, zoals olie, kolen en aardgas.
Deze brandstoffen gebruiken we om warmte of elektriciteit te maken.
Naast olie, kolen en aardgas kan er ook energie geproduceerd worden uit water, wind, zon en biomassa (planten en bomen). Deze vormen noemen we hernieuwbare energiebronnen, omdat de voorraad hiervan nooit

opraakt. In Nederland worden voornamelijk olie en aardgas gebruikt om te voorzien in onze energiebehoefte. De voorraden olie en gas zijn eindig en kunnen deze eeuw opraken. Daarom stappen we geleidelijk over op hernieuwbare energiebronnen.

VRAAG 6031 **INFORMATIE SCHERM**

Huishoudens, bedrijven, industrie en vervoer zijn de belangrijkste gebruikers van energie. Woningen in Nederland worden vooral verwarmd met aardgas. Elektriciteit gebruiken we voor licht en elektrische apparaten. Voertuigen zoals auto's en vrachtwagens rijden op olie (in de vorm van diesel of benzine). De industrie gebruikt brandstoffen om warmte en elektriciteit te maken voor hun processen.
In Nederland staan grote elektriciteitscentrales die aardgas of kolen als brandstof gebruiken voor de opwekking van elektriciteit. Ook staat er een kerncentrale voor de productie van elektriciteit. Het is ook mogelijk om in kleinere installaties elektriciteit op te wekken. Deze installaties staan meestal bij bedrijven. De warmte die vrijkomt bij deze elektriciteitsopwekking wordt zo veel mogelijk benut door de bedrijven zelf.
Soms wordt deze warmte ook gebruikt voor verwarming van huizen en kantoren.
Verder wordt ongeveer een vijfde van de elektriciteit die we gebruiken in Nederland ingevoerd uit het buitenland.

VRAAG 6032 **INFORMATIE SCHERM**

In Nederland wordt nu nog maar een kleine hoeveelheid energie opgewekt uit hernieuwbare bronnen (water, wind, zon en biomassa). Elektriciteit wordt gemaakt met behulp van windmolens, zonnecellen en waterkracht. Ook wordt er elektriciteit opgewekt door de verbranding van biomassa. Biomassa kan bijvoorbeeld zijn: snoeihout en groente-, fruit- en tuinafval of geïmporteerd hout en palmolie. Warm water komt soms uit een zonneboiler. Nu worden brandstoffen voor auto's en bussen voornamelijk uit olie gemaakt. In de toekomst zullen we daarvoor vaker brandstoffen gebruiken die uit biomassa worden gemaakt.

VRAAG 6026 **INFORMATIE SCHERM**

Wat betekent energieopwekking met olie, gas en steenkool voor ons klimaat?
De lucht in de dampkring rond de aarde bestaat uit verschillende gassen, onder andere stikstof, zuurstof en kooldioxide. Kooldioxide of CO2 wordt een broeikasgas genoemd. Broeikasgassen in onze dampkring zorgen ervoor dat de warmte die de aarde van de zon ontvangt niet direct weer ontsnapt naar de ruimte. Dit zogenoemde broeikaseffect zorgt voor een leefbaar klimaat op aarde. Maar bij de opwekking van energie met brandstoffen als olie, aardgas en steenkool komt extra CO2 vrij en in onze dampkring. Daardoor wordt het broeikaseffect versterkt. De versterking van het broeikaseffect leidt tot een stijging van de gemiddelde temperatuur op aarde. De afgelopen honderd jaar is de gemiddelde temperatuur met ongeveer 0.7 graden Celsius toegenomen.

VRAAG 6033 **INFORMATIE SCHERM**

Het overgrote deel van de energie op aarde wordt momenteel opgewekt met brandstoffen als olie, aardgas en steenkool. In Nederland is dit bijvoorbeeld ongeveer 95 procent. De verwachting is dat ook de komende 50 jaar een groot deel van de energie uit olie, aardgas en steenkool komt. Experts verwachten dat wanneer de uitstoot van CO2 blijft toenemen zoals nu het geval is, de gemiddelde temperatuur op aarde in het jaar 2100 1.1 tot 6.4 graden Celsius hoger zal zijn dan in 1990. Deze temperatuurstijging wordt veroorzaakt door CO2 uitstoot in de hele wereld, niet alleen door de uitstoot in Nederland.

VRAAG 6027 **INFORMATIE SCHERM**

De gemiddelde temperatuurstijging op aarde kan allerlei gevolgen hebben die het leven van veel mensen kunnen beïnvloeden.
De gemiddelde temperatuurstijging betekent echter niet dat het overal op aarde warmer wordt.
De temperatuurstijging kan het klimaat zodanig beïnvloeden dat het in sommige streken juist kouder wordt, of natter, of winderiger.
U krijgt nu informatie over de gevolgen van de temperatuurstijging door het broeikaseffect.
De mate waarin de gevolgen hieronder zullen optreden, hangt af van hoeveel de temperatuur stijgt.

De gevolgen van een wereldwijd gemiddelde temperatuurstijging die hieronder beschreven staan, zijn een gevolg van de CO2 uitstoot in de hele wereld (dus niet alleen de Nederlandse uitstoot).
Gevolgen van de temperatuurstijging betekenen niet altijd een verslechtering, sommige gevolgen van temperatuurstijging kunnen positief zijn.

VRAAG 6028 **INFORMATIE SCHERM**

We vragen u nu een aantal gevolgen van de temperatuurstijging door het broeikaseffect te beoordelen.

VRAAG 7041_5

Droogte
De verwachte temperatuurstijging heeft gevolgen voor het klimaat over de hele wereld. Sommige gebieden in de wereld kunnen door de opwarming van het klimaat te maken krijgen met grotere droogte. Er is een redelijke tot grote kans dat daardoor vaker dan nu oogsten verdorren en honger kan ontstaan.
Vooral gebieden waar de temperatuur ook nu hoog is zullen hiermee te maken krijgen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_5 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_5 , 1]

Droogte
De verwachte temperatuurstijging heeft gevolgen voor het klimaat over de hele wereld. Sommige gebieden in de wereld kunnen door de opwarming van het klimaat te maken krijgen met grotere droogte. Er is een redelijke tot grote kans dat daardoor vaker dan nu oogsten verdorren en honger kan ontstaan.
Vooral gebieden waar de temperatuur ook nu hoog is zullen hiermee te maken krijgen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_5 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_5 , 2]

Droogte
De verwachte temperatuurstijging heeft gevolgen voor het klimaat over de hele wereld. Sommige gebieden in de wereld kunnen door de opwarming van het klimaat te maken krijgen met grotere droogte. Er is een redelijke tot grote kans dat daardoor vaker dan nu oogsten verdorren en honger kan ontstaan.
Vooral gebieden waar de temperatuur ook nu hoog is zullen hiermee te maken krijgen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_6
Warmte
In gebieden waar de temperatuur nu laag is, bijvoorbeeld Siberië, kan het klimaat minder koud worden. Landbouwopbrengsten kunnen hier hoger worden. In sommige gebieden kunnen nieuwe natuurgebieden ontstaan.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_6 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_6 , 1]
Warmte
In gebieden waar de temperatuur nu laag is, bijvoorbeeld Siberië, kan het klimaat minder koud worden. Landbouwopbrengsten kunnen hier hoger worden. In sommige gebieden kunnen nieuwe natuurgebieden ontstaan.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_6 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_6 , 2]
Warmte
In gebieden waar de temperatuur nu laag is, bijvoorbeeld Siberië, kan het klimaat minder koud worden. Landbouwopbrengsten kunnen hier hoger worden. In sommige gebieden kunnen nieuwe natuurgebieden ontstaan.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_7
Extremer weer
In andere gebieden kan het broeikaseffect leiden tot verandering in extreme gebeurtenissen zoals hevige regenval, sneeuwval en stormen. Experts verwachten dat de hevigheid, duur en intensiteit van deze gebeurtenissen toe zal nemen. Stormen over de hele aarde, ook orkanen, zullen zeer waarschijnlijk heviger worden en meer schade veroorzaken. Door hevige regenval, sneeuwval en stormen wordt de kans op overstromingen in veel gebieden groter.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_7 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_7 , 1]
Extremer weer
In andere gebieden kan het broeikaseffect leiden tot verandering in extreme gebeurtenissen zoals hevige regenval, sneeuwval en stormen. Experts verwachten dat de hevigheid, duur en intensiteit van deze gebeurtenissen toe zal nemen. Stormen over de hele aarde, ook orkanen, zullen zeer waarschijnlijk heviger worden en meer schade veroorzaken.

Door hevige regenval, sneeuwval en stormen wordt de kans op
overstromingen in veel gebieden groter.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_7 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_7 , 2]

Extremer weer
In andere gebieden kan het broeikaseffect leiden tot verandering in
extreme gebeurtenissen zoals hevige regenval, sneeuwval en stormen.
Experts verwachten dat de hevigheid, duur en intensiteit van deze
gebeurtenissen toe zal nemen. Stormen over de hele aarde, ook orkanen,
zullen zeer waarschijnlijk heviger worden en meer schade veroorzaken.
Door hevige regenval, sneeuwval en stormen wordt de kans op
overstromingen in veel gebieden groter.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_8

Stijging zeespiegel
De temperatuurstijging zorgt ervoor dat een deel van het poolijs en en een deel
van de ijskappen smelten en het zeewater uitzet, waardoor de zeespiegel stijgt.
In de periode van 2007 tot 2099 kan de zeespiegel gemiddeld over de hele wereld
stijgen met 18 tot 59 centimeter.
In sommige gebieden kan stroming in de zee voor een hogere zeespiegel bij de kust
zorgen. Rond Nederland kan de zeespiegelstijging daardoor oplopen tot 85 centimeter
in de periode van 2007 tot 2099. Door de stijging van de zeespiegel komen sommige
lager gelegen gebieden in de wereld onder water te liggen.
Van bijvoorbeeld landen die bestaan uit groepen kleine eilanden, wordt verwacht dat ze,
door de zeespiegelstijging, in de komende eeuw deels tot volledig onder water
verdwijnen. Over de hele wereld zal de natuur aangetast worden en zullen natuurgebieden
verdwijnen door de stijging van de temperatuur en van de zeespiegel.
Hierdoor kunnen plantensoorten en diersoorten uitsterven.
Ook de zeer kwetsbare koraalgebieden kunnen door temperatuurstijging verdwijnen.
In Nederland kan het Waddengebied verloren gaan.
Kwetsbare landen of natuurgebieden kunnen dus aangetast worden of verdwijnen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_8 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_8 , 1]

Stijging zeespiegel
De temperatuurstijging zorgt ervoor dat een deel van het poolijs en en een deel
van de ijskappen smelten en het zeewater uitzet, waardoor de zeespiegel stijgt.
In de periode van 2007 tot 2099 kan de zeespiegel gemiddeld over de hele wereld
stijgen met 18 tot 59 centimeter.
In sommige gebieden kan stroming in de zee voor een hogere zeespiegel bij de kust
zorgen. Rond Nederland kan de zeespiegelstijging daardoor oplopen tot 85 centimeter

in de periode van 2007 tot 2099. Door de stijging van de zeespiegel komen sommige lager gelegen gebieden in de wereld onder water te liggen.
Van bijvoorbeeld landen die bestaan uit groepen kleine eilanden, wordt verwacht dat ze, door de zeespiegelstijging, in de komende eeuw deels tot volledig onder water verdwijnen. Over de hele wereld zal de natuur aangetast worden en zullen natuurgebieden verdwijnen door de stijging van de temperatuur en van de zeespiegel.
Hierdoor kunnen plantensoorten en diersoorten uitsterven.
Ook de zeer kwetsbare koraalgebieden kunnen door temperatuurstijging verdwijnen.
In Nederland kan het Waddengebied verloren gaan.
Kwetsbare landen of natuurgebieden kunnen dus aangetast worden of verdwijnen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_8 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_8 , 2]

Stijging zeespiegel
De temperatuurstijging zorgt ervoor dat een deel van het poolijs en en een deel van de ijskappen smelten en het zeewater uitzet, waardoor de zeespiegel stijgt.
In de periode van 2007 tot 2099 kan de zeespiegel gemiddeld over de hele wereld stijgen met 18 tot 59 centimeter.
In sommige gebieden kan stroming in de zee voor een hogere zeespiegel bij de kust zorgen. Rond Nederland kan de zeespiegelstijging daardoor oplopen tot 85 centimeter in de periode van 2007 tot 2099. Door de stijging van de zeespiegel komen sommige lager gelegen gebieden in de wereld onder water te liggen.
Van bijvoorbeeld landen die bestaan uit groepen kleine eilanden, wordt verwacht dat ze, door de zeespiegelstijging, in de komende eeuw deels tot volledig onder water verdwijnen. Over de hele wereld zal de natuur aangetast worden en zullen natuurgebieden verdwijnen door de stijging van de temperatuur en van de zeespiegel.
Hierdoor kunnen plantensoorten en diersoorten uitsterven.
Ook de zeer kwetsbare koraalgebieden kunnen door temperatuurstijging verdwijnen.
In Nederland kan het Waddengebied verloren gaan.
Kwetsbare landen of natuurgebieden kunnen dus aangetast worden of verdwijnen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_9

Stijgend water in en om Nederland
Voor Nederland zou de temperatuurstijging op aarde kunnen betekenen dat we vaker met overstromingen van rivieren te maken krijgen door heftige regenval. Om dit te voorkomen heeft de overheid besloten gebieden aan te wijzen om meer rivierwater tijdelijk op te vangen. Het instellen van deze gebieden en de toename van risicogebieden voor overstromingen verkleint het gebied waarop we kunnen wonen en werken. Er zullen maatregelen nodig zijn om de kustlijn te beschermen tegen de stijging van de zeespiegel en de hevigere stormen: De zeewering moet versterkt worden (bijvoorbeeld door de dijken op te hogen). Ook rivierdijken zullen opgehoogd moeten worden om overstromingen te voorkomen. Al met al kunnen er dus beschermende maatregelen nodig zijn en het Nederlandse woon- en werkgebied kan kleiner worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_9 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_9 , 1]

Stijgend water in en om Nederland
Voor Nederland zou de temperatuurstijging op aarde kunnen betekenen dat we vaker met overstromingen van rivieren te maken krijgen door heftige regenval. Om dit te voorkomen heeft de overheid besloten gebieden aan te wijzen om meer rivierwater tijdelijk op te vangen. Het instellen van deze gebieden en de toename van risicogebieden voor overstromingen verkleint het gebied waarop we kunnen wonen en werken. Er zullen maatregelen nodig zijn om de kustlijn te beschermen tegen de stijging van de zeespiegel en de hevigere stormen: De zeewering moet versterkt worden (bijvoorbeeld door de dijken op te hogen). Ook rivierdijken zullen opgehoogd moeten worden om overstromingen te voorkomen. Al met al kunnen er dus beschermende maatregelen nodig zijn en het Nederlandse woon- en werkgebied kan kleiner worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_9 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_9 , 2]

Stijgend water in en om Nederland
Voor Nederland zou de temperatuurstijging op aarde kunnen betekenen dat we vaker met overstromingen van rivieren te maken krijgen door heftige regenval. Om dit te voorkomen heeft de overheid besloten gebieden aan te wijzen om meer rivierwater tijdelijk op te vangen. Het instellen van deze gebieden en de toename van risicogebieden voor overstromingen verkleint het gebied waarop we kunnen wonen en werken. Er zullen maatregelen nodig zijn om de kustlijn te beschermen tegen de stijging van de zeespiegel en de hevigere stormen: De zeewering moet versterkt worden (bijvoorbeeld door de dijken op te hogen). Ook rivierdijken zullen opgehoogd moeten worden om overstromingen te voorkomen. Al met al kunnen er dus beschermende maatregelen nodig zijn en het Nederlandse woon- en werkgebied kan kleiner worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_10

Slachtoffers in arme landen
Niet alle landen hebben de mogelijkheden zich aan te passen. Daarom is het waarschijnlijk dat de landen in de wereld die nu het armst zijn, het minst in staat zijn om voldoende maatregelen voor te bereiden. Het is dan ook waarschijnlijk dat de armste landen het sterkst getroffen zullen worden door de gevolgen van de temperatuurstijging. Bijvoorbeeld overstromingen veroorzaken wereldwijd nu al enkele tienduizenden doden per jaar, dit kan in de komende eeuw oplopen tot een veelvoud daarvan. Deze doden zullen vooral in arme landen vallen. Ook zullen ontwikkelingslanden in verhoogde mate blootstaan aan bedreigingen als hongersnood en besmettelijke ziekten. Hierdoor kunnen veel mensen in arme landen genoodzaakt zijn te emigreren.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_10 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_10 , 1]

Slachtoffers in arme landen
Niet alle landen hebben de mogelijkheden zich aan te passen. Daarom is het waarschijnlijk dat de landen in de wereld die nu het armst zijn, het minst in staat zijn om voldoende maatregelen voor te bereiden. Het is dan ook waarschijnlijk dat de armste landen het sterkst getroffen zullen worden door de gevolgen van de temperatuurstijging. Bijvoorbeeld overstromingen veroorzaken wereldwijd nu al enkele tienduizenden doden per jaar, dit kan in de komende eeuw oplopen tot een veelvoud daarvan. Deze doden zullen vooral in arme landen vallen. Ook zullen ontwikkelingslanden in verhoogde mate blootstaan aan bedreigingen als hongersnood en besmettelijke ziekten. Hierdoor kunnen veel mensen in arme landen genoodzaakt zijn te emigreren.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_10 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_10 , 2]

Slachtoffers in arme landen
Niet alle landen hebben de mogelijkheden zich aan te passen. Daarom is het waarschijnlijk dat de landen in de wereld die nu het armst zijn, het minst in staat zijn om voldoende maatregelen voor te bereiden. Het is dan ook waarschijnlijk dat de armste landen het sterkst getroffen zullen worden door de gevolgen van de temperatuurstijging. Bijvoorbeeld overstromingen veroorzaken wereldwijd nu al enkele tienduizenden doden per jaar, dit kan in de komende eeuw oplopen tot een veelvoud daarvan. Deze doden zullen vooral in arme landen vallen. Ook zullen ontwikkelingslanden in verhoogde mate blootstaan aan bedreigingen als hongersnood en besmettelijke ziekten. Hierdoor kunnen veel mensen in arme landen genoodzaakt zijn te emigreren.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_11

Zomers in Nederland
In Nederland zullen de zomers gemiddeld warmer zijn door een toename van extreme weersituaties. Er zullen meer hittegolven voorkomen. Mensen met een zwakke gezondheid (bijvoorbeeld hoogbejaarden) zullen vaker ziek worden en sterven door de hitte en door de toename van ziektekiemen. Door de warmere zomers is het mogelijk dat tropische ziektes vaker in Nederland voorkomen. Ook wordt verwacht dat meer allergieën zullen voorkomen en dat er meer ziekten worden overgedragen door insecten, bijvoorbeeld de ziekte van Lyme.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_11 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_11 , 1]

Zomers in Nederland
In Nederland zullen de zomers gemiddeld warmer zijn door een toename van extreme weersituaties. Er zullen meer hittegolven voorkomen. Mensen met een zwakke gezondheid (bijvoorbeeld hoogbejaarden) zullen vaker ziek worden en sterven door de hitte en door de toename van ziektekiemen. Door de warmere zomers is het mogelijk dat tropische ziektes vaker in Nederland voorkomen. Ook wordt verwacht dat meer allergieën zullen voorkomen en dat er meer ziekten worden overgedragen door insecten, bijvoorbeeld de ziekte van Lyme.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_11 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_11 , 2]

Zomers in Nederland
In Nederland zullen de zomers gemiddeld warmer zijn door een toename van extreme weersituaties. Er zullen meer hittegolven voorkomen. Mensen met een zwakke gezondheid (bijvoorbeeld hoogbejaarden) zullen vaker ziek worden en sterven door de hitte en door de toename van ziektekiemen. Door de warmere zomers is het mogelijk dat tropische ziektes vaker in Nederland voorkomen. Ook wordt verwacht dat meer allergieën zullen voorkomen en dat er meer ziekten worden overgedragen door insecten, bijvoorbeeld de ziekte van Lyme.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_12

Winters in Nederland
De winters zullen in Nederland minder koud zijn. Er zullen minder koudegolven zijn waardoor minder mensen ziek worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_12 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_12 , 1]

Winters in Nederland
De winters zullen in Nederland minder koud zijn. Er zullen minder koudegolven zijn waardoor minder mensen ziek worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_12 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_12 , 2]

Winters in Nederland
De winters zullen in Nederland minder koud zijn. Er zullen minder koudegolven zijn waardoor minder mensen ziek worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 11

Wat is uw algemene waardering van het versterkte broeikaseffect?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed

VRAAG 12

We vragen u nu een rapportcijfer (van 1 tot 10) geven aan het versterkte broeikaseffect.

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 6041 **INFORMATIE SCHERM**

Internationale afspraken
Veel landen in de wereld wensen het broeikaseffect te verminderen.
Daarom zijn er internationale afspraken gemaakt om de uitstoot van CO2 terug te dringen.
Ook Nederland vindt het zeer belangrijk om de uitstoot van CO2 te verminderen.
Hoe kunnen we de uitstoot van CO2 verminderen?
Er zijn drie manieren om CO2 uitstoot te verminderen.

VRAAG 6034	INFORMATIE SCHERM

De eerste manier is door te besparen op energie.
Dit kan door mensen en bedrijven aan te sporen minder energie te gebruiken.
Bijvoorbeeld door minder warm te stoken, of door minder auto te rijden.
Een andere manier is om apparaten die energie gebruiken zuiniger te maken.
Ook huizen, auto's en fabrieken zouden zuiniger gemaakt kunnen worden.
Deze zuinigere apparaten, huizen, auto's of fabrieken gebruiken minder energie, maar leveren hetzelfde resultaat.
Dit wordt ook wel energiezuinigheid of energie-efficiëntie genoemd.

VRAAG 6042	INFORMATIE SCHERM

De tweede manier is door te zorgen dat er geen of veel minder CO2 ontstaat bij het opwekken van energie. Dit is bijvoorbeeld zo bij zonne-energie, windenergie, waterkracht en kernenergie. Bij energieopwekking door verbranding van biomassa (zoals hout en groente-, fruit-, tuin- en kweekafval of bijvoorbeeld palmolie) ontstaat wel CO2, maar dit zou ook zijn ontstaan wanneer deze planten op natuurlijke wijze zouden zijn vergaan. Wanneer planten groeien, nemen ze CO2 op. Deze CO2 komt vrij wanneer de planten vergaan of verbrand worden. De opwekking van energie door verbranding van plantenafval levert dus wel CO2 uitstoot op, maar dit zou bij het vergaan van deze planten ook gebeuren.
Deze energiebronnen leveren nu minder dan 5 procent van de energie die we in Nederland gebruiken. Sommige van deze energiebronnen zullen in de komende tientallen jaren meer ingezet worden dan nu het geval is. Andere, zoals zonne-energie en waterkracht, zullen waarschijnlijk niet veel meer ingezet worden. Zonne-energie is (nog) niet ver ontwikkeld en levert in Nederland maar zeer beperkt energie. Energie uit waterkracht is in Nederland zeer beperkt doordat er nauwelijks hoogteverschillen in het land zijn. Windenergie, energie uit biomassa en kernenergie zouden wel meer ingezet kunnen worden. Maar het is onwaarschijnlijk dat, ook als er bespaard wordt op energie, deze energiebronnen de komende tientallen jaren voldoende energie leveren om volledig in de Nederlandse behoefte te voorzien. Daardoor blijft het gebruik van brandstoffen als kolen, aardgas en olie de komende tientallen jaren zeer waarschijnlijk.

VRAAG 6043	INFORMATIE SCHERM

De derde manier om CO2 uitstoot te verminderen, is door te zorgen dat bij de energieopwekking met brandstoffen als kolen en aardgas minder CO2 in de lucht komt. Dit kan door de CO2 die vrijkomt bij energieopwekking met aardgas en kolen af te vangen en voor altijd ondergronds op te slaan, bijvoorbeeld in lege aardgasvelden. Deze methode noemen we CO2 afvang en opslag. Doordat de CO2 wordt opgeslagen kan deze niet meer in de lucht komen en dus ook niet meer bijdragen aan het broeikaseffect.

VRAAG 6035	INFORMATIE SCHERM

Om het risico van een versterkt broeikaseffect sterk te verminderen is het nodig om veel minder CO2 uit te stoten. In 2050 moet dat 60 procent tot 80 procent minder zijn dan we nu uitstoten. Daarmee kan de temperatuurstijging waarschijnlijk beperkt worden tot 2 graden Celsius. Dat is de maximale stijging waarbij deskundigen denken dat de gevolgen te overzien zijn. Hierbij is er vanuit gegaan dat de rijke landen hun uitstoot meer beperken dan arme landen.

VRAAG 6044	INFORMATIE SCHERM

Om in 2050 de uitstoot zover terug te brengen is het al in 2030 nodig om 50 procent minder CO2 uit te stoten dan nu. Zoals u hiervoor al gelezen hebt, zijn er drie methoden om uitstoot van CO2 te verminderen: besparing van energie, vervanging van CO2-uitstotende brandstoffen door windenergie, kernenergie of biomassa en CO2 afvang en opslag. Deskundigen hebben zeven pakketten geselecteerd die met behulp van één van deze methoden in staat zijn om al in 2030 de CO2 uitstoot te verminderen met 50 procent. In deze enquête krijgt u informatie over deze zeven pakketten. Deskundigen verwachten dat deze zeven pakketten belangrijke mogelijkheden vormen om in 2030 CO2 uitstoot te verminderen. Eén pakket is echter onvoldoende om de gewenste vermindering van CO2 uitstoot te halen.

Er zijn daarvoor drie pakketten nodig.
Om 50 procent van de CO2 uitstoot te verminderen, moet er 120 miljoen ton CO2 minder uitgestoten worden. Maar elk pakket in deze enquête stoot 40 miljoen ton CO2 minder uit. Drie pakketten samen stoten wel (3 x 40 miljoen =) 120 miljoen ton CO2 minder uit. Kortom, als alle maatregelen die in een pakket zijn beschreven worden uitgevoerd wordt er 40 miljoen ton CO2 minder uitgestoten. Door invoering van drie van de zeven pakketten zou dus 120 miljoen ton CO2 minder uitgestoten worden. Dat is de helft van de totale CO2 uitstoot nu.

VRAAG 60451 **INFORMATIE SCHERM**

De zeven pakketten zijn:
1. Verbetering van energiezuinigheid
2. Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
3. Elektriciteit van windmolens op zee
4. Omzetting van biomassa naar autobrandstof en elektriciteit
5. Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
6. Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
7. Elektriciteit uit kerncentrales

VRAAG 6046 **INFORMATIE SCHERM**

Bij het samenstellen van de informatie over de gevolgen van de pakketten hebben deskundigen bepaalde aannames gemaakt.
Ze gingen bijvoorbeeld van het volgende uit:
* Nederland is niet het enige land waar de CO2 uitstoot wordt teruggedrongen, maar alle landen in de wereld streven hiernaar
* De vermindering van 50 procent is gebaseerd op de verwachte economische groei. Meer groei tot 2030 dan verwacht kan er voor zorgen dat de groei van de uitstoot van CO2 hoger is dan berekend.
In dat geval zal dus een grotere hoeveelheid CO2 uitstoot verminderd moeten worden.
* Aangenomen wordt dat de energieomzetting in Nederland gebeurt.
Bijvoorbeeld elektriciteitsopwekking of het maken van warmte gebeurt in Nederland.
Wel is het mogelijk aardgas, kolen, uranium en biomassa uit andere landen in te voeren.
* Elk pakket bespaart 40 miljoen ton CO2 uitstoot

VRAAG 6036 **INFORMATIE SCHERM**

Daarnaast moet u bij het kiezen van drie pakketten straks rekening houden met de combinatie van de pakketten. Niet elke combinatie van pakketten is logisch of mogelijk. Voordat u gevraagd wordt een keuze te maken, krijgt u hierover meer informatie.

VRAAG 6107 **INFORMATIE SCHERM**

U krijgt straks dus informatie over zeven pakketten voordat we u vragen een keuze te maken. Mocht u graag pauze willen houden tussendoor (even stoppen), dan willen wij u vriendelijk verzoeken te proberen om geen pauze te houden voordat u minstens één van de pakketten beoordeeld heeft.

VRAAG 6037 **INFORMATIE SCHERM**

Samengevat leidt het huidige energiegebruik uit kolen, olie en gas tot een te grote uitstoot van het broeikasgas CO2. Het klimaat verandert hierdoor.
De temperatuur zal sterk toenemen met gevolgen voor waterhoogte, de landbouw, natuur, zeespiegel en de gezondheid. Vanwege deze gevolgen en de bijkomende kosten, wil de overheid maatregelen nemen.
Er zijn verschillende opties om de CO2 uitstoot te verminderen. Men kan het gebruik van energie terugdringen, andere bronnen gebruiken (zoals windenergie, biomassa of kernenergie) of wel kolen en gas gebruiken maar dan de vrijkomende CO2 ondergronds opslaan.
Alle zeven pakketten beschreven in deze enquête hebben gemeenschappelijk dat ze leiden tot een gelijke afname van CO2.
Drie pakketten samen komt overeen met de doelstelling om de uitstoot in 2030 50 procent lager te laten zijn dan nu.

VRAAG 6047 **INFORMATIE SCHERM**

U heeft intussen behoorlijk wat informatie te lezen gekregen.
Het is belangrijk dat u deze informatie goed in u heeft opgenomen voordat u de rest van

de enquête invult. Om te zien of alles duidelijk uitgelegd is en u alles heeft begrepen,
worden nu een aantal vragen gesteld over de voorgaande informatie.

VRAAG 31

Wordt momenteel ongeveer 95 procent van de energie die gebruikt wordt
in Nederland opgewekt met behulp van kolen, gas en olie?

1 ❑ Nee, het is ongeveer 50 procent
2 ❑ Ja
3 ❑ Nee, het is bijna 100 procent

VRAAG 6048 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Momenteel wordt inderdaad ongeveer 95 procent
van de energie die gebruikt wordt in Nederland opgewekt met behulp van
kolen, gas en olie."

VRAAG 32

Bij de huidige opwekking van energie met behulp van kolen in Nederland ..

1 ❑ wordt er geen CO2 uitgestoten naar de dampkring
2 ❑ wordt er wel CO2 uitgestoten naar de dampkring

VRAAG 6049 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Bij de huidige opwekking van energie met behulp van kolen
in Nederland wordt er wel CO2 uitgestoten naar de dampkring.

VRAAG 33

Bij de huidige opwekking van energie met behulp van gas in Nederland ...

1 ❑ wordt er geen CO2 uitgestoten naar de dampkring
2 ❑ wordt er wel CO2 uitgestoten naar de dampkring

VRAAG 6050 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Bij de huidige opwekking van energie met behulp
van gas in Nederland wordt er wel CO2 uitgestoten naar de dampkring.

VRAAG 34

Door de uitstoot van CO2 bij de huidige opwekking van
energie met kolen, gas en olie .....

1 ❑ wordt het broeikaseffect versterkt
2 ❑ wordt het broeikaseffect verminderd
3 ❑ blijft het broeikaseffect gelijk

VRAAG 6051 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Door de uitstoot van CO2 bij de huidige opwekking van energie met
kolen, gas en olie wordt het broeikaseffect versterkt.

VRAAG 35

Wanneer het broeikaseffect versterkt wordt ...

1 ❑ gaat de gemiddelde temperatuur op aarde omhoog
2 ❑ gaat de gemiddelde temperatuur op aarde omlaag
3 ❑ blijft de gemiddelde temperatuur op aarde hetzelfde

VRAAG 6052 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Wanneer het broeikaseffect versterkt wordt
gaat de gemiddelde temperatuur omhoog.

VRAAG 36

Wanneer de uitstoot van CO2 blijft toenemen zoals nu,
zal de gemiddelde temperatuur op aarde tot 2099 ....

1 ❑ meer dan 6.4 graden Celsius stijgen
2 ❑ waarschijnlijk 1.1 tot 6.4 graden Celsius stijgen
3 ❑ waarschijnlijk 1.1 tot 6.4 graden Celsius dalen
4 ❑ zeker 1.1 tot 6.4 graden stijgen

VRAAG 6053 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Wanneer de uitstoot van CO2 blijft toenemen zoals nu, zal de
gemiddelde temperatuur op aarde tot 2099 waarschijnlijk
1.1 tot 6.4 graden Celsius stijgen.

VRAAG 37

De volgende vragen gaan over de zeven pakketten
die eerder in deze vragenlijst genoemd zijn.
Welke stelling is juist?

1 ❑ Alle zeven pakketten zorgen ervoor dat er nauwelijks CO2 ontstaat
2 ❑ Alle zeven pakketten hebben gemeen dat er nauwelijks CO2 in de lucht wordt uitgestoten
3 ❑ Alle zeven pakketten hebben gemeen dat er meer CO2 in de lucht wordt uitgestoten dan bij de huidige manieren van energie opwekking

VRAAG 6054 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Alle zeven pakketten hebben gemeen dat er
geen CO2 in de lucht wordt uitgestoten.

VRAAG 38

Drie van de zeven pakketten (waarover deze enquête gaat)
zorgen samen voor een vermindering van CO2 uitstoot in 2030
vergeleken met nu ....

1 ❑ Van ongeveer 100 procent
2 ❑ Van ongeveer 50 procent
3 ❑ Van ongeveer 20 procent
4 ❑ Deze pakketten streven niet naar een vermindering van CO2 uitstoot

VRAAG 6055 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Drie van de zeven pakketten (waarover deze enquête gaat)
zorgen samen voor een vermindering van CO2 uitstoot
in 2030 van ongeveer 50 procent vergeleken met nu.

VRAAG 39

Kernenergie en windenergie verminderen de CO2 uitstoot omdat ..

1 ❑ Er geen CO2 ontstaat bij het opwekken van elektriciteit met behulp van windmolens of kerncentrales
2 ❑ Er wel CO2 ontstaat bij het opwekken van elektriciteit met behulp van windmolens of kerncentrales, maar deze CO2 afgevangen wordt en opgeslagen
3 ❑ Er wel CO2 ontstaat bij het opwekken van elektriciteit met behulp van windmolens of kerncentrales, maar net zo veel als eerder is opgenomen uit de lucht

VRAAG 6056 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
Kernenergie en windenergie verminderen de
CO2 uitstoot omdat er geen CO2 ontstaat bij het opwekken van
elektriciteit met behulp van windmolens of kerncentrales.

VRAAG 40

De opwekking van energie met behulp van biomassa vermindert
de CO2 uitstoot omdat ...

1 ❑ Er geen CO2 ontstaat bij het opwekken van energie met biomassa
2 ❑ Er wel CO2 ontstaat bij het opwekken van energie met biomassa, maar deze CO2 afgevangen wordt en opgeslagen
3 ❑ Er wel CO2 ontstaat bij het opwekken van energie met biomassa, maar net zoveel als toch al zou ontstaan wanneer de biomassa was vergaan

VRAAG 6057 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
De opwekking van energie met behulp van biomassa vermindert
de CO2 uitstoot omdat er wel CO2 ontstaat bij het
opwekken van energie met biomassa, maar net zoveel als toch al zou
ontstaan wanneer de biomassa was vergaan.

VRAAG 41

De pakketten in deze enquête die kolen en gas
gebruiken verminderen de CO2 uitstoot omdat ....

1 ❑ Er geen CO2 ontstaat bij het opwekken van energie met behulp van kolen en gas
2 ❑ Er wel CO2 ontstaat bij het opwekken van energie met behulp van kolen en gas, maar deze CO2 afgevangen wordt en opgeslagen
3 ❑ Er wel CO2 ontstaat bij het opwekken van energie met behulp van kolen en gas, maar net zoveel als in de jaren er voor is opgenomen uit de lucht

VRAAG 6038 **INFORMATIE SCHERM**

Inderdaad, dat is juist. <> Dit antwoord is niet juist.
De pakketten in deze enquête die kolen en gas
gebruiken verminderen de CO2 uitstoot omdat er wel CO2 ontstaat bij
het opwekken van energie met behulp van kolen en gas, maar deze CO2
afgevangen wordt en opgeslagen.

VRAAG 6061 **INFORMATIE SCHERM**

LET OP
[Prog: Dit vragenblok, tot vraag 6071, alleen indien SPLIT1 = 3]

Straks krijgt u zeven pakketten te beoordelen. Twee van die pakketten maken gebruik van de opslag van CO2. U krijgt straks ook de gevolgen van deze pakketten te beoordelen. Er zijn echter veel meer technologieën die gebruik kunnen maken van CO2 transport en opslag, dan de twee pakketten die we in deze vragenlijst aan u kunnen voorleggen. Daarom willen we graag weten hoe u over CO2 transport en opslag in het algemeen denkt.

VRAAG 7041_13

We vragen u nu een aantal gevolgen van de afvang, het transport en de ondergrondse opslag van CO2 te beoordelen.
Bij het transport van CO2 in pijpleidingen kan de leiding lek raken,
waardoor CO2 in de lucht komt. De kans hierop is zeer klein en
vergelijkbaar met de kans op gaslekken in ondergrondse pijpleidingen
nu in Nederland. Door goede systemen die op het lekken van CO2
controleren, zal het lekken van veel CO2 voorkomen kunnen worden.
De verwachting is dat door goede controle het risico op een lek in de
CO2-leidingen zeer gering is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_13 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_13 , 1]

We vragen u nu een aantal gevolgen van de afvang, het transport en de ondergrondse opslag van CO2 te beoordelen.
Bij het transport van CO2 in pijpleidingen kan de leiding lek raken,
waardoor CO2 in de lucht komt. De kans hierop is zeer klein en
vergelijkbaar met de kans op gaslekken in ondergrondse pijpleidingen
nu in Nederland. Door goede systemen die op het lekken van CO2

controleren, zal het lekken van veel CO2 voorkomen kunnen worden.
De verwachting is dat door goede controle het risico op een lek in de
CO2-leidingen zeer gering is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_13 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_13 , 2]

We vragen u nu een aantal gevolgen van de afvang, het transport en de ondergrondse opslag
van CO2 te beoordelen.
Bij het transport van CO2 in pijpleidingen kan de leiding lek raken,
waardoor CO2 in de lucht komt. De kans hierop is zeer klein en
vergelijkbaar met de kans op gaslekken in ondergrondse pijpleidingen
nu in Nederland. Door goede systemen die op het lekken van CO2
controleren, zal het lekken van veel CO2 voorkomen kunnen worden.
De verwachting is dat door goede controle het risico op een lek in de
CO2-leidingen zeer gering is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_14

Gevolg van CO2 afvang, transport en ondergrondse opslag in Nederland
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk.
Teveel CO2 in de lucht kan vóórkomen wanneer een zeer grote
hoeveelheid CO2 met grote snelheid vrijkomt en blijft hangen,
bijvoorbeeld in een bergdal. In ons land is dit zeer onwaarschijnlijk. Ten
eerste is het zeer onwaarschijnlijk dat zo'n grote hoeveelheid in één keer
vrijkomt. Ten tweede is Nederland vlak en kan CO2 zich moeilijk
ophopen of blijven hangen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_14 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_14 , 1]

Gevolg van CO2 afvang, transport en ondergrondse opslag in Nederland
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk.
Teveel CO2 in de lucht kan vóórkomen wanneer een zeer grote
hoeveelheid CO2 met grote snelheid vrijkomt en blijft hangen,
bijvoorbeeld in een bergdal. In ons land is dit zeer onwaarschijnlijk. Ten
eerste is het zeer onwaarschijnlijk dat zo'n grote hoeveelheid in één keer
vrijkomt. Ten tweede is Nederland vlak en kan CO2 zich moeilijk
ophopen of blijven hangen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_14 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_14 , 2]

Gevolg van CO2 afvang, transport en ondergrondse opslag in Nederland
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk.
Teveel CO2 in de lucht kan vóórkomen wanneer een zeer grote
hoeveelheid CO2 met grote snelheid vrijkomt en blijft hangen,
bijvoorbeeld in een bergdal. In ons land is dit zeer onwaarschijnlijk. Ten
eerste is het zeer onwaarschijnlijk dat zo'n grote hoeveelheid in één keer
vrijkomt. Ten tweede is Nederland vlak en kan CO2 zich moeilijk
ophopen of blijven hangen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_15

Wanneer CO2 eenmaal in de ondergrondse ruimte is opgeslagen,
zou het kunnen weglekken door slecht afsluitende putten,
scheuren en breuken in de afsluitende laag van de ondergrondse ruimte.
Hoewel deskundigen niet precies weten hoeveel CO2 hierbij in de lucht
zou komen, gaat het vermoedelijk om heel kleine hoeveelheden.
Door goede systemen die op het lekken van CO2 controleren, zou het lekken
van veel CO2 voorkómen kunnen worden. De verwachting is dat door
goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes
zeer gering is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_15 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_15 , 1]

Wanneer CO2 eenmaal in de ondergrondse ruimte is opgeslagen,
zou het kunnen weglekken door slecht afsluitende putten,
scheuren en breuken in de afsluitende laag van de ondergrondse ruimte.
Hoewel deskundigen niet precies weten hoeveel CO2 hierbij in de lucht
zou komen, gaat het vermoedelijk om heel kleine hoeveelheden.
Door goede systemen die op het lekken van CO2 controleren, zou het lekken
van veel CO2 voorkómen kunnen worden. De verwachting is dat door

goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes
zeer gering is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_15 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_15 , 2]

Wanneer CO2 eenmaal in de ondergrondse ruimte is opgeslagen,
zou het kunnen weglekken door slecht afsluitende putten,
scheuren en breuken in de afsluitende laag van de ondergrondse ruimte.
Hoewel deskundigen niet precies weten hoeveel CO2 hierbij in de lucht
zou komen, gaat het vermoedelijk om heel kleine hoeveelheden.
Door goede systemen die op het lekken van CO2 controleren, zou het lekken
van veel CO2 voorkómen kunnen worden. De verwachting is dat door
goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes
zeer gering is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_16

Wanneer CO2 weglekt uit pijpleidingen of ondergrondse opslag, kan dit verschillende
risico's met zich mee brengen. Er is een kleine kans dat weggelekte CO2 het grondwater
in de omgeving verzuurd. Wanneer dit drinkwater is, is het niet drinkbaar meer.
Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen,
afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn
voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_16 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_16 , 1]

Wanneer CO2 weglekt uit pijpleidingen of ondergrondse opslag, kan dit verschillende risico's met zich mee brengen. Er is een kleine kans dat weggelekte CO2 het grondwater in de omgeving verzuurd. Wanneer dit drinkwater is, is het niet drinkbaar meer. Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_16 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_16 , 2]

Wanneer CO2 weglekt uit pijpleidingen of ondergrondse opslag, kan dit verschillende risico's met zich mee brengen. Er is een kleine kans dat weggelekte CO2 het grondwater in de omgeving verzuurd. Wanneer dit drinkwater is, is het niet drinkbaar meer. Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_17

Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO2 kleine aardbevingen kunnen veroorzaken.
Hierdoor kunnen op land bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Bodemdaling die ontstaat door het uit de grond halen van aardgas kan mogelijk tegengegaan worden door CO2 in de grond te brengen.
Sommige deskundigen denken dat dit de kans op aardbevingen in de buurt zou kunnen verminderen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_17 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_17 , 1]

Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO2 kleine aardbevingen kunnen veroorzaken.
Hierdoor kunnen op land bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Bodemdaling die ontstaat door het uit de grond halen van aardgas kan mogelijk tegengegaan worden door CO2 in de grond te brengen.
Sommige deskundigen denken dat dit de kans op aardbevingen in de buurt zou kunnen verminderen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_17 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_17 , 2]

Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO2 kleine aardbevingen kunnen veroorzaken.
Hierdoor kunnen op land bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Bodemdaling die ontstaat door het uit de grond halen van aardgas kan mogelijk tegengegaan worden door CO2 in de grond te brengen.
Sommige deskundigen denken dat dit de kans op aardbevingen in de buurt zou kunnen verminderen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_18

CO2 die wordt afgevangen en ondergronds wordt opgeslagen komt niet in de lucht van onze dampkring en draagt dus niet bij aan de temperatuurstijging door het broeikaseffect.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_18 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_18 , 1]

CO2 die wordt afgevangen en ondergronds wordt opgeslagen komt niet in de lucht van onze dampkring en draagt dus niet bij aan de temperatuurstijging door het broeikaseffect.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_18 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_18 , 2]

CO_2 die wordt afgevangen en ondergronds wordt opgeslagen komt niet in de lucht van onze dampkring en draagt dus niet bij aan de temperatuurstijging door het broeikaseffect.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 51

Zojuist beoordeelde u een aantal kenmerken en gevolgen van CO_2 afvang, transport en ondergrondse opslag in Nederland.
Nu willen we graag uw totaaloordeel hierover weten.
Wat vindt u al met al van CO_2 afvang, transport en ondergrondse opslag in Nederland?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed

VRAAG 52

We vragen u nu een rapportcijfer (van 1 tot 10) geven aan CO_2 afvang, transport en ondergrondse opslag in Nederland.

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10
99 ❑ Geen mening

VRAAG 6071 **INFORMATIE SCHERM**

U krijgt straks informatie over de gevolgen van zeven pakketten.
De informatie is door deskundigen samengesteld. Dit betekent dat u gevolgen te zien krijgt die volgens deskundigen belangrijk zijn.
Wat deskundigen echter niet kunnen bepalen is of u de gevolgen van belang vindt en hoe nadelig of voordelig u een bepaald gevolg vindt.

VRAAG 6072 **INFORMATIE SCHERM**

Straks wordt u gevraagd de gevolgen van de verschillende pakketten te beoordelen.
Daarna wordt u gevraagd een keuze te maken uit de verschillende pakketten.
Hoe dit laatste in zijn werk gaat zullen we duidelijk maken aan de hand van de voorbeeldvragen die u eerder invulde.

VRAAG 6073 **INFORMATIE SCHERM**

In de voorbeeld-enquête heeft u de gevolgen van pijnstiller merk X beoordeeld.
U heeft informatie gehad over de gevolgen van merk X, en vervolgens heeft u deze gevolgen beoordeeld.

VRAAG 6101 **INFORMATIE SCHERM**

We laten uw oordelen over de gevolgen van Merk X nog even zien.
U heeft <?> beoordeeld als nadeel.
U heeft dat nadeel beoordeeld met de waarde <?>
U heeft <?> beoordeeld als voordeel.
U heeft dat voordeel beoordeeld met de waarde <?>
U heeft <?> beoordeeld als onbelangrijk.
Uw oordelen zetten we op het volgende scherm in een tabel.

VRAAG 6102

Wij bieden u een hulpmiddel aan dat gebruikt kan worden bij het bepalen van uw totaaloordeel over Merk X. Uw totaaloordeel is wat u al met al van Merk X vindt.
De computer maakt een soort verlies en winstrekening op. Dat werkt als volgt:
Gevolgen die u een nadeel vond en waarbij u hebt aangegeven hoe groot u dit nadeel vond (een getal tussen 1 en 9), worden door de computer opgeteld tot een totale nadeelscore.
Gevolgen die u een voordeel vond en waarbij u hebt aangegeven hoe groot u dit voordeel vond (een getal tussen 1 en 9), worden door de computer opgeteld tot een totale voordeelscore.
Natuurlijk zijn gevolgen die u onbelangrijk vond niet in de winst- en verliesrekening meegenomen, maar ze verschijnen wel met een nulletje in de kolom 'onbelangrijk'.
Prijs
Kans op duizeligheid
Kans op misselijkheid
Kans op sufheid

VRAAG 6103

Wij bieden u een hulpmiddel aan dat gebruikt kan worden bij het bepalen van uw totaaloordeel over Merk X. Uw totaaloordeel is wat u al met al van Merk X vindt.
De computer maakt een soort verlies en winstrekening op. Dat werkt als volgt:
Gevolgen die u een nadeel vond en waarbij u hebt aangegeven hoe groot u dit nadeel vond (een getal tussen 1 en 9), worden door de computer opgeteld tot een totale nadeelscore.
Gevolgen die u een voordeel vond en waarbij u hebt aangegeven hoe groot u dit voordeel vond (een getal tussen 1 en 9), worden door de computer opgeteld tot een totale voordeelscore.
Natuurlijk zijn gevolgen die u onbelangrijk vond niet in de winst- en verliesrekening meegenomen, maar ze verschijnen wel met een nulletje in de kolom 'onbelangrijk'.
Prijs
Kans op duizeligheid
Kans op misselijkheid
Kans op sufheid
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 6104

Prijs
Kans op duizeligheid
Kans op misselijkheid
Kans op sufheid
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
We vragen u nu om uw totaaloordeel, dus hoe u al met al over deze pijnstiller denkt.
Het ligt voor de hand dat u hierbij rekening houdt met uw eigen beoordelingen van de gevolgen.
Daarbij is het natuurlijk handig om uw eigen totale nadeelscore te gebruiken. Mocht u ergens gevolgen als voordeel beoordeeld hebben, dan kunt u uw totale voordeelscore natuurlijk ook in uw keuze betrekken.
Wat is uw totaaloordeel over Merk X, op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed

VRAAG 6106

Vul nu uw totaaloordeel in over deze pijnstiller, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 6200 **INFORMATIE SCHERM**

U hebt nu uw algemene waardering uitgesproken voor merk X. U zou ook de mogelijkheid kunnen hebben te kiezen uit twee merken pijnstillers, merk X en merk Y.
Stelt u zich voor dat u merk Y op dezelfde manier kunt beoordelen.
U hebt dan van beide merken pijnstillers de gevolgen beoordeeld.
U hebt beide merken pijnstillers een rapportcijfer gegeven.
Nu zou u een beslissing kunnen maken, welke pijnstiller u het beste vindt.
Dit was natuurlijk maar een voorbeeld. In dit voorbeeld ging het niet om een werkelijk te maken keuze.
Bovendien kreeg u maar weinig informatie over de pijnstillers. Hierdoor kwam de werkwijze van de enquête misschien wat omslachtig over. Straks krijgt u echter informatie over meer keuzemogelijkheden en bovendien over meer gevolgen per keuzemogelijkheid.
U zult zien dat de werkwijze van de enquête u dan helpt om de gevolgen van de keuzemogelijkheden (de zeven energiepakketten) op een rijtje te zetten. De werkwijze is straks precies hetzelfde als in het voorbeeld.

VRAAG 6201 **INFORMATIE SCHERM**

Straks zult u op de manier waarop u merk X beoordeelde, ook de zeven pakketten kunnen beoordelen. Eerst krijgt u de gevolgen van een pakket te beoordelen. Daarna krijgt u een overzicht van uw beoordelingen. Met dit overzicht kunt u uw totale nadeelscore en uw totale voordeelscore van het pakket berekenen. Vervolgens kunt u het pakket als geheel beoordelen.
Op dezelfde manier kunt u ook de andere pakketten beoordelen.
Nadat u de zeven pakketten op deze manier beoordeeld hebt, krijgt u aan het eind een overzicht van de rapportcijfers die u de zeven pakketten gegeven hebt. Op dit punt kunt u straks, als u dat wilt, rapportcijfers veranderen. Daarbij kunt u, als u dat wilt, eerdere overzichten van beoordelingen van gevolgen nog eens bekijken.
Daarna kunt u kiezen, welke drie pakketten uw voorkeur hebben.

VRAAG 6084 **INFORMATIE SCHERM**

De informatie over de gevolgen van de verschillende pakketten is door deskundigen samengesteld.
Dit betekent dat u gevolgen te zien krijgt die volgens deskundigen belangrijk zijn.
Wat deskundigen echter niet kunnen bepalen is of u een bepaald gevolg belangrijk vindt.
Daarom vragen we dat aan u.

VRAAG 6085 **INFORMATIE SCHERM**

Niet alle gevolgen van de verschillende pakketten worden vermeld. U krijgt alleen informatie over punten waarop de pakketten verschillen. Zo geldt voor alle pakketten dat ze zorgen voor dezelfde hoeveelheid vermindering van CO2 uitstoot. Hoewel dit belangrijk is, zult u deze informatie niet tegenkomen bij de gevolgen. Het is immers hetzelfde voor alle pakketten en het helpt u dus niet bij het maken van een keuze.
In de voorbeeld-enquête over pijnstillers hebben we bijvoorbeeld ook niet vermeld dat een kenmerk van beide pijnstillers is dat ze pijn stillen. Dit geldt voor beide merken in gelijke mate en helpt dus niet bij het maken van een keuze.

VRAAG 6086 **INFORMATIE SCHERM**

Het zal u straks misschien opvallen dat veel van de gevolgen van de pakketten nadelen zijn.
Dit komt voor een deel omdat de voordelen van de pakketten vaak voor alle zeven pakketten gelden en dus niet vermeld zijn. Denk bijvoorbeeld aan het kenmerk dat we net noemden, de levering van voldoende energie.
Alle pakketten hebben dus ook belangrijke voordelen, ook al staan ze niet bij de gevolgen die we u vragen te beoordelen.

VRAAG 6087 **INFORMATIE SCHERM**

Als u bij een van de pakketten informatie over een bepaald aspect tegenkomt, wil dat niet zeggen dat u bij alle pakketten informatie over dat aspect zult tegenkomen.
Bij één pakket krijgt u bijvoorbeeld informatie over gevolgen voor vissen en zoogdieren in zee.
Bij andere pakketten niet, omdat deze pakketten geen gevolgen hebben voor vissen en zoogdieren in zee.

VRAAG 6088 **INFORMATIE SCHERM**

Gevolgen van pakketten worden ook niet vermeld, wanneer ze niet verschillen van gevolgen die nu ook plaatsvinden. U krijgt alleen informatie over gevolgen die anders zijn dan de gevolgen van de huidige energiewinning.
Een voorbeeld zijn de gevolgen voor luchtkwaliteit voor mensen. Bij sommige pakketten staat hier niets over vermeld, omdat de gevolgen voor luchtkwaliteit hetzelfde zijn als nu.
Dat betekent dus niet dat er helemaal geen gevolgen zijn voor de luchtkwaliteit, slechts dat deze gevolgen hetzelfde zijn als nu.

VRAAG 6089 **INFORMATIE SCHERM**

Wanneer een bepaald gevolg niet optreedt bij een pakket, terwijl dat in de huidige situatie wel zo is, staat dit in het gevolg vermeld. Wanneer er bijvoorbeeld door een pakket geen luchtvervuiling door uitlaatgassen optreedt, staat dit vermeld als een vermindering van uitlaatgassen ten opzichte van nu.
Slechts een enkele keer staat een gebrek aan gevolg uitdrukkelijk wel vermeld.
Dit is het geval wanneer veel leken lijken te denken dat er een gevolg is, terwijl deskundigen weten of verwachten dat dit gevolg niet zal optreden.

VRAAG 6090 **INFORMATIE SCHERM**

Voor deze enquête is door verschillende onderzoekers van verschillende achtergronden zeer veel inspanning verricht om evenwichtige en recente informatie te verzamelen van vele experts.
Hiervoor zijn experts van bedrijven, overheid, milieuorganisaties en universiteiten geraadpleegd,
in binnen- en buitenland. Desondanks zijn niet alle gevolgen van de pakketten bekend.
Voor sommige pakketten zijn over bepaalde gevolgen wel veel gegevens, terwijl er voor andere pakketten helemaal geen gegevens zijn over die gevolgen. Bijvoorbeeld bij technologieën die al veel gebruikt zijn, is uit ervaring bekend hoeveel ongelukken er gebeuren en onder welke omstandigheden dit gebeurt.
Bij modernere technologieën, zoals wind of biomassa, zijn hierover geen gegevens.
Toch is het waarschijnlijk dat bij het gebruik van deze pakketten ook ongelukken gebeuren.
Hoewel het dus bij veel pakketten waarschijnlijk is dat er ongelukken gebeuren, is maar voor een deel van de pakketten bekend hoeveel precies. Omdat het de vergelijking tussen de pakketten oneerlijk zou worden wanneer zulke nadelige gevolgen bij sommige pakketten wel vermeld staan, en bij andere pakketten niet, staan dit soort gevolgen niet in de enquête vermeld.

VRAAG 6091 **INFORMATIE SCHERM**

Een gevolg dat om deze reden ontbreekt bij alle pakketten is de veiligheid voor mensen bij het winnen van grondstoffen die nodig zijn voor het pakket, en eventuele bouw- en onderhoudswerkzaamheden die nodig zijn voor het pakket. Hierbij kunt u bijvoorbeeld denken aan eventuele ongelukken bij het winnen van kolen of uraniumerts in mijnen, of ongelukken tijdens het winnen van materialen voor de bouw van windmolens.
Ook bij het verbouwen van biomassa kunnen ongelukken gebeuren.
Bij het vervoer van grondstoffen en bouwmateriaal kunnen ook ongelukken gebeuren.
Dit vervoer zou ook meer vervuiling of CO2 uitstoot kunnen opleveren dan nu in de gevolgen vermeld staat.

VRAAG 6092 **INFORMATIE SCHERM**

De laatste opmerking over de vermelding van gevolgen betreft de prijs van energie bij de pakketten.
Straks zal het u misschien opvallen dat de energieprijs bij bijna alle pakketten omhoog gaat ten opzichte van de huidige energieprijs. Deskundigen verwachten dat dit niet alleen geldt voor de pakketten in de enquête, maar ook voor andere vormen van energiewinning.

VRAAG 6093 **INFORMATIE SCHERM**

Als u van alle zeven pakketten de gevolgen beoordeeld heeft, wordt u gevraagd drie van de zeven pakketten te kiezen.
Met die keuze geeft u aan welke combinatie van drie energie pakketten volgens u de voorkeur verdient om in 2030 50 procent minder CO2 uit te stoten in de lucht.
Voordat u een keuze maakt, zal nogmaals vermeld worden welke combinaties van pakketten niet mogelijk zijn.

VRAAG 111 **INFORMATIE SCHERM**

Nu volgt een omschrijving van het eerste pakket.
Daarna volgen de te beoordelen gevolgen.
U kunt altijd één of meer schermen terug gaan als u iets nog eens wilt lezen of iets wat u heeft
ingevuld wilt verbeteren. Door op het vakje 'vorige' te klikken kunt u een scherm terug gaan.
Onthoudt u hierbij nog wel dat u niet kunt veranderen of u iets onbelangrijk, een nadeel of een voordeel vindt.

VRAAG 112 **INFORMATIE SCHERM**

Verbetering van energiezuinigheid
Dit pakket streeft er naar 40 miljoen ton CO2 uitstoot te besparen in 2030 door apparaten, auto's, huizen en het maken van producten energiezuiniger te maken. Energiezuinigheid is de vermindering van de energie die nodig is voor gelijk resultaat. Bijvoorbeeld, de energie die nodig is om een middelgroot huis te verwarmen. Of de energie die nodig is om een ton staal te produceren. Of de energie die nodig is om 1 kilometer met de auto te rijden.
Door bijvoorbeeld zuinigere technologieën, beter geïsoleerde huizen of zuinigere auto's is minder energie nodig voor hetzelfde resultaat.
Zonder extra maatregelen verbetert de energiezuinigheid elk jaar.
Om 40 miljoen ton CO2 uitstoot te besparen moet er nog 1% extra energiezuinigheid per jaar van apparaten, auto's, huizen en fabrieken bewerkstelligd worden.
Om deze 1 % extra energiezuinigheid per jaar te bereiken zal de overheid dwingende maatregelen moeten nemen.
Deze maatregelen moeten er voor zorgen dat bedrijven en burgers moeite doen om apparaten, auto's, huizen en het maken van producten energiezuiniger te maken. Doordat er door dit pakket minder energie nodig zal zijn voor hetzelfde resultaat, hoeft er ook minder brandstof gebruikt te worden om energie op te wekken.

VRAAG 7041_19

Verbetering van energiezuinigheid
Bijdrage aan luchtkwaliteit
Wanneer dit pakket van maatregelen voor energiezuinigheid wordt toegepast, wordt de bijdrage aan luchtvervuiling door energiegebruik minder omdat er minder brandstof gebruikt zal worden voor auto's, stroom en industrie. Door dit pakket zal de gezondheid van mensen verbeterd worden door schonere lucht.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_19 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_19 , 1]

Verbetering van energiezuinigheid
Bijdrage aan luchtkwaliteit
Wanneer dit pakket van maatregelen voor energiezuinigheid wordt toegepast, wordt de bijdrage aan luchtvervuiling door energiegebruik minder omdat er minder brandstof gebruikt zal worden voor auto's, stroom en industrie. Door dit pakket zal de gezondheid van mensen verbeterd worden door schonere lucht.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_19 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_19 , 2]

Verbetering van energiezuinigheid
Bijdrage aan luchtkwaliteit
Wanneer dit pakket van maatregelen voor energiezuinigheid wordt toegepast, wordt de bijdrage aan luchtvervuiling door energiegebruik minder omdat er minder brandstof gebruikt zal worden voor auto's, stroom en industrie. Door dit pakket zal de gezondheid van mensen verbeterd worden door schonere lucht.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_20

Verbetering van energiezuinigheid
Gebruik natuurlijke bronnen
Voor dit pakket worden apparaten en machines ontwikkeld die niet alleen zuiniger zijn, maar ook langer meegaan dan nu.
Daardoor hoeven apparaten en machines minder vaak vervangen te worden.
Dit vermindert het gebruik van materialen die nodig zijn om deze apparaten en machines te maken. Het vermindert ook de hoeveelheid afval, omdat materiaal efficiënter gebruikt wordt en omdat apparaten en technologieën minder snel afgedankt worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_20 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_20 , 1]

Verbetering van energiezuinigheid
Gebruik natuurlijke bronnen
Voor dit pakket worden apparaten en machines ontwikkeld die niet alleen zuiniger zijn, maar ook langer meegaan dan nu.
Daardoor hoeven apparaten en machines minder vaak vervangen te worden.
Dit vermindert het gebruik van materialen die nodig zijn om deze apparaten en machines te maken. Het vermindert ook de hoeveelheid afval, omdat materiaal efficiënter gebruikt wordt en omdat apparaten en technologieën minder snel afgedankt worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_20 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_20 , 2]

Verbetering van energiezuinigheid
Gebruik natuurlijke bronnen
Voor dit pakket worden apparaten en machines ontwikkeld die niet alleen zuiniger zijn, maar ook langer meegaan dan nu.
Daardoor hoeven apparaten en machines minder vaak vervangen te worden.
Dit vermindert het gebruik van materialen die nodig zijn om deze apparaten en machines te maken. Het vermindert ook de hoeveelheid afval, omdat materiaal efficiënter gebruikt wordt en omdat apparaten en technologieën minder snel afgedankt worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_21

Verbetering van energiezuinigheid
Betrouwbaarheid energievoorziening
Doordat er voor apparaten, huizen en het maken van producten minder energie nodig is, is Nederland minder afhankelijk van landen waaruit energiebronnen ingevoerd worden, bijvoorbeeld minder afhankelijk van het Midden-Oosten.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_21 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_21 , 1]

Verbetering van energiezuinigheid
Betrouwbaarheid energievoorziening
Doordat er voor apparaten, huizen en het maken van producten minder energie nodig is, is Nederland minder afhankelijk van landen waaruit energiebronnen ingevoerd worden, bijvoorbeeld minder afhankelijk van het Midden-Oosten.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_21 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_21 , 2]

Verbetering van energiezuinigheid
Betrouwbaarheid energievoorziening
Doordat er voor apparaten, huizen en het maken van producten minder energie nodig is, is Nederland minder afhankelijk van landen waaruit energiebronnen ingevoerd worden, bijvoorbeeld minder afhankelijk van het Midden-Oosten.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_22

Verbetering van energiezuinigheid
Economische gevolgen
Doordat er minder energie nodig is, hoeft er minder geld gestoken te worden in nieuwe elektriciteitscentrales en nieuwe elektriciteitsleidingen en wordt er minder olie, gas en kolen gebruikt.
Het geld dat uitgespaard wordt door besparingen in de hele maatschappij kan op een andere manier gebruikt worden. Sommige experts denken dat dit pakket mogelijk voor 200.000 banen extra in de Europese Unie kan zorgen per tien jaar, anderen denken dat dit erg optimistisch is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_22 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_22 , 1]

Verbetering van energiezuinigheid
Economische gevolgen
Doordat er minder energie nodig is, hoeft er minder geld gestoken te worden in nieuwe elektriciteitscentrales en nieuwe elektriciteitsleidingen en wordt er minder olie, gas en kolen gebruikt.
Het geld dat uitgespaard wordt door besparingen in de hele maatschappij kan op een andere manier gebruikt worden. Sommige experts denken dat dit pakket mogelijk voor 200.000 banen extra in de Europese Unie kan zorgen per tien jaar, anderen denken dat dit erg optimistisch is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_22 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_22 , 2]

Verbetering van energiezuinigheid
Economische gevolgen
Doordat er minder energie nodig is, hoeft er minder geld gestoken te worden in nieuwe elektriciteitscentrales en nieuwe elektriciteitsleidingen en wordt er minder olie, gas en kolen gebruikt.
Het geld dat uitgespaard wordt door besparingen in de hele maatschappij kan op een andere manier gebruikt worden. Sommige experts denken dat dit pakket mogelijk voor 200.000 banen extra in de Europese Unie kan zorgen per tien jaar, anderen denken dat dit erg optimistisch is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_23

Verbetering van energiezuinigheid
Maatregelen om brandstofgebruik voor transport te beperken
Door dit pakket komt er Europese wetgeving die vereist dat in 2030 passagiersauto’s 30 kilometer kunnen rijden op één liter brandstof. Nu is dat ongeveer 12,5 kilometer per liter.
De aanschaf van die zuinige auto’s kan eerst flink duurder worden, maar experts verwachten dat wanneer deze zuinige auto’s op grote schaal gemaakt worden, de auto’s in de loop der tijd weer minder duur worden. Deze auto’s zijn zuiniger in gebruik. Zware auto’s (bijvoorbeeld SUV’s) zullen duurder worden. Andere overheidsmaatregelen om brandstofgebruik te beperken zouden bijvoorbeeld tolwegen of extra belasting voor vervuilende auto’s kunnen zijn. Al met al wordt autogebruik voor mensen die veel brandstof verbruiken waarschijnlijk duurder.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_23 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_23 , 1]

Verbetering van energiezuinigheid
Maatregelen om brandstofgebruik voor transport te beperken
Door dit pakket komt er Europese wetgeving die vereist dat in 2030 passagiersauto’s 30 kilometer kunnen rijden op één liter brandstof. Nu is dat ongeveer 12,5 kilometer per liter.

De aanschaf van die zuinige auto's kan eerst flink duurder worden, maar experts verwachten dat wanneer deze zuinige auto's op grote schaal gemaakt worden, de auto's in de loop der tijd weer minder duur worden. Deze auto's zijn zuiniger in gebruik. Zware auto's (bijvoorbeeld SUV's) zullen duurder worden. Andere overheidsmaatregelen om brandstofgebruik te beperken zouden bijvoorbeeld tolwegen of extra belasting voor vervuilende auto's kunnen zijn. Al met al wordt autogebruik voor mensen die veel brandstof verbruiken waarschijnlijk duurder.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_23 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_23 , 2]

Verbetering van energiezuinigheid
Maatregelen om brandstofgebruik voor transport te beperken
Door dit pakket komt er Europese wetgeving die vereist dat in 2030 passagiersauto's 30 kilometer kunnen rijden op één liter brandstof. Nu is dat ongeveer 12,5 kilometer per liter.
De aanschaf van die zuinige auto's kan eerst flink duurder worden, maar experts verwachten dat wanneer deze zuinige auto's op grote schaal gemaakt worden, de auto's in de loop der tijd weer minder duur worden. Deze auto's zijn zuiniger in gebruik. Zware auto's (bijvoorbeeld SUV's) zullen duurder worden. Andere overheidsmaatregelen om brandstofgebruik te beperken zouden bijvoorbeeld tolwegen of extra belasting voor vervuilende auto's kunnen zijn. Al met al wordt autogebruik voor mensen die veel brandstof verbruiken waarschijnlijk duurder.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_24

Verbetering van energiezuinigheid
Gevolgen voor industrie
Om dit pakket tot stand te brengen zal de industrie met strenge regels en wetten verplicht worden om apparaten en technologieën die in de industrie gebruikt worden energiezuiniger te maken.
Bijvoorbeeld machines die gebruikt worden in fabrieken voor aandrijving of koeling moeten dan energiezuiniger gemaakt worden. Dit soort apparaten en technologieën zijn duurder voor de industrie, maar omdat ze minder energie gebruiken zijn ze uiteindelijk net zo duur als minder zuinige apparaten en technologieën.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_24 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_24 , 1]

Verbetering van energiezuinigheid
Gevolgen voor industrie
Om dit pakket tot stand te brengen zal de industrie met strenge regels en wetten verplicht worden om apparaten en technologieën die in de industrie gebruikt worden energiezuiniger te maken.
Bijvoorbeeld machines die gebruikt worden in fabrieken voor aandrijving of koeling moeten dan energiezuiniger gemaakt worden. Dit soort apparaten en technologieën zijn duurder voor de industrie, maar omdat ze minder energie gebruiken zijn ze uiteindelijk net zo duur als minder zuinige apparaten en technologieën.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_24 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_24 , 2]

Verbetering van energiezuinigheid
Gevolgen voor industrie
Om dit pakket tot stand te brengen zal de industrie met strenge regels en wetten verplicht worden om apparaten en technologieën die in de industrie gebruikt worden energiezuiniger te maken.
Bijvoorbeeld machines die gebruikt worden in fabrieken voor aandrijving of koeling moeten dan energiezuiniger gemaakt worden. Dit soort apparaten en technologieën zijn duurder voor de industrie, maar omdat ze minder energie gebruiken zijn ze uiteindelijk net zo duur als minder zuinige apparaten en technologieën.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_25

Verbetering van energiezuinigheid
Gevolgen voor huizen en gebouwen
Door dit pakket zullen strikte maatregelen genomen worden die het energiezuiniger maken van nieuwe huizen en gebouwen afdwingen. Het zuiniger maken van bestaande slecht geïsoleerde huizen en gebouwen zal worden gestimuleerd door subsidie te geven voor isolatie of door belasting te heffen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_25 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_25 , 1]

Verbetering van energiezuinigheid
Gevolgen voor huizen en gebouwen
Door dit pakket zullen strikte maatregelen genomen worden die het energiezuiniger maken van nieuwe huizen en gebouwen afdwingen. Het zuiniger maken van bestaande slecht geïsoleerde huizen en gebouwen zal worden gestimuleerd door subsidie te geven voor isolatie of door belasting te heffen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_25 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_25 , 2]

Verbetering van energiezuinigheid
Gevolgen voor huizen en gebouwen
Door dit pakket zullen strikte maatregelen genomen worden die het energiezuiniger maken van nieuwe huizen en gebouwen afdwingen. Het zuiniger maken van bestaande slecht geïsoleerde huizen en gebouwen zal worden gestimuleerd door subsidie te geven voor isolatie of door belasting te heffen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_26

Verbetering van energiezuinigheid
Prijs
Door dit pakket zal er meer belasting geheven worden op energie om mensen te stimuleren minder energie te gebruiken. De prijs van energie zal hierdoor hoger worden, maar het is onbekend hoeveel. Mogelijk zal de overheid besluiten om de extra inkomsten uit de belasting op energie te gebruiken om andere belastingen te verlagen. Doordat huizen en apparaten energiezuiniger worden zal er minder energie gebruikt worden. Experts verwachten dat deze vermindering in gebruik er mogelijk voor zorgt dat huishoudens een minder hoge energierekening krijgen, maar de energierekening zou ook hoger kunnen worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_26 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_26 , 1]

Verbetering van energiezuinigheid
Prijs
Door dit pakket zal er meer belasting geheven worden op energie om mensen te stimuleren minder energie te gebruiken. De prijs van energie zal hierdoor hoger worden, maar het is onbekend hoeveel. Mogelijk zal de overheid besluiten om de extra inkomsten uit de belasting op energie te gebruiken om andere belastingen te verlagen. Doordat huizen en apparaten energiezuiniger worden zal er minder energie gebruikt worden. Experts verwachten dat deze vermindering in gebruik er mogelijk voor zorgt dat huishoudens een minder hoge energierekening krijgen, maar de energierekening zou ook hoger kunnen worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_26 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_26 , 2]

Verbetering van energiezuinigheid
Prijs
Door dit pakket zal er meer belasting geheven worden op energie om mensen te stimuleren minder energie te gebruiken. De prijs van energie zal hierdoor hoger worden, maar het is onbekend hoeveel. Mogelijk zal de overheid besluiten om de extra inkomsten uit de belasting op energie te gebruiken om andere belastingen te verlagen. Doordat huizen en apparaten energiezuiniger worden zal er minder energie gebruikt worden. Experts verwachten dat deze vermindering in gebruik er mogelijk voor zorgt dat huishoudens een minder hoge energierekening krijgen, maar de energierekening zou ook hoger kunnen worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_27

Verbetering van energiezuinigheid
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_27 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_27 , 1]

Verbetering van energiezuinigheid
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_27 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_27 , 2]

Verbetering van energiezuinigheid
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 113

Dit zijn uw oordelen over het pakket Verbetering van energiezuinigheid.
..
Bijdrage aan luchtkwaliteit
Gebruik natuurlijke bronnen
Betrouwbaarheid energievoorziening
Economische gevolgen
Maatregelen om brandstofgebruik voor transport te beperken
Gevolgen voor industrie
Gevolgen voor huizen en gebouwen
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 116

Dit zijn uw oordelen over het pakket Verbetering van energiezuinigheid.
..
Bijdrage aan luchtkwaliteit
Gebruik natuurlijke bronnen
Betrouwbaarheid energievoorziening
Economische gevolgen
Maatregelen om brandstofgebruik voor transport te beperken
Gevolgen voor industrie
Gevolgen voor huizen en gebouwen
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:

TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 114
Wat is uw totaaloordeel over verbetering van energiezuinigheid,
op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 115
Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 121 **INFORMATIE SCHERM**
Nu volgt een omschrijving van het tweede pakket. Daarna volgen de
te beoordelen gevolgen.

VRAAG 122 **INFORMATIE SCHERM**
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Dit pakket streeft er naar 40 miljoen ton CO2 uitstoot te besparen in 2030. Dit pakket is een aanvulling op het eerste pakket "verbetering van energiezuinigheid". Het eerste pakket streeft naar een vermindering van 40 miljoen ton CO2 uitstoot door 1% meer energiezuinigheid per jaar van apparaten, auto's, huizen. Dit tweede pakket "verbetering van energiezuinigheid" komt bovenop het eerste pakket en streeft naar een vermindering van nog eens 40 miljoen ton CO2 uitstoot door nog eens 1% meer energiezuinigheid. Door het eerste en tweede pakket "energiezuinigheid" samen wordt dus 80 miljoen ton CO2 uitstoot bespaart in 2030.
Voor dit pakket zal de overheid buitengewoon zware en dwingende maatregelen moeten nemen, nog veel zwaardere maatregelen dan in het eerste pakket. Deze maatregelen moeten er voor zorgen dat bedrijven en burgers veel moeite doen om apparaten, auto's, huizen en het maken van producten energiezuiniger te maken. Daarnaast moeten zeer strikte overheidsmaatregelen, bijvoorbeeld statiegeld, belastingen en boetes, in dit pakket burgers dwingen minder energie en materiaal te gebruiken.

VRAAG 7041_28

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Bijdrage aan luchtkwaliteit
Omdat er door dit pakket minder energie nodig zal zijn voor hetzelfde gebruik, hoeft er ook minder brandstof gebruikt te worden om energie op te wekken. Wanneer dit pakket van maatregelen voor energiezuinigheid wordt toegepast, wordt de bijdrage aan luchtvervuiling minder omdat er minder brandstof voor auto's gebruikt zal worden. In Nederland overlijden nu ongeveer 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Door dit pakket zal de gezondheid van mensen verbeterd worden door schonere lucht, en meer nog dan in het eerste pakket energie zuinigheid.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_28 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_28 , 1]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Bijdrage aan luchtkwaliteit
Omdat er door dit pakket minder energie nodig zal zijn voor hetzelfde gebruik, hoeft er ook minder brandstof gebruikt te worden om energie op te wekken. Wanneer dit pakket van maatregelen voor energiezuinigheid wordt toegepast, wordt de bijdrage aan luchtvervuiling minder omdat er minder brandstof voor auto's gebruikt zal worden. In Nederland overlijden nu ongeveer 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Door dit pakket zal de gezondheid van mensen verbeterd worden door schonere lucht, en meer nog dan in het eerste pakket energie zuinigheid.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_28 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_28 , 2]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Bijdrage aan luchtkwaliteit
Omdat er door dit pakket minder energie nodig zal zijn voor hetzelfde gebruik, hoeft er ook minder brandstof gebruikt te worden om energie op te wekken. Wanneer dit pakket van maatregelen voor energiezuinigheid wordt toegepast, wordt de bijdrage aan luchtvervuiling minder omdat er minder brandstof voor auto's gebruikt zal worden. In Nederland overlijden nu ongeveer 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Door dit pakket zal de gezondheid van mensen verbeterd worden door schonere lucht, en meer nog dan in het eerste pakket energie zuinigheid.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_29
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Economische gevolgen
Doordat er minder energie nodig is, hoeft er minder geld gestoken te worden in nieuwe elektriciteitscentrales en nieuwe elektriciteitsleidingen en wordt er minder olie, gas en kolen gebruikt. Of het geld dat hiermee bespaard wordt ergens voor gebruikt kan worden is onzeker, want er zijn grote investeringen nodig in huizen, industrie, apparaten en auto's.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_29 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_29 , 1]
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Economische gevolgen
Doordat er minder energie nodig is, hoeft er minder geld gestoken te worden in nieuwe elektriciteitscentrales en nieuwe elektriciteitsleidingen en wordt er minder olie, gas en kolen gebruikt. Of het geld dat hiermee bespaard wordt ergens voor gebruikt kan worden is onzeker, want er zijn grote investeringen nodig in huizen, industrie, apparaten en auto's.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_29 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_29 , 2]
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Economische gevolgen
Doordat er minder energie nodig is, hoeft er minder geld gestoken te worden in nieuwe elektriciteitscentrales en nieuwe elektriciteitsleidingen en wordt er minder olie, gas en kolen gebruikt. Of het geld dat hiermee bespaard wordt ergens voor gebruikt kan worden is onzeker, want er zijn grote investeringen nodig in huizen, industrie, apparaten en auto's.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_30
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor transport
In dit pakket, zullen de motoren van auto's niet alleen veel energiezuiniger moeten worden, maar moeten auto's ook van ander, lichter materiaal gemaakt worden. Auto's kunnen daardoor duurder worden, maar gebruiken minder brandstof. Er zullen tolwegen komen, waardoor het openbaar vervoer veel goedkoper zal worden dan reizen met de auto.
Ook voor vrachtvervoer zullen de wegen veel duurder worden. Daardoor kunnen producten die van ver komen, zoals bijvoorbeeld kiwi's en bananen, duurder worden. Vliegen zal ook veel duurder worden doordat zuinigere maar duurdere vliegtuigen gebruikt moeten worden, wat verrekend zal worden in het ticket. Al met al worden de meeste vormen van transport duurder.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_30 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_30 , 1]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor transport
In dit pakket, zullen de motoren van auto's niet alleen veel energiezuiniger moeten worden, maar moeten auto's ook van ander, lichter materiaal gemaakt worden. Auto's kunnen daardoor duurder worden, maar gebruiken minder brandstof. Er zullen tolwegen komen, waardoor het openbaar vervoer veel goedkoper zal worden dan reizen met de auto.
Ook voor vrachtvervoer zullen de wegen veel duurder worden. Daardoor kunnen producten die van ver komen, zoals bijvoorbeeld kiwi's en bananen, duurder worden. Vliegen zal ook veel duurder worden doordat zuinigere maar duurdere vliegtuigen gebruikt moeten worden, wat verrekend zal worden in het ticket. Al met al worden de meeste vormen van transport duurder.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_30 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_30 , 2]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor transport
In dit pakket, zullen de motoren van auto's niet alleen veel energiezuiniger moeten worden, maar moeten auto's ook van ander, lichter materiaal gemaakt worden. Auto's kunnen daardoor duurder worden, maar gebruiken minder brandstof. Er zullen tolwegen komen, waardoor het openbaar vervoer veel goedkoper zal worden dan reizen met de auto.
Ook voor vrachtvervoer zullen de wegen veel duurder worden. Daardoor kunnen producten die van ver komen, zoals bijvoorbeeld kiwi's en bananen, duurder worden. Vliegen zal ook veel duurder worden doordat zuinigere maar duurdere vliegtuigen gebruikt moeten worden, wat verrekend zal worden in het ticket. Al met al worden de meeste vormen van transport duurder.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_31

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor industrie
Voor dit pakket zullen zeer vernieuwende technologieën nodig zijn, die meer geld kosten. Deze baanbrekende technologieën zijn duurder voor de industrie. Het zou kunnen dat door deze extra kosten voor de industrie, sommige producten ook duurder zullen worden voor de klant.
In dit pakket is de industrie ook verantwoordelijk voor het opruimen van verpakkingen en het recyclen van producten. Bijvoorbeeld door statiegeld in te stellen, niet alleen voor frisdrank, maar voor veel meer soorten verpakkingen of producten. Er zullen ook maatregelen komen om mensen meer te laten recyclen, zoals voorlichting of bijvoorbeeld boetes voor het niet scheiden van afval.
Om te zorgen dat dit pakket ook werkelijk tot stand komt, zullen strenge regels worden opgelegd aan de industrie.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_31	**STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_31 , 1]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor industrie
Voor dit pakket zullen zeer vernieuwende technologieën nodig zijn, die meer geld kosten. Deze baanbrekende technologieën zijn duurder voor de industrie. Het zou kunnen dat door deze extra kosten voor de industrie, sommige producten ook duurder zullen worden voor de klant.
In dit pakket is de industrie ook verantwoordelijk voor het opruimen van verpakkingen en het recyclen van producten. Bijvoorbeeld door statiegeld in te stellen, niet alleen voor frisdrank, maar voor veel meer soorten verpakkingen of producten. Er zullen ook maatregelen komen om mensen meer te laten recyclen, zoals voorlichting of bijvoorbeeld boetes voor het niet scheiden van afval.
Om te zorgen dat dit pakket ook werkelijk tot stand komt, zullen strenge regels worden opgelegd aan de industrie.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_31	**STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_31 , 2]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor industrie
Voor dit pakket zullen zeer vernieuwende technologieën nodig zijn, die meer geld kosten. Deze baanbrekende technologieën zijn duurder voor de industrie. Het zou kunnen dat door deze extra kosten voor de industrie, sommige producten ook duurder zullen worden voor de klant.
In dit pakket is de industrie ook verantwoordelijk voor het opruimen van verpakkingen en het recyclen van producten. Bijvoorbeeld door statiegeld in te stellen, niet alleen voor frisdrank, maar voor veel meer soorten verpakkingen of producten. Er zullen ook maatregelen komen om mensen meer te laten recyclen, zoals voorlichting of bijvoorbeeld boetes voor het niet scheiden van afval.
Om te zorgen dat dit pakket ook werkelijk tot stand komt, zullen strenge regels worden opgelegd aan de industrie.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_32

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor consumenten
Omdat producten veel zuiniger moeten zijn in dit pakket, kan het zijn dat sommige producten moeilijker op de markt gebracht kunnen worden, of heel erg duur worden. Producten zouden ook minder luxe, minder groot of minder mooi kunnen worden. Bijvoorbeeld hele grote auto's, jacuzzi's
of waterbedden worden dan moeilijk verkrijgbaar of heel duur.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_32 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_32 , 1]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor consumenten
Omdat producten veel zuiniger moeten zijn in dit pakket, kan het zijn dat sommige producten moeilijker op de markt gebracht kunnen worden, of heel erg duur worden. Producten zouden ook minder luxe, minder groot of minder mooi kunnen worden. Bijvoorbeeld hele grote auto's, jacuzzi's
of waterbedden worden dan moeilijk verkrijgbaar of heel duur.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_32 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_32 , 2]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor consumenten
Omdat producten veel zuiniger moeten zijn in dit pakket, kan het zijn dat sommige producten moeilijker op de markt gebracht kunnen worden, of heel erg duur worden. Producten zouden ook minder luxe, minder groot of minder mooi kunnen worden. Bijvoorbeeld hele grote auto's, jacuzzi's
of waterbedden worden dan moeilijk verkrijgbaar of heel duur.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_33

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor huizen en gebouwen
Door dit pakket zullen strikte maatregelen genomen worden die het energiezuiniger maken van huizen en gebouwen afdwingen. Nieuwe huizen en gebouwen zullen zo ontworpen moeten worden dat ze bijna geen energie gebruiken. Bij oudere gebouwen zal het energieverbruik drastisch af moeten nemen (bijvoorbeeld tussen 70 en 90 %).
De aanpassingen hiervoor zullen veel geld kosten. In dit pakket moeten burgers ofwel fors investeren in energiebesparende maatregelen of hun gedrag drastisch veranderen (bijvoorbeeld door huizen veel minder warm te stoken).

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_33 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_33 , 1]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor huizen en gebouwen
Door dit pakket zullen strikte maatregelen genomen worden die het energiezuiniger maken van huizen en gebouwen afdwingen. Nieuwe huizen en gebouwen zullen zo ontworpen moeten worden dat ze bijna geen energie gebruiken. Bij oudere gebouwen zal het energieverbruik drastisch af moeten nemen (bijvoorbeeld tussen 70 en 90 %).
De aanpassingen hiervoor zullen veel geld kosten. In dit pakket moeten burgers ofwel fors investeren in energiebesparende maatregelen of hun gedrag drastisch veranderen (bijvoorbeeld door huizen veel minder warm te stoken).

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_33 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_33 , 2]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Gevolgen voor huizen en gebouwen
Door dit pakket zullen strikte maatregelen genomen worden die het energiezuiniger maken van huizen en gebouwen afdwingen. Nieuwe huizen en gebouwen zullen zo ontworpen moeten worden dat ze bijna geen energie gebruiken. Bij oudere gebouwen zal het energieverbruik drastisch af moeten nemen (bijvoorbeeld tussen 70 en 90 %).
De aanpassingen hiervoor zullen veel geld kosten. In dit pakket moeten burgers ofwel fors investeren in energiebesparende maatregelen of hun gedrag drastisch veranderen (bijvoorbeeld door huizen veel minder warm te stoken).

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_34

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Prijs
Door dit pakket zal er meer belasting geheven worden op energie om mensen te stimuleren minder energie te gebruiken. Zolang een huishouden onder een bepaalde hoeveelheid blijft is een eenheid energie niet zo duur, maar wanneer een huishouden meer verbruikt is de energie boven de grens veel duurder per eenheid. De energieprijs zal hoger worden dan in het eerste pakket energie zuinigheid.
De verwachting is dat elektriciteit minimaal 20 tot 40% duurder wordt dan nu.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_34 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_34 , 1]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Prijs
Door dit pakket zal er meer belasting geheven worden op energie om mensen te stimuleren minder energie te gebruiken. Zolang een huishouden onder een bepaalde hoeveelheid blijft is een eenheid energie niet zo duur, maar wanneer een huishouden meer verbruikt is de energie boven de grens veel duurder per eenheid. De energieprijs zal hoger worden dan in het eerste

pakket energie zuinigheid.
De verwachting is dat elektriciteit minimaal 20 tot 40% duurder wordt dan nu.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_34 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_34 , 2]

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Prijs
Door dit pakket zal er meer belasting geheven worden op energie om mensen te stimuleren minder energie te gebruiken. Zolang een huishouden onder een bepaalde hoeveelheid blijft is een eenheid energie niet zo duur, maar wanneer een huishouden meer verbruikt is de energie boven de grens veel duurder per eenheid. De energieprijs zal hoger worden dan in het eerste pakket energie zuinigheid.
De verwachting is dat elektriciteit minimaal 20 tot 40% duurder wordt dan nu.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_35

Verbetering van enerfzevendigheid en vermindering materiaalgebruik en energiegebruik
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_35 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_35 , 1]

Verbetering van enerfzevendigheid en vermindering materiaalgebruik en energiegebruik
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_35 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_35 , 2]

Verbetering van enerfzevendigheid en vermindering materiaalgebruik en energiegebruik
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 123
Dit zijn uw oordelen over het pakket Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik.
..
Bijdrage aan luchtkwaliteit
Economische gevolgen
Gevolgen voor transport
Gevolgen voor industrie
Gevolgen voor consumenten
Gevolgen voor huizen en gebouwen
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 126
Dit zijn uw oordelen over het pakket Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik.
..
Bijdrage aan luchtkwaliteit
Economische gevolgen
Gevolgen voor transport
Gevolgen voor industrie
Gevolgen voor consumenten
Gevolgen voor huizen en gebouwen
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 124
Wat is uw totaaloordeel over verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik, op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 125
Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 131 **INFORMATIE SCHERM**
Nu volgt een omschrijving van het derde pakket.
Daarna volgen de te beoordelen gevolgen.

VRAAG 132 **INFORMATIE SCHERM**
Elektriciteit van windmolens op zee
Dit pakket streeft er naar 40 miljoen ton CO2 uitstoot te besparen in 2030 door ongeveer 23 windmolenparken in de Nederlandse Noordzee te plaatsen. Deze windmolens leveren elektriciteit. De windmolenparken zullen op verschillende plekken in zee langs de hele Nederlandse kust geplaatst worden op minimaal 20 kilometer uit de kust.

VRAAG 7041_36
Elektriciteit van windmolens op zee
Gevolgen voor uitzicht
Voor dit pakket zullen 23 windmolenparken met totaal 3500 windmolens geplaatst worden in de Nederlandse Noordzee. Deze windmolens zullen ongeveer 150 meter hoog zijn, inclusief de wieken die tot ruim 60 meter lang zijn. Op enkele dagen per jaar die zeer helder zijn, kunnen mogelijk enkele windmolens te zien zijn vanaf de kust.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_36 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_36 , 1]
Elektriciteit van windmolens op zee
Gevolgen voor uitzicht
Voor dit pakket zullen 23 windmolenparken met totaal 3500 windmolens geplaatst worden in de Nederlandse Noordzee. Deze windmolens zullen ongeveer 150 meter hoog zijn, inclusief de wieken die tot ruim 60 meter lang zijn. Op enkele dagen per jaar die zeer helder zijn, kunnen mogelijk enkele windmolens te zien zijn vanaf de kust.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_36 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_36 , 2]

Elektriciteit van windmolens op zee
Gevolgen voor uitzicht
Voor dit pakket zullen 23 windmolenparken met totaal 3500 windmolens geplaatst worden in de Nederlandse Noordzee. Deze windmolens zullen ongeveer 150 meter hoog zijn, inclusief de wieken die tot ruim 60 meter lang zijn. Op enkele dagen per jaar die zeer helder zijn, kunnen mogelijk enkele windmolens te zien zijn vanaf de kust.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_37

Elektriciteit van windmolens op zee
Gevolgen voor vogels
Op land vliegen vogels soms tegen de wieken van een windmolen aan en overleven dat meestal niet. Momenteel overlijden ongeveer 50.000 vogels per jaar in Nederland doordat ze tegen windmolens aanvliegen. Ter vergelijking; er overlijden in het verkeer jaarlijks meer dan 2 miljoen vogels in Nederland. Door dit pakket zullen er meer windmolens komen, maar omdat deze ver uit de kust komen, is de verwachting dat deze windmolens minder vogels zullen doden dan de windmolens die nu op land staan

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_37 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_37 , 1]

Elektriciteit van windmolens op zee
Gevolgen voor vogels
Op land vliegen vogels soms tegen de wieken van een windmolen aan en overleven dat meestal niet. Momenteel overlijden ongeveer 50.000 vogels per jaar in Nederland doordat ze tegen windmolens aanvliegen. Ter vergelijking; er overlijden in het verkeer jaarlijks meer dan 2 miljoen vogels in Nederland. Door dit pakket zullen er meer windmolens komen, maar omdat deze ver uit de kust komen, is de verwachting dat deze windmolens minder vogels zullen doden dan de windmolens die nu op land staan

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_37 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_37 , 2]

Elektriciteit van windmolens op zee
Gevolgen voor vogels
Op land vliegen vogels soms tegen de wieken van een windmolen aan en overleven dat meestal niet. Momenteel overlijden ongeveer 50.000 vogels per jaar in Nederland doordat ze tegen windmolens aanvliegen. Ter vergelijking; er overlijden in het verkeer jaarlijks meer dan 2 miljoen vogels in Nederland. Door dit pakket zullen er meer windmolens komen, maar omdat deze ver uit de kust komen, is de verwachting dat deze windmolens minder vogels zullen doden dan de windmolens die nu op land staan

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_38

Elektriciteit van windmolens op zee
Gevolgen voor vissen en zoogdieren in zee
Onderzoek laat tot nu toe zien dat bewegingen van vissen en zoogdieren niet beïnvloed worden door windmolens op zee, zolang hun natuurlijke leefomgeving niet teveel onderbroken wordt door grote windmolenparken. Het is nog onbekend bij welke mate van onderbreking vissen en zoogdieren wel hinder ondervinden. Windmolens kunnen mogelijk als kunstrif dienen en bescherming bieden voor vissen, waardoor de vispopulatie in de Nederlandse Noordzee kan groeien.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_38 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_38 , 1]

Elektriciteit van windmolens op zee
Gevolgen voor vissen en zoogdieren in zee
Onderzoek laat tot nu toe zien dat bewegingen van vissen en zoogdieren niet beïnvloed worden door windmolens op zee, zolang hun natuurlijke leefomgeving niet teveel onderbroken wordt door grote windmolenparken. Het is nog onbekend bij welke mate van onderbreking vissen en zoogdieren wel hinder ondervinden. Windmolens kunnen mogelijk als kunstrif dienen en bescherming bieden voor vissen, waardoor de vispopulatie in de Nederlandse Noordzee kan groeien.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_38 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_38 , 2]

Elektriciteit van windmolens op zee
Gevolgen voor vissen en zoogdieren in zee
Onderzoek laat tot nu toe zien dat bewegingen van vissen en zoogdieren niet beïnvloed worden door windmolens op zee, zolang hun natuurlijke leefomgeving niet teveel onderbroken wordt door grote windmolenparken. Het is nog onbekend bij welke mate van onderbreking vissen en zoogdieren wel hinder ondervinden. Windmolens kunnen mogelijk als kunstrif dienen en bescherming bieden voor vissen, waardoor de vispopulatie in de Nederlandse Noordzee kan groeien.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_39

Elektriciteit van windmolens op zee
Gevolgen voor visserij
Door het plaatsen van windmolenparken op zee zal er minder ruimte zijn op de Nederlandse Noordzee om te vissen. De windmolenparken zullen ongeveer een twintigste (5%) van de Nederlandse Noordzee innemen. Het kan gebeuren dat het hele gebied waar de windmolens geplaatst zijn, inclusief een veiligheidszone, niet meer toegankelijk is voor vissers. De belangrijkste effecten hiervan zijn het verlies van visgronden en mogelijk extra vaartijden om plekken te bereiken waar wel gevist mag worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_39 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_39 , 1]

Elektriciteit van windmolens op zee
Gevolgen voor visserij
Door het plaatsen van windmolenparken op zee zal er minder ruimte zijn op de Nederlandse Noordzee om te vissen. De windmolenparken zullen ongeveer een twintigste (5%) van de Nederlandse Noordzee innemen. Het kan gebeuren dat het hele gebied waar de windmolens geplaatst zijn, inclusief een veiligheidszone, niet meer toegankelijk is voor vissers. De belangrijkste effecten hiervan zijn het verlies van visgronden en mogelijk extra vaartijden om plekken te bereiken waar wel gevist mag worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_39 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_39 , 2]

Elektriciteit van windmolens op zee
Gevolgen voor visserij
Door het plaatsen van windmolenparken op zee zal er minder ruimte zijn op de Nederlandse Noordzee om te vissen. De windmolenparken zullen ongeveer een twintigste (5%) van de Nederlandse Noordzee innemen. Het kan gebeuren dat het hele gebied waar de windmolens geplaatst zijn, inclusief een veiligheidszone, niet meer toegankelijk is voor vissers. De belangrijkste effecten hiervan zijn het verlies van visgronden en mogelijk extra vaartijden om plekken te bereiken waar wel gevist mag worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_40

Elektriciteit van windmolens op zee
Opvang wisselende stroomproductie
Omdat de windmolenparken afhankelijk zijn van de wind produceren ze soms te veel elektriciteit, soms te weinig. Het is mogelijk een overschot aan elektriciteit op te vangen door water in een reservoir op te pompen. Op het moment dat meer elektriciteit nodig is, laat men het water via een turbine weer uit het reservoir. Hiermee wordt elektriciteit opgewekt. Om een teveel aan elektriciteit te kunnen vervoeren is een verzwaring van het elektriciteitsnet nodig. Er zullen hierdoor iets meer elektriciteitleidingen komen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_40 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_40 , 1]

Elektriciteit van windmolens op zee
Opvang wisselende stroomproductie
Omdat de windmolenparken afhankelijk zijn van de wind produceren ze soms te veel elektriciteit, soms te weinig. Het is mogelijk een overschot aan elektriciteit op te vangen door water in een reservoir op te pompen. Op het moment dat meer elektriciteit nodig is, laat men het water via een turbine weer uit het reservoir. Hiermee wordt elektriciteit opgewekt. Om een teveel aan elektriciteit te kunnen vervoeren is een verzwaring van het elektriciteitsnet nodig. Er zullen hierdoor iets meer elektriciteitleidingen komen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_40 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_40 , 2]

Elektriciteit van windmolens op zee
Opvang wisselende stroomproductie
Omdat de windmolenparken afhankelijk zijn van de wind produceren ze soms te veel elektriciteit, soms te weinig. Het is mogelijk een overschot aan elektriciteit op te vangen door water in een reservoir op te pompen. Op het moment dat meer elektriciteit nodig is, laat men het water via een turbine weer uit het reservoir. Hiermee wordt elektriciteit opgewekt. Om een teveel aan elektriciteit te kunnen vervoeren is een verzwaring van het elektriciteitsnet nodig. Er zullen hierdoor iets meer elektriciteitleidingen komen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_41

Elektriciteit van windmolens op zee
Gevolgen voor werkgelegenheid
Voor dit pakket moeten ongeveer 3500 windmolens gebouwd en onderhouden worden. Sommige experts denken dat dit rond 2030 tienduizenden full-time banen extra oplevert, waarvan een groot deel in Nederland.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_41 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_41 , 1]

Elektriciteit van windmolens op zee
Gevolgen voor werkgelegenheid
Voor dit pakket moeten ongeveer 3500 windmolens gebouwd en onderhouden worden. Sommige experts denken dat dit rond 2030 tienduizenden full-time banen extra oplevert, waarvan een groot deel in Nederland.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_41 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_41 , 2]

Elektriciteit van windmolens op zee
Gevolgen voor werkgelegenheid
Voor dit pakket moeten ongeveer 3500 windmolens gebouwd en onderhouden worden.
Sommige experts denken dat dit rond 2030 tienduizenden full-time banen extra oplevert, waarvan een groot deel in Nederland.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_42

Elektriciteit van windmolens op zee
Prijs
Elektriciteit van windmolens zal in 2030 voor huishoudens ongeveer 10-20% meer kosten dan nu. De Nederlandse industrie zal ongeveer 40% meer moeten betalen voor elektriciteit.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_42 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_42 , 1]

Elektriciteit van windmolens op zee
Prijs
Elektriciteit van windmolens zal in 2030 voor huishoudens ongeveer 10-20% meer kosten dan nu. De Nederlandse industrie zal ongeveer 40% meer moeten betalen voor elektriciteit.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_42 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_42 , 2]

Elektriciteit van windmolens op zee
Prijs
Elektriciteit van windmolens zal in 2030 voor huishoudens ongeveer 10-20% meer kosten dan nu. De Nederlandse industrie zal ongeveer 40% meer moeten betalen voor elektriciteit.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_43

Elektriciteit van windmolens op zee
Bijdrage aan het broeikaseffect

De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_43 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_43 , 1]

Elektriciteit van windmolens op zee
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_43 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_43 , 2]

Elektriciteit van windmolens op zee
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 133
Dit zijn uw oordelen over het pakket Elektriciteit van windmolens op zee.
..
Gevolgen voor uitzicht
Gevolgen voor vogels
Gevolgen voor vissen en zoogdieren in zee
Gevolgen voor visserij
Opvang wisselende stroomproductie
Gevolgen voor werkgelegenheid
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 136
Dit zijn uw oordelen over het pakket Elektriciteit van windmolens op zee.
..
Gevolgen voor uitzicht
Gevolgen voor vogels
Gevolgen voor vissen en zoogdieren in zee

Gevolgen voor visserij
Opvang wisselende stroomproductie
Gevolgen voor werkgelegenheid
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 134
Wat is uw totaaloordeel over elektriciteit van windmolens op zee,
op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 135
Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 141 **INFORMATIE SCHERM**
Nu volgt een omschrijving van het vierde pakket.
Daarna volgen de te beoordelen gevolgen.

VRAAG 142 **INFORMATIE SCHERM**
Omzetting van biomassa naar autobrandstof en elektriciteit
Dit pakket streeft er naar 40 miljoen ton CO2 uitstoot te besparen door een deel van de auto's te laten rijden op brandstof uit biomassa en door elektriciteitscentrales te stoken met biomassa. Biomassa is een term voor allerlei organisch materiaal, zoals hout, gras, organisch afval, stro, enzovoort. Biomassa kan gebruikt worden om elektriciteit op te wekken, maar ook om brandstof voor auto's te maken. Wanneer planten groeien, nemen ze CO2 op.
Deze CO2 komt bij de verbranding van de biomassa weer vrij. Er komt door de verbranding van planten niet meer CO2 in de lucht dan door die planten uit de lucht was gehaald, waardoor biomassa CO2-neutraal is. Het pakket zelf is niet volledig CO2 neutraal omdat de biomassa nog vervoerd en verwerkt moet worden. Om in 2030 genoeg biomassa te hebben om 40 miljoen ton CO2 uitstoot te besparen, zal naar schatting 80% van de biomassa ingevoerd moeten worden uit het buitenland. Het grootste deel van deze biomassa wordt dan deels in het buitenland, deels in Nederland omgezet naar moderne biobrandstof voor auto's.
Voor de omzetting van biomassa naar biobrandstof zullen biobrandstoffabrieken gebouwd worden.
Mogelijk zal ook een deel van de olieraffinaderijen, waar ruwe olie naar bijvoorbeeld benzine en diesel wordt omgezet, langzaam worden omgebouwd tot of vervangen worden door biobrandstoffabrieken.
Een kleiner deel van deze biomassa wordt dan in Nederland omgezet naar elektriciteit in 3 of 4 grote elektriciteitscentrales in zeehavens als Rijnmond, Eemshaven of Terneuzen.

VRAAG 7041_44

Omzetting van biomassa naar autobrandstof en elektriciteit
Bijdrage aan luchtkwaliteit
Voertuigen die op biobrandstof rijden stoten minder giftige stoffen uit en zorgen voor een betere luchtkwaliteit in de steden dan nu. In Nederland overlijden nu per jaar zo'n 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Wanneer dit pakket rond 2030 op grote schaal is gerealiseerd wordt de luchtkwaliteit in Nederland aanmerkelijk verbeterd. Dit kan de gezondheid van veel mensen verbeteren.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_44 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_44 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Bijdrage aan luchtkwaliteit
Voertuigen die op biobrandstof rijden stoten minder giftige stoffen uit en zorgen voor een betere luchtkwaliteit in de steden dan nu. In Nederland overlijden nu per jaar zo'n 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Wanneer dit pakket rond 2030 op grote schaal is gerealiseerd wordt de luchtkwaliteit in Nederland aanmerkelijk verbeterd. Dit kan de gezondheid van veel mensen verbeteren.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_44 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_44 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Bijdrage aan luchtkwaliteit
Voertuigen die op biobrandstof rijden stoten minder giftige stoffen uit en zorgen voor een betere luchtkwaliteit in de steden dan nu. In Nederland overlijden nu per jaar zo'n 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Wanneer dit pakket rond 2030 op grote schaal is gerealiseerd wordt de luchtkwaliteit in Nederland aanmerkelijk verbeterd. Dit kan de gezondheid van veel mensen verbeteren.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_45

Omzetting van biomassa naar autobrandstof en elektriciteit
Landgebruik voor biomassa met certificaat
Om biomassa te verkrijgen is grond nodig. Om genoeg biomassa te verkrijgen voor dit pakket zal grond nodig zijn met een oppervlakte van ongeveer de helft van Nederland tot meer dan heel Nederland. Daarom zal biomassa voor een groot deel ingevoerd worden uit regio's zoals Latijns Amerika, het Zuiden en Oosten van Afrika, Oost Europa/Rusland en de omgeving van Australië. Biomassa die dan op een verantwoorde manier gemaakt wordt (bijvoorbeeld van grassen of bomen) krijgt een certificaat (vergelijkbaar met bijvoorbeeld het keurmerk voor hardhout). Verantwoorde biomassa kan voor de eerder genoemde gebieden tot meer inkomsten, meer werkgelegenheid en minder armoede leiden. Ook kan de verbouwing van dit soort gewassen tot een verbetering van landkwaliteit en tot meer duurzame landbouw leiden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_45 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_45 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Landgebruik voor biomassa met certificaat
Om biomassa te verkrijgen is grond nodig. Om genoeg biomassa te verkrijgen voor dit pakket zal grond nodig zijn met een oppervlakte van ongeveer de helft van Nederland tot meer dan heel Nederland. Daarom zal biomassa voor een groot deel ingevoerd worden uit regio's zoals Latijns Amerika, het Zuiden en Oosten van Afrika, Oost Europa/Rusland en de omgeving van Australië. Biomassa die dan op een verantwoorde manier gemaakt wordt (bijvoorbeeld van grassen of bomen) krijgt een certificaat (vergelijkbaar met bijvoorbeeld het keurmerk voor hardhout). Verantwoorde biomassa kan voor de eerder genoemde gebieden tot meer inkomsten, meer werkgelegenheid en minder armoede leiden. Ook kan de verbouwing van dit soort gewassen tot een verbetering van landkwaliteit en tot meer duurzame landbouw leiden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_45 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_45 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Landgebruik voor biomassa met certificaat
Om biomassa te verkrijgen is grond nodig. Om genoeg biomassa te verkrijgen voor dit pakket zal grond nodig zijn met een oppervlakte van ongeveer de helft van Nederland tot meer dan heel Nederland. Daarom zal biomassa voor een groot deel ingevoerd worden uit regio's zoals Latijns Amerika, het Zuiden en Oosten van Afrika, Oost Europa/Rusland en de omgeving van Australië. Biomassa die dan op een verantwoorde manier gemaakt wordt (bijvoorbeeld van grassen of bomen) krijgt een certificaat (vergelijkbaar met bijvoorbeeld het keurmerk voor hardhout). Verantwoorde biomassa kan voor de eerder genoemde gebieden tot meer inkomsten, meer werkgelegenheid en minder armoede leiden. Ook kan de verbouwing van dit soort gewassen tot een verbetering van landkwaliteit en tot meer duurzame landbouw leiden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_46

Omzetting van biomassa naar autobrandstof en elektriciteit
Landgebruik voor biomassa zonder certificaat
Sommige experts denken dat Nederland genoeg biomassa met certificaat zal kunnen invoeren voor dit pakket. Andere experts denken echter dat dit misschien niet lukt, bijvoorbeeld wanneer andere landen ook veel biomassa gaan invoeren. Biomassa zonder certificaat is niet altijd op verantwoorde wijze gemaakt, wat ernstige gevolgen kan hebben voor de gebieden waar de biomassa wordt verbouwd. In deze gebieden kunnen in het ergste geval water reserves uitgeput raken, andere landbouw en bossen vernietigd worden en kleine boeren verdreven worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_46 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_46 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Landgebruik voor biomassa zonder certificaat
Sommige experts denken dat Nederland genoeg biomassa met certificaat zal kunnen invoeren voor dit pakket. Andere experts denken echter dat dit misschien niet lukt, bijvoorbeeld wanneer andere landen ook veel biomassa gaan invoeren. Biomassa zonder certificaat is niet altijd op verantwoorde wijze gemaakt, wat ernstige gevolgen kan hebben voor de gebieden waar de biomassa wordt verbouwd. In deze gebieden kunnen in het ergste geval water reserves uitgeput raken, andere landbouw en bossen vernietigd worden en kleine boeren verdreven worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_46 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_46 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Landgebruik voor biomassa zonder certificaat
Sommige experts denken dat Nederland genoeg biomassa met certificaat zal kunnen invoeren voor dit pakket. Andere experts denken echter dat dit misschien niet lukt, bijvoorbeeld wanneer andere landen ook veel biomassa gaan invoeren. Biomassa zonder certificaat is niet altijd op verantwoorde wijze gemaakt, wat ernstige gevolgen kan hebben voor de gebieden waar de biomassa wordt verbouwd. In deze gebieden kunnen in het ergste geval water reserves uitgeput raken, andere landbouw en bossen vernietigd worden en kleine boeren verdreven worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_47

Omzetting van biomassa naar autobrandstof en elektriciteit
Invloed op voedselproductie
Wanneer veel landen gebruik gaan maken van biomassa, kan er mogelijk zoveel landbouwgrond nodig zijn dat er minder landbouwgrond is voor het verbouwen van voedsel. Door landbouw te verbeteren in gebieden waar de opbrengst laag is kan er met minder grond evenveel voedsel verbouwd worden, waardoor ruimte overblijft voor het verbouwen van

biomassa. Biomassa kan ook geplant worden op grond die onbruikbaar is voor andere landbouw. Door de verbouwing van biomassa kan in sommige gevallen meer landbouwgrond gemaakt worden, omdat grond die eerder niet geschikt was voor het verbouwen van voedsel, door het verbouwen van biomassa wel bruikbaar wordt voor het verbouwen van voedsel. Resten van landbouw en bosbouw die anders niet gebruikt zouden worden (bijvoorbeeld resthout, zaagsel en stro), kunnen gebruikt worden als biomassa.
Het verbouwen van biomassa kan tot concurrentie leiden met het verbouwen van voedsel, maar het verbouwen van biomassa kan tegelijk leiden tot beter beheer van bodems, en kan stimuleren dat voedsel efficiënter verbouwd wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_47 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_47 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Invloed op voedselproductie
Wanneer veel landen gebruik gaan maken van biomassa, kan er mogelijk zoveel landbouwgrond nodig zijn dat er minder landbouwgrond is voor het verbouwen van voedsel. Door landbouw te verbeteren in gebieden waar de opbrengst laag is kan er met minder grond evenveel voedsel verbouwd worden, waardoor ruimte overblijft voor het verbouwen van biomassa. Biomassa kan ook geplant worden op grond die onbruikbaar is voor andere landbouw. Door de verbouwing van biomassa kan in sommige gevallen meer landbouwgrond gemaakt worden, omdat grond die eerder niet geschikt was voor het verbouwen van voedsel, door het verbouwen van biomassa wel bruikbaar wordt voor het verbouwen van voedsel. Resten van landbouw en bosbouw die anders niet gebruikt zouden worden (bijvoorbeeld resthout, zaagsel en stro), kunnen gebruikt worden als biomassa.
Het verbouwen van biomassa kan tot concurrentie leiden met het verbouwen van voedsel, maar het verbouwen van biomassa kan tegelijk leiden tot beter beheer van bodems, en kan stimuleren dat voedsel efficiënter verbouwd wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_47 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_47 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Invloed op voedselproductie
Wanneer veel landen gebruik gaan maken van biomassa, kan er mogelijk zoveel landbouwgrond nodig zijn dat er minder landbouwgrond is voor het verbouwen van voedsel. Door landbouw te verbeteren in gebieden waar de opbrengst laag is kan er met minder grond evenveel voedsel verbouwd worden, waardoor ruimte overblijft voor het verbouwen van biomassa. Biomassa kan ook geplant worden op grond die onbruikbaar is voor andere landbouw. Door de verbouwing van biomassa kan in sommige gevallen meer landbouwgrond gemaakt worden, omdat grond die eerder niet geschikt was voor het verbouwen van voedsel, door het verbouwen van biomassa wel bruikbaar wordt voor het verbouwen van voedsel. Resten van landbouw en bosbouw die anders niet gebruikt zouden worden (bijvoorbeeld resthout, zaagsel en stro), kunnen gebruikt worden als biomassa.
Het verbouwen van biomassa kan tot concurrentie leiden met het verbouwen van voedsel, maar het verbouwen van biomassa kan tegelijk leiden tot beter beheer van bodems, en kan stimuleren dat voedsel efficiënter verbouwd wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_48

Omzetting van biomassa naar autobrandstof en elektriciteit
Betrouwbaarheid energie
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat we altijd voldoende energie kunnen opwekken. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (bijvoorbeeld de afhankelijkheid van het Midden-Oosten voor olie). Biomassa kan uit veel landen en verschillende werelddelen worden ingevoerd. Sommige experts denken dat biomassa met certificaat uit minder landen ingevoerd zal kunnen worden. De kans dat de biomassa die nodig is voor dit pakket niet ingevoerd kan worden is al met al redelijk klein tot zeer klein. Biobrandstoffen vervangen aardolie, waardoor de afhankelijkheid van de invoer van olie vermindert. De betrouwbaarheid van energieopwekking is daarom redelijk groot.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_48 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_48 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Betrouwbaarheid energie
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat we altijd voldoende energie kunnen opwekken. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (bijvoorbeeld de afhankelijkheid van het Midden-Oosten voor olie). Biomassa kan uit veel landen en verschillende werelddelen worden ingevoerd. Sommige experts denken dat biomassa met certificaat uit minder landen ingevoerd zal kunnen worden. De kans dat de biomassa die nodig is voor dit pakket niet ingevoerd kan worden is al met al redelijk klein tot zeer klein. Biobrandstoffen vervangen aardolie, waardoor de afhankelijkheid van de invoer van olie vermindert. De betrouwbaarheid van energieopwekking is daarom redelijk groot.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_48 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_48 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Betrouwbaarheid energie
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat we altijd voldoende energie kunnen opwekken. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (bijvoorbeeld de afhankelijkheid van het Midden-Oosten voor olie). Biomassa kan uit veel landen en verschillende werelddelen worden ingevoerd. Sommige experts denken dat biomassa met certificaat uit minder landen ingevoerd zal kunnen worden. De kans dat de biomassa die nodig is voor dit pakket niet ingevoerd kan worden is al met al redelijk klein tot zeer klein. Biobrandstoffen vervangen aardolie, waardoor de afhankelijkheid van de invoer van olie vermindert. De betrouwbaarheid van energieopwekking is daarom redelijk groot.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_49

Omzetting van biomassa naar autobrandstof en elektriciteit
Uitbreiding havens
Om de biomassa die nodig is voor dit pakket in te kunnen voeren en te kunnen verwerken zijn grotere havens nodig. Daarom zullen huidige havens worden uitgebreid. De uitbreiding van havens zal ook extra werkgelegenheid opleveren. Er zal meer werkgelegenheid ontstaan door dit pakket, meer nog dan er werkgelegenheid verdwijnt doordat er minder kolen en olie gebruikt worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_49 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_49 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Uitbreiding havens
Om de biomassa die nodig is voor dit pakket in te kunnen voeren en te kunnen verwerken zijn grotere havens nodig. Daarom zullen huidige havens worden uitgebreid. De uitbreiding van havens zal ook extra werkgelegenheid opleveren. Er zal meer werkgelegenheid ontstaan door dit pakket, meer nog dan er werkgelegenheid verdwijnt doordat er minder kolen en olie gebruikt worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_49 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_49 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Uitbreiding havens
Om de biomassa die nodig is voor dit pakket in te kunnen voeren en te kunnen verwerken zijn grotere havens nodig. Daarom zullen huidige havens worden uitgebreid. De uitbreiding van havens zal ook extra werkgelegenheid opleveren. Er zal meer werkgelegenheid ontstaan door dit pakket, meer nog dan er werkgelegenheid verdwijnt doordat er minder kolen en olie gebruikt worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_50

Omzetting van biomassa naar autobrandstof en elektriciteit
Benodigde nieuwe voertuigen
De meeste auto’s die nu rondrijden kunnen deels op biobrandstof rijden (deze brandstof wordt dan gemixt met benzine of diesel). Voor dit pakket zou ongeveer tweederde van de auto’s tussen nu en 2030 geleidelijk aan vervangen moeten worden door auto’s die volledig op brandstof uit biomassa kunnen rijden. Deze auto’s zijn al ontwikkeld en zijn afgezien van de brandstof gelijk aan de huidige auto’s.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_50 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_50 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Benodigde nieuwe voertuigen
De meeste auto's die nu rondrijden kunnen deels op biobrandstof rijden (deze brandstof wordt dan gemixt met benzine of diesel). Voor dit pakket zou ongeveer tweederde van de auto's tussen nu en 2030 geleidelijk aan vervangen moeten worden door auto's die volledig op brandstof uit biomassa kunnen rijden. Deze auto's zijn al ontwikkeld en zijn afgezien van de brandstof gelijk aan de huidige auto's.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_50 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_50 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Benodigde nieuwe voertuigen
De meeste auto's die nu rondrijden kunnen deels op biobrandstof rijden (deze brandstof wordt dan gemixt met benzine of diesel). Voor dit pakket zou ongeveer tweederde van de auto's tussen nu en 2030 geleidelijk aan vervangen moeten worden door auto's die volledig op brandstof uit biomassa kunnen rijden. Deze auto's zijn al ontwikkeld en zijn afgezien van de brandstof gelijk aan de huidige auto's.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_51

Omzetting van biomassa naar autobrandstof en elektriciteit
Economische gevolgen
In dit pakket vervangen biobrandstoffen aardolie. Omdat biobrandstoffen op termijn goedkoper zijn dan aardolie, gaat er minder geld Nederland uit.
Dit heeft een gunstig effect op de toekomstige handelsbalans van Nederland.
Dat kan positief zijn voor de Nederlandse economie.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_51 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_51 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Economische gevolgen
In dit pakket vervangen biobrandstoffen aardolie. Omdat biobrandstoffen op termijn goedkoper zijn dan aardolie, gaat er minder geld Nederland uit.
Dit heeft een gunstig effect op de toekomstige handelsbalans van Nederland.
Dat kan positief zijn voor de Nederlandse economie.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_51 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_51 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Economische gevolgen
In dit pakket vervangen biobrandstoffen aardolie. Omdat biobrandstoffen op termijn goedkoper zijn dan aardolie, gaat er minder geld Nederland uit.
Dit heeft een gunstig effect op de toekomstige handelsbalans van Nederland.
Dat kan positief zijn voor de Nederlandse economie.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_52

Omzetting van biomassa naar autobrandstof en elektriciteit
Prijs
De prijs van elektriciteit uit biomassa blijft naar verwachting gelijk. De prijs van brandstof voor auto's uit biomassa zal iets goedkoper worden. Wanneer op biobrandstof dezelfde belasting geheven wordt als op benzine, zal biobrandstof in 2030 ongeveer hetzelfde tot mogelijk 20 % per liter goedkoper zijn dan benzine nu.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_52 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_52 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Prijs
De prijs van elektriciteit uit biomassa blijft naar verwachting gelijk. De prijs van brandstof voor auto's uit biomassa zal iets goedkoper worden. Wanneer op biobrandstof dezelfde belasting geheven wordt als op benzine, zal biobrandstof in 2030 ongeveer hetzelfde tot mogelijk 20 % per liter goedkoper zijn dan benzine nu.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_52 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_52 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Prijs
De prijs van elektriciteit uit biomassa blijft naar verwachting gelijk. De prijs van brandstof voor auto's uit biomassa zal iets goedkoper worden. Wanneer op biobrandstof dezelfde belasting geheven wordt als op benzine, zal biobrandstof in 2030 ongeveer hetzelfde tot mogelijk 20 % per liter goedkoper zijn dan benzine nu.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_53

Omzetting van biomassa naar autobrandstof en elektriciteit
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_53 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_53 , 1]

Omzetting van biomassa naar autobrandstof en elektriciteit
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_53 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_53 , 2]

Omzetting van biomassa naar autobrandstof en elektriciteit
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 143

Dit zijn uw oordelen over het pakket Omzetting van biomassa naar autobrandstof en elektriciteit
.
..
Bijdrage aan luchtkwaliteit
Landgebruik voor biomassa met certificaat
Landgebruik voor biomassa zonder certificaat
Invloed op voedselproductie
Betrouwbaarheid energie
Uitbreiding havens
Benodigde nieuwe voertuigen
Economische gevolgen
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 146

Dit zijn uw oordelen over het pakket Omzetting van biomassa naar autobrandstof en elektriciteit
.
..
Bijdrage aan luchtkwaliteit
Landgebruik voor biomassa met certificaat
Landgebruik voor biomassa zonder certificaat
Invloed op voedselproductie
Betrouwbaarheid energie
Uitbreiding havens
Benodigde nieuwe voertuigen

Economische gevolgen
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 144

Wat is uw totaaloordeel over omzetting van biomassa
naar autobrandstof en elektriciteit, op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 145

Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 151 **INFORMATIE SCHERM**

Nu volgt een omschrijving van het vijfde pakket.
Daarna volgen de te beoordelen gevolgen.

VRAAG 152 **INFORMATIE SCHERM**

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Dit pakket streeft ernaar 40 miljoen ton CO2 uitstoot te besparen door CO2 die bij gasgestookte en kolengestookte elektriciteitscentrales ontstaat, af te vangen en ondergronds op te slaan. Dit kan zowel onder het land als onder de bodem van het Nederlands deel van de Noordzee.
Afvang van CO2 kan bij bestaande elektriciteitscentrales plaatsvinden of ingepast worden in nieuwe centrales. Verwacht wordt dat in 2030 ongeveer de helft van de centrales met CO2 afvang kolengestookt zal zijn en de helft gasgestookt. Dit pakket kan tijdelijk worden toegepast omdat de ruimte waarin CO2 opgeslagen kan worden vol raakt en gas en kolen uiteindelijk op raken. Met de huidige kennis van de ondergrond is de verwachting dat er voor ongeveer 100 tot 300 jaar opslagruimte is. Verder onderzoek naar veiligheid en beschikbaarheid is echter nodig om te kunnen bepalen of al deze opslagruimte kan worden gebruikt. Onderzoek kan echter ook uitwijzen dat er meer ruimte is dan nu verwacht.

VRAAG 7041_54

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Bijdrage aan vervuiling door kolenwinning
De kolen die nodig zijn voor de elektriciteitscentrales worden in het buitenland gewonnen. In sommige landen is de directe omgeving van kolenmijnen vaak sterk vervuild, in andere landen minder. Sterk afhankelijk van de landen waaruit Nederland de kolen invoert die nodig zijn voor dit pakket, kan het land, water en de lucht rondom de mijn weinig tot zeer vervuild raken.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_54 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_54 , 1]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Bijdrage aan vervuiling door kolenwinning
De kolen die nodig zijn voor de elektriciteitscentrales worden in het buitenland gewonnen. In sommige landen is de directe omgeving van kolenmijnen vaak sterk vervuild, in andere landen minder. Sterk afhankelijk van de landen waaruit Nederland de kolen invoert die nodig zijn voor dit pakket, kan het land, water en de lucht rondom de mijn weinig tot zeer vervuild raken.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_54 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_54 , 2]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Bijdrage aan vervuiling door kolenwinning
De kolen die nodig zijn voor de elektriciteitscentrales worden in het buitenland gewonnen. In sommige landen is de directe omgeving van kolenmijnen vaak sterk vervuild, in andere landen minder. Sterk afhankelijk van de landen waaruit Nederland de kolen invoert die nodig zijn voor dit pakket, kan het land, water en de lucht rondom de mijn weinig tot zeer vervuild raken.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_55

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Veiligheid van CO2 transport in pijpleidingen
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk. Bij het transport van CO2 in pijpleidingen kan de leiding lek raken, waardoor CO2 in de lucht komt. Er is een kleine kans dat er zoveel CO2 blijft hangen, dat het gevaarlijk is voor mensen, dieren en planten. De kans op lekken is vergelijkbaar met de kans op gaslekken in ondergrondse aardgas-pijpleidingen nu in Nederland. Voor dit pakket is ongeveer 2000 kilometer pijpleiding nodig. Met die hoeveelheid pijpleiding kan verwacht worden dat er ongeveer eens per twee jaar iets misgaat, maar dat zal lang niet altijd leiden tot het ontsnappen van CO2. De verwachting is dat door goede controle het risico op een lek in de CO2-leidingen zeer klein is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_55 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_55 , 1]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Veiligheid van CO2 transport in pijpleidingen
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk. Bij het transport van CO2 in pijpleidingen kan de leiding lek raken, waardoor CO2 in de lucht komt. Er is een kleine kans dat er zoveel CO2 blijft hangen, dat het gevaarlijk is voor mensen, dieren en planten. De kans op lekken is vergelijkbaar met de kans op gaslekken in ondergrondse aardgas-pijpleidingen nu in Nederland. Voor dit pakket is ongeveer 2000 kilometer pijpleiding nodig. Met die hoeveelheid pijpleiding kan verwacht worden dat er ongeveer eens per twee jaar iets misgaat, maar dat zal lang niet altijd leiden tot het ontsnappen van CO2. De verwachting is dat door goede controle het risico op een lek in de CO2-leidingen zeer klein is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_55 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_55 , 2]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Veiligheid van CO2 transport in pijpleidingen
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk. Bij het transport van CO2 in pijpleidingen kan de leiding lek raken, waardoor CO2 in de lucht komt. Er is een kleine kans dat er zoveel CO2 blijft hangen, dat het gevaarlijk is voor mensen, dieren en planten. De kans op lekken is vergelijkbaar met de kans op gaslekken in ondergrondse aardgas-pijpleidingen nu in Nederland. Voor dit pakket is ongeveer 2000 kilometer pijpleiding nodig. Met die hoeveelheid pijpleiding kan verwacht worden dat er ongeveer eens per twee jaar iets misgaat, maar dat zal lang niet altijd leiden tot het ontsnappen van CO2. De verwachting is dat door goede controle het risico op een lek in de CO2-leidingen zeer klein is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_56

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Veiligheid ondergrondse opslag van CO2
Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO2 kleine aardbevingen kunnen veroorzaken. Hierdoor kunnen bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Wanneer CO2 eenmaal in de ondergrondse ruimte is opgeslagen, zou het kunnen weglekken door slecht afsluitende putten, en door scheuren en breuken in de afsluitende laag van de ondergrondse ruimte. Wanneer een ondergrondse ruimte jarenlang blijft lekken, doet dit het uitstoot verminderde effect van de optie deels teniet. Hoewel deskundigen niet precies weten hoeveel CO2 hierbij in de lucht zou komen, gaat het vermoedelijk om heel kleine hoeveelheden.
Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.
Er is een kleine kans dat weggelekte CO2 het grondwater in de omgeving verzuurd.
Wanneer dit drinkwater is, is het niet direct drinkbaar meer maar moet het een extra behandelingsstap ondergaan. De verwachting is dat door goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes zeer klein is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_56 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_56 , 1]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Veiligheid ondergrondse opslag van CO2
Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO2 kleine aardbevingen kunnen veroorzaken. Hierdoor kunnen bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Wanneer CO2 eenmaal in de ondergrondse ruimte is opgeslagen, zou het kunnen weglekken door slecht afsluitende putten, en door scheuren en breuken in de afsluitende laag van de ondergrondse ruimte. Wanneer een ondergrondse ruimte jarenlang blijft lekken, doet dit het uitstoot verminderde effect van de optie deels teniet. Hoewel deskundigen niet precies weten hoeveel CO2 hierbij in de lucht zou komen, gaat het vermoedelijk om heel kleine hoeveelheden.
Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.
Er is een kleine kans dat weggelekte CO2 het grondwater in de omgeving verzuurd.
Wanneer dit drinkwater is, is het niet direct drinkbaar meer maar moet het een extra behandelingsstap ondergaan. De verwachting is dat door goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes zeer klein is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_56 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_56 , 2]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Veiligheid ondergrondse opslag van CO2
Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO2 kleine aardbevingen kunnen veroorzaken. Hierdoor kunnen bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Wanneer CO2 eenmaal in de ondergrondse ruimte is opgeslagen, zou het kunnen weglekken door slecht afsluitende putten, en door scheuren en breuken in de afsluitende laag van de ondergrondse ruimte. Wanneer een ondergrondse ruimte jarenlang blijft lekken, doet dit het uitstoot verminderde effect van de optie deels teniet. Hoewel deskundigen niet precies weten

hoeveel CO2 hierbij in de lucht zou komen, gaat het vermoedelijk om heel kleine hoeveelheden.
Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen,
afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen
zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.
Er is een kleine kans dat weggelekte CO2 het grondwater in de omgeving verzuurd.
Wanneer dit drinkwater is, is het niet direct drinkbaar meer maar moet het een extra
behandelingsstap ondergaan. De verwachting is dat door goede controle het risico op
het lekken van CO2 uit ondergrondse ruimtes zeer klein is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_57

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds
wordt opgeslagen
Betrouwbaarheid van de energievoorziening
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat
betekent dat er altijd voldoende energie beschikbaar is. De brandstoffen daarvoor moeten we
deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van
slechts enkele landen (zoals we nu sterk afhankelijk zijn van het Midden-Oosten voor olie).
Kolen kunnen uit veel landen en verschillende werelddelen worden ingevoerd. De kans dat de
kolen die nodig zijn voor een deel van deze centrales niet ingevoerd kunnen worden is daarom
zeer klein. De betrouwbaarheid van energie uit een deel van de centrales is daarom groot.
Het gebruik van gas als brandstof is minder betrouwbaar wanneer gas moet worden ingevoerd
uit andere landen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_57 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_57 , 1]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds
wordt opgeslagen
Betrouwbaarheid van de energievoorziening
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat
betekent dat er altijd voldoende energie beschikbaar is. De brandstoffen daarvoor moeten we
deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van
slechts enkele landen (zoals we nu sterk afhankelijk zijn van het Midden-Oosten voor olie).
Kolen kunnen uit veel landen en verschillende werelddelen worden ingevoerd. De kans dat de
kolen die nodig zijn voor een deel van deze centrales niet ingevoerd kunnen worden is daarom
zeer klein. De betrouwbaarheid van energie uit een deel van de centrales is daarom groot.
Het gebruik van gas als brandstof is minder betrouwbaar wanneer gas moet worden ingevoerd
uit andere landen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_57 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_57 , 2]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds
wordt opgeslagen

Betrouwbaarheid van de energievoorziening
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat er altijd voldoende energie beschikbaar is. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals we nu sterk afhankelijk zijn van het Midden-Oosten voor olie).
Kolen kunnen uit veel landen en verschillende werelddelen worden ingevoerd. De kans dat de kolen die nodig zijn voor een deel van deze centrales niet ingevoerd kunnen worden is daarom zeer klein. De betrouwbaarheid van energie uit een deel van de centrales is daarom groot.
Het gebruik van gas als brandstof is minder betrouwbaar wanneer gas moet worden ingevoerd uit andere landen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_58
Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Prijs
Wanneer elektriciteit wordt opgewekt in elektriciteitscentrales met CO2 afvang en opslag, zullen bedrijven in 2030 ongeveer 20% meer moeten gaan betalen voor hun elektriciteit.
Voor huishoudens wordt de prijs van elektriciteit ongeveer 5% tot 10% hoger.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_58 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_58 , 1]
Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Prijs
Wanneer elektriciteit wordt opgewekt in elektriciteitscentrales met CO2 afvang en opslag, zullen bedrijven in 2030 ongeveer 20% meer moeten gaan betalen voor hun elektriciteit.
Voor huishoudens wordt de prijs van elektriciteit ongeveer 5% tot 10% hoger.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_58 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_58 , 2]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Prijs
Wanneer elektriciteit wordt opgewekt in elektriciteitscentrales met CO2 afvang en opslag, zullen bedrijven in 2030 ongeveer 20% meer moeten gaan betalen voor hun elektriciteit. Voor huishoudens wordt de prijs van elektriciteit ongeveer 5% tot 10% hoger.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_59

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_59 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_59 , 1]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_59 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_59 , 2]

Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 153

Dit zijn uw oordelen over het pakket Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen.
..
Bijdrage aan vervuiling door kolenwinning
Veiligheid van CO2 transport in pijpleidingen
Veiligheid ondergrondse opslag van CO2
Betrouwbaarheid van de energievoorziening
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 156

Dit zijn uw oordelen over het pakket Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen.
..
Bijdrage aan vervuiling door kolenwinning
Veiligheid van CO2 transport in pijpleidingen
Veiligheid ondergrondse opslag van CO2
Betrouwbaarheid van de energievoorziening
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 154

Wat is uw totaaloordeel over grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen, op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 155
Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 161 **INFORMATIE SCHERM**
Nu volgt een omschrijving van het zesde pakket.
Daarna volgen de te beoordelen gevolgen.

VRAAG 162 **INFORMATIE SCHERM**
Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Dit pakket streeft er naar 40 miljoen ton CO2 uitstoot te besparen door waterstof te produceren en de CO2 die daarbij ontstaat, af te vangen en op te slaan. Waterstof is een gas dat bij verbranding energie oplevert. Het kan gebruikt worden om elektriciteit mee op te wekken. Waterstof kan ook gebruikt worden als brandstof voor auto's en in huishoudens ter vervanging van aardgas. Voor dit pakket zullen ongeveer 20 tot 25 grote waterstoffabrieken gebouwd worden. De CO2, die bij de omzetting van aardgas naar waterstof vrijkomt, wordt afgevangen en opgeslagen in ondergrondse velden in Nederland en onder de bodem van de Noordzee. De waterstof uit de 20 tot 25 fabrieken zal deels gebruikt worden om het merendeel van de auto's in Nederland in 2030 van brandstof te voorzien. Hiervoor zullen de huidige tankstations zo aangepast moeten worden dat er waterstof opgeslagen en getankt kan worden. Deels wordt de waterstof gebruikt om het merendeel van de huishoudens en industrie van waterstof te voorzien, waar het in kleine installaties omgezet kan worden in elektriciteit en warmte. In huishoudens is een dergelijke installatie vergelijkbaar met een cv ketel.
Dit pakket kan tijdelijk worden toegepast omdat de ruimte waarin CO2 opgeslagen kan worden vol raakt en aardgas uiteindelijk op raakt. Met de huidige kennis van de ondergrond is de verwachting dat er voor ongeveer 100 tot 300 jaar opslagruimte is. Verder onderzoek naar veiligheid en beschikbaarheid is echter nodig om te kunnen bepalen of al deze opslagruimte kan worden gebruikt. Onderzoek kan echter ook uitwijzen dat er meer ruimte is dan nu verwacht.
Het is waarschijnlijk dat de infrastructuur (zoals installaties, tankstations en leidingnet) na die tijd nog wel gebruikt kan worden, omdat dan andere manieren ontwikkeld zullen zijn om waterstof te maken zonder aardgas.

VRAAG 7041_60
Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Benodigde nieuwe waterstofleidingen
De waterstof moet worden vervoerd naar bedrijven en naar honderdduizenden huizen en gebouwen.
Hiervoor is een fijnmazig net van heel veel ondergrondse pijpleidingen nodig.
De aanleg van deze leidingen is ingrijpend en tijdrovend en levert overlast op door graafwerkzaamheden, ook in woonwijken.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_60 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_60 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Benodigde nieuwe waterstofleidingen
De waterstof moet worden vervoerd naar bedrijven en naar honderdduizenden huizen en gebouwen.
Hiervoor is een fijnmazig net van heel veel ondergrondse pijpleidingen nodig.
De aanleg van deze leidingen is ingrijpend en tijdrovend en levert overlast op door graafwerkzaamheden, ook in woonwijken.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_60 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_60 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Benodigde nieuwe waterstofleidingen
De waterstof moet worden vervoerd naar bedrijven en naar honderdduizenden huizen en gebouwen.
Hiervoor is een fijnmazig net van heel veel ondergrondse pijpleidingen nodig.
De aanleg van deze leidingen is ingrijpend en tijdrovend en levert overlast op door graafwerkzaamheden, ook in woonwijken.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_61

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Benodigde nieuwe voertuigen
Voor dit pakket moeten bijna alle auto’s worden vervangen door auto’s die op waterstof rijden. Deze auto’s zouden in 2030 duurder kunnen zijn dan een dieselauto, maar verwacht wordt dat brandstofcelauto’s in de loop der tijd goedkoper worden.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_61 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_61 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Benodigde nieuwe voertuigen
Voor dit pakket moeten bijna alle auto’s worden vervangen door auto’s die op waterstof rijden. Deze auto’s zouden in 2030 duurder kunnen zijn dan een dieselauto, maar verwacht wordt dat brandstofcelauto’s in de loop der tijd goedkoper worden.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_61 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_61 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Benodigde nieuwe voertuigen
Voor dit pakket moeten bijna alle auto’s worden vervangen door auto’s die op waterstof rijden. Deze auto’s zouden in 2030 duurder kunnen zijn dan een dieselauto, maar verwacht wordt dat brandstofcelauto’s in de loop der tijd goedkoper worden.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_62

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan de luchtkwaliteit
Voertuigen met brandstofcellen die op waterstof rijden stoten geen vervuilende stoffen uit en zorgen voor een veel betere luchtkwaliteit in de steden dan nu. In Nederland overlijden nu per jaar ongeveer 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Wanneer dit pakket rond 2030 op grote schaal is verwezenlijkt worden in Nederland duizenden levens per jaar gespaard door schonere lucht.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_62 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_62 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan de luchtkwaliteit
Voertuigen met brandstofcellen die op waterstof rijden stoten geen vervuilende stoffen uit en zorgen voor een veel betere luchtkwaliteit in de steden dan nu. In Nederland overlijden nu per jaar ongeveer 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Wanneer dit pakket rond 2030 op grote schaal is verwezenlijkt worden in Nederland duizenden levens per jaar gespaard door schonere lucht.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_62 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_62 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan de luchtkwaliteit
Voertuigen met brandstofcellen die op waterstof rijden stoten geen vervuilende stoffen uit en zorgen voor een veel betere luchtkwaliteit in de steden dan nu. In Nederland overlijden nu per jaar ongeveer 5000 mensen vroegtijdig aan de gevolgen van slechte luchtkwaliteit door uitlaatgassen van het verkeer. Wanneer dit pakket rond 2030 op grote schaal is verwezenlijkt worden in Nederland duizenden levens per jaar gespaard door schonere lucht.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_63

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan geluid
Motoren van auto’s en andere voertuigen die op waterstof lopen, maken geen lawaai. Door dit pakket zal het gemiddelde geluidsniveau in steden en bewoonde gebieden van 85 decibel naar 70 of minder decibel dalen. (Als voorbeeld: 85 decibel is ongeveer het geluidsniveau van druk kruispunt in de stad, 70 decibel is ongeveer het geluidsniveau van een rustig kruispunt).

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_63 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_63 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan geluid
Motoren van auto's en andere voertuigen die op waterstof lopen, maken geen lawaai. Door dit pakket zal het gemiddelde geluidsniveau in steden en bewoonde gebieden van 85 decibel naar 70 of minder decibel dalen. (Als voorbeeld: 85 decibel is ongeveer het geluidsniveau van druk kruispunt in de stad, 70 decibel is ongeveer het geluidsniveau van een rustig kruispunt).

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_63 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_63 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan geluid
Motoren van auto's en andere voertuigen die op waterstof lopen, maken geen lawaai. Door dit pakket zal het gemiddelde geluidsniveau in steden en bewoonde gebieden van 85 decibel naar 70 of minder decibel dalen. (Als voorbeeld: 85 decibel is ongeveer het geluidsniveau van druk kruispunt in de stad, 70 decibel is ongeveer het geluidsniveau van een rustig kruispunt).

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_64

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid centrales
In de industrie is de afgelopen tientallen jaren al veel ervaring opgedaan met de omzetting van gas naar waterstof in fabrieken. De bouw van deze fabrieken en de te nemen veiligheidsmaatregelen zijn standaard. Deskundigen zijn het er niet altijd over eens of een waterstoffabriek even veilig gemaakt kan worden als een huidige gasgestookte centrale.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_64 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_64 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid centrales
In de industrie is de afgelopen tientallen jaren al veel ervaring opgedaan met de omzetting van gas naar waterstof in fabrieken. De bouw van deze fabrieken en de te nemen veiligheidsmaatregelen zijn standaard. Deskundigen zijn het er niet altijd over eens of een waterstoffabriek even veilig gemaakt kan worden als een huidige gasgestookte centrale.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_64 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_64 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid centrales
In de industrie is de afgelopen tientallen jaren al veel ervaring opgedaan met de omzetting van gas naar waterstof in fabrieken. De bouw van deze fabrieken en de te nemen veiligheidsmaatregelen zijn standaard. Deskundigen zijn het er niet altijd over eens of een waterstoffabriek even veilig gemaakt kan worden als een huidige gasgestookte centrale.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_65

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid waterstof in dagelijks leven
Deskundigen denken dat het vervoer van waterstof via pijpleidingen en het gebruik van waterstof in huishoudens net zo veilig is te maken als het huidige vervoer en gebruik van aardgas. Wel zijn de kosten van de technische veiligheidsmaatregelen waarschijnlijk hoger. Ongevallen door verstikking, brand of ontploffing zullen dan niet vaker voorkomen dan nu. De veiligheid van waterstof in tankstations en voertuigen in 2030 is waarschijnlijk hetzelfde als de veiligheid van gas of LPG nu.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_65 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_65 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid waterstof in dagelijks leven
Deskundigen denken dat het vervoer van waterstof via pijpleidingen en het gebruik van waterstof in huishoudens net zo veilig is te maken als het huidige vervoer en gebruik van aardgas. Wel zijn de kosten van de technische veiligheidsmaatregelen waarschijnlijk hoger. Ongevallen door verstikking, brand of ontploffing zullen dan niet vaker voorkomen dan nu. De veiligheid van waterstof in tankstations en voertuigen in 2030 is waarschijnlijk hetzelfde als de veiligheid van gas of LPG nu.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_65 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_65 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid waterstof in dagelijks leven
Deskundigen denken dat het vervoer van waterstof via pijpleidingen en het gebruik van waterstof in huishoudens net zo veilig is te maken als het huidige vervoer en gebruik van aardgas. Wel zijn de kosten van de technische veiligheidsmaatregelen waarschijnlijk hoger. Ongevallen door verstikking, brand of ontploffing zullen dan niet vaker voorkomen dan nu. De veiligheid van waterstof in tankstations en voertuigen in 2030 is waarschijnlijk hetzelfde als de veiligheid van gas of LPG nu.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_66

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid van CO2 transport in pijpleidingen
Lucht waar teveel CO2 in zit is schadelijk en mogelijk zelfs dodelijk. Bij het transport van CO2 in pijpleidingen kan de leiding lek raken, waardoor CO2 in de lucht komt. Er is een kleine kans dat er zoveel CO2 blijft hangen, dat het gevaarlijk is voor mensen, dieren en planten. De kans op lekken is vergelijkbaar met de kans op gaslekken in ondergrondse aardgaspijpleidingen nu in Nederland. Voor dit pakket zal er ongeveer eens per twee jaar iets mis gaan voor de benodigde 2000 kilometer pijpleiding, maar dat zal lang niet altijd leiden tot het ontsnappen van CO2. De verwachting is dat door goede controle het risico op een lek in de CO2-leidingen zeer gering is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_66 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_66 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Veiligheid van CO2 transport in pijpleidingen

Lucht waar teveel CO_2 in zit is schadelijk en mogelijk zelfs dodelijk. Bij het transport van CO_2 in pijpleidingen kan de leiding lek raken, waardoor CO_2 in de lucht komt. Er is een kleine kans dat er zoveel CO_2 blijft hangen, dat het gevaarlijk is voor mensen, dieren en planten. De kans op lekken is vergelijkbaar met de kans op gaslekken in ondergrondse aardgaspijpleidingen nu in Nederland. Voor dit pakket zal er ongeveer eens per twee jaar iets mis gaan voor de benodigde 2000 kilometer pijpleiding, maar dat zal lang niet altijd leiden tot het ontsnappen van CO_2. De verwachting is dat door goede controle het risico op een lek in de CO_2-leidingen zeer gering is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_66 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_66 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO_2 ondergronds wordt opgeslagen.
Veiligheid van CO_2 transport in pijpleidingen
Lucht waar teveel CO_2 in zit is schadelijk en mogelijk zelfs dodelijk. Bij het transport van CO_2 in pijpleidingen kan de leiding lek raken, waardoor CO_2 in de lucht komt. Er is een kleine kans dat er zoveel CO_2 blijft hangen, dat het gevaarlijk is voor mensen, dieren en planten. De kans op lekken is vergelijkbaar met de kans op gaslekken in ondergrondse aardgaspijpleidingen nu in Nederland. Voor dit pakket zal er ongeveer eens per twee jaar iets mis gaan voor de benodigde 2000 kilometer pijpleiding, maar dat zal lang niet altijd leiden tot het ontsnappen van CO_2. De verwachting is dat door goede controle het risico op een lek in de CO_2-leidingen zeer gering is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_67

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO_2 ondergronds wordt opgeslagen.
Veiligheid ondergrondse opslag van CO_2
Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO_2 kleine aardbevingen kunnen veroorzaken. Hierdoor kunnen op land bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Wanneer CO_2 eenmaal in de ondergrondse ruimte is opgeslagen, zou het kunnen weglekken door slecht afsluitende putten, en door scheuren en breuken in de afsluitende laag van de ondergrondse ruimte. Wanneer een ondergrondse ruimte jarenlang blijft lekken, doet dit het uitstoot verminderde effect van de optie deels teniet. Hoewel deskundigen niet precies weten hoeveel CO_2 hierbij in de lucht zou komen, gaat het vermoedelijk om heel kleine hoeveelheden. De verwachting is dat door goede controle het risico op het lekken van CO_2 uit ondergrondse ruimtes zeer gering is. Daarnaast is er een zeer kleine kans dat weggelekte CO_2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.
Er is een kleine kans dat weggelekte CO_2 het grondwater in de omgeving verzuurd.
Wanneer dit drinkwater is, is het niet direct drinkbaar meer maar moet het een extra behandelingsstap ondergaan. De verwachting is dat door goede controle het risico op het lekken van CO_2 uit ondergrondse ruimtes zeer klein is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_67 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_67 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO_2 ondergronds wordt opgeslagen.
Veiligheid ondergrondse opslag van CO_2
Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO_2 kleine aardbevingen kunnen veroorzaken. Hierdoor kunnen op land bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Wanneer CO_2 eenmaal in de ondergrondse ruimte is opgeslagen, zou het kunnen weglekken door slecht afsluitende putten, en door scheuren en breuken in de afsluitende laag van de ondergrondse ruimte. Wanneer een ondergrondse ruimte jarenlang blijft lekken, doet dit het uitstoot verminderde effect van de optie deels teniet. Hoewel deskundigen niet precies weten hoeveel CO_2 hierbij in de lucht zou komen, gaat het vermoedelijk om heel kleine hoeveelheden. De verwachting is dat door goede controle het risico op het lekken van CO_2 uit ondergrondse ruimtes zeer gering is. Daarnaast is er een zeer kleine kans dat weggelekte CO_2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden.
Er is een kleine kans dat weggelekte CO_2 het grondwater in de omgeving verzuurd.
Wanneer dit drinkwater is, is het niet direct drinkbaar meer maar moet het een extra behandelingsstap ondergaan. De verwachting is dat door goede controle het risico op het lekken van CO_2 uit ondergrondse ruimtes zeer klein is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_67 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_67 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO_2 ondergronds wordt opgeslagen.
Veiligheid ondergrondse opslag van CO_2
Net zoals bij het uit de grond halen van aardgas zou het in de grond brengen van CO_2 kleine aardbevingen kunnen veroorzaken. Hierdoor kunnen op land bijvoorbeeld scheurtjes in gebouwen in de omgeving ontstaan.
Wanneer CO_2 eenmaal in de ondergrondse ruimte is opgeslagen, zou het kunnen weglekken door slecht afsluitende putten, en door scheuren en breuken in de afsluitende laag van de

ondergrondse ruimte. Wanneer een ondergrondse ruimte jarenlang blijft lekken, doet dit het uitstoot verminderde effect van de optie deels teniet. Hoewel deskundigen niet precies weten hoeveel CO2 hierbij in de lucht zou komen, gaat het vermoedelijk om heel kleine hoeveelheden. De verwachting is dat door goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes zeer gering is. Daarnaast is er een zeer kleine kans dat weggelekte CO2 zich ophoopt in laaggelegen, afgesloten ruimtes zoals kelders. Dit zou schadelijk en mogelijk dodelijk kunnen zijn voor mensen, dieren en planten die zich in dit soort ruimtes bevinden. Er is een kleine kans dat weggelekte CO2 het grondwater in de omgeving verzuurd. Wanneer dit drinkwater is, is het niet direct drinkbaar meer maar moet het een extra behandelingsstap ondergaan. De verwachting is dat door goede controle het risico op het lekken van CO2 uit ondergrondse ruimtes zeer klein is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_68

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Betrouwbaarheid energievoorziening
Het is belangrijk dat we altijd voldoende energie kunnen opwekken. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals bijvoorbeeld de afhankelijkheid van het Midden-Oosten voor olie). Om de betrouwbaarheid zo hoog mogelijk te houden is het mogelijk om eerder gas te importeren om zo meer Nederlandse gasreserves op te kunnen slaan voor later gebruik. Het is ook mogelijk om waterstof uit andere brandstoffen dan aardgas te maken, zoals kolen of biomassa.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_68 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_68 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Betrouwbaarheid energievoorziening
Het is belangrijk dat we altijd voldoende energie kunnen opwekken. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals bijvoorbeeld de afhankelijkheid van het Midden-Oosten voor olie). Om de betrouwbaarheid zo hoog mogelijk te houden is het mogelijk om eerder gas te importeren om zo meer Nederlandse gasreserves op te kunnen slaan voor later gebruik. Het is ook mogelijk om waterstof uit andere brandstoffen dan aardgas te maken, zoals kolen of biomassa.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_68 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_68 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Betrouwbaarheid energievoorziening

Het is belangrijk dat we altijd voldoende energie kunnen opwekken. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals bijvoorbeeld de afhankelijkheid van het Midden-Oosten voor olie). Om de betrouwbaarheid zo hoog mogelijk te houden is het mogelijk om eerder gas te importeren om zo meer Nederlandse gasreserves op te kunnen slaan voor later gebruik. Het is ook mogelijk om waterstof uit andere brandstoffen dan aardgas te maken, zoals kolen of biomassa.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_69

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Economische gevolgen
Er moet in Nederland in korte tijd heel veel geld gestoken worden in alle veranderingen die noodzakelijk zijn voor dit pakket (bijvoorbeeld nieuwe installaties en voertuigen, heel veel pijpleidingen voor het vervoer van waterstof). Het precieze effect van deze investeringen op onze economie is onbekend.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_69 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_69 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Economische gevolgen
Er moet in Nederland in korte tijd heel veel geld gestoken worden in alle veranderingen die noodzakelijk zijn voor dit pakket (bijvoorbeeld nieuwe installaties en voertuigen, heel veel pijpleidingen voor het vervoer van waterstof). Het precieze effect van deze investeringen op onze economie is onbekend.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_69 STAAT DIRECT ONDER DE VORIGE VRAAG

INDIEN [VRAAG 7041_69 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Economische gevolgen
Er moet in Nederland in korte tijd heel veel geld gestoken worden in alle veranderingen die noodzakelijk zijn voor dit pakket (bijvoorbeeld nieuwe installaties en voertuigen, heel veel pijpleidingen voor het vervoer van waterstof). Het precieze effect van deze investeringen op onze economie is onbekend.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_70

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Prijs
De kosten voor waterstof voor huishoudens zullen ongeveer 25-35% hoger zijn dan voor aardgas. Het maken van waterstof is ongeveer twee keer zo duur als benzine. Hierdoor zal de autobrandstofprijs met ongeveer 20% stijgen. Overigens zullen de brandstofkosten voor het wegverkeer waarschijnlijk duidelijk minder stijgen omdat waterstofauto’s zuiniger worden. De verwachting is dat de kosten voor autorijden in een waterstofauto in 2030 gelijk zullen zijn aan de kosten voor autorijden in een dieselauto.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_70 STAAT DIRECT ONDER DE VORIGE VRAAG

INDIEN [VRAAG 7041_70 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Prijs
De kosten voor waterstof voor huishoudens zullen ongeveer 25-35% hoger zijn dan voor aardgas. Het maken van waterstof is ongeveer twee keer zo duur als benzine. Hierdoor zal de autobrandstofprijs met ongeveer 20% stijgen. Overigens zullen de brandstofkosten voor het wegverkeer waarschijnlijk duidelijk minder stijgen omdat waterstofauto’s zuiniger worden. De verwachting is dat de kosten voor autorijden in een waterstofauto in 2030 gelijk zullen zijn aan de kosten voor autorijden in een dieselauto.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_70 STAAT DIRECT ONDER DE VORIGE VRAAG

INDIEN [VRAAG 7041_70 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Prijs
De kosten voor waterstof voor huishoudens zullen ongeveer 25-35% hoger zijn dan voor aardgas. Het maken van waterstof is ongeveer twee keer zo duur als benzine. Hierdoor zal de autobrandstofprijs met ongeveer 20% stijgen. Overigens zullen de brandstofkosten voor het wegverkeer waarschijnlijk duidelijk minder stijgen omdat waterstofauto’s zuiniger worden.

De verwachting is dat de kosten voor autorijden in een waterstofauto in 2030 gelijk zullen zijn aan de kosten voor autorijden in een dieselauto.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_71

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_71 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_71 , 1]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_71 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_71 , 2]

Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 163
Dit zijn uw oordelen over het pakket Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
..
Benodigde nieuwe waterstofleidingen
Benodigde nieuwe voertuigen
Bijdrage aan de luchtkwaliteit
Bijdrage aan geluid
Veiligheid centrales
Veiligheid waterstof in dagelijks leven
Veiligheid CO2 transport in pijpleidingen
Veiligheid ondergrondse opslag van CO2
Betrouwbaarheid energievoorziening
Economische gevolgen
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 166
Dit zijn uw oordelen over het pakket Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen.
..
Benodigde nieuwe waterstofleidingen
Benodigde nieuwe voertuigen
Bijdrage aan de luchtkwaliteit
Bijdrage aan geluid
Veiligheid centrales
Veiligheid waterstof in dagelijks leven
Veiligheid CO2 transport in pijpleidingen
Veiligheid ondergrondse opslag van CO2
Betrouwbaarheid energievoorziening
Economische gevolgen
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 164
Wat is uw totaaloordeel over grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen, op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 165
Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 171 **INFORMATIE SCHERM**
Nu volgt een omschrijving van het laatste pakket.
Daarna volgen de te beoordelen gevolgen.

VRAAG 172 **INFORMATIE SCHERM**
Elektriciteit uit kerncentrales
Dit pakket streeft ernaar 40 miljoen ton CO2 uitstoot te besparen door in 2030 elektriciteit op te wekken in 5 grote kerncentrales. In kerncentrales wordt de grondstof uranium als brandstof gebruikt. Uraniumerts wordt gewonnen in mijnen. Bij de opwekking van elektriciteit met uranium wordt geen CO2 geproduceerd. De hoeveelheid uranium die nodig is voor dit pakket is nog minimaal honderd jaar beschikbaar, ook als meer landen dan nu uranium gebruiken en het verbruik ervan daarmee wereldwijd toeneemt. Het is waarschijnlijk dat er nog nieuwe uraniumbronnen gevonden zullen worden, waardoor centrales nog lang van uranium voorzien kunnen worden.

VRAAG 7041_72
Elektriciteit uit kerncentrales
Radioactieve straling bij normaal bedrijf
Uit kerncentrales in normaal bedrijf komen heel kleine deeltjes vrij die zeer kleine hoeveelheden radioactief straling uitzenden, minder nog dan wat van nature in de omgeving aanwezig is. Deze hoeveelheid veroorzaakt op korte termijn geen gezondheidsproblemen. Sommige deskundigen denken dat er op lange termijn geen gevolgen zullen zijn voor mens en natuur van heel lage hoeveelheden radioactieve straling, andere deskundigen menen dat er niet genoeg kennis is om hierover uitspraken te doen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_72 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_72 , 1]

Elektriciteit uit kerncentrales
Radioactieve straling bij normaal bedrijf
Uit kerncentrales in normaal bedrijf komen heel kleine deeltjes vrij die zeer kleine hoeveelheden radioactief straling uitzenden, minder nog dan wat van nature in de omgeving aanwezig is. Deze hoeveelheid veroorzaakt op korte termijn geen gezondheidsproblemen. Sommige deskundigen denken dat er op lange termijn geen gevolgen zullen zijn voor mens en natuur van heel lage hoeveelheden radioactieve straling, andere deskundigen menen dat er niet genoeg kennis is om hierover uitspraken te doen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_72 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_72 , 2]

Elektriciteit uit kerncentrales
Radioactieve straling bij normaal bedrijf
Uit kerncentrales in normaal bedrijf komen heel kleine deeltjes vrij die zeer kleine hoeveelheden radioactief straling uitzenden, minder nog dan wat van nature in de omgeving aanwezig is. Deze hoeveelheid veroorzaakt op korte termijn geen gezondheidsproblemen. Sommige deskundigen denken dat er op lange termijn geen gevolgen zullen zijn voor mens en natuur van heel lage hoeveelheden radioactieve straling, andere deskundigen menen dat er niet genoeg kennis is om hierover uitspraken te doen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_73

Elektriciteit uit kerncentrales
Kernafval
Bij het geschikt maken van uranium voor gebruik in kerncentrales, maar vooral bij gebruik in de kerncentrales zelf, ontstaat kernafval. Een deel van dit kernafval is na gebruik duizenden jaren zeer radioactief, dat wil zeggen, het zendt zeer veel straling uit. In dit pakket zal kernafval waarschijnlijk opgeslagen worden in sterk beveiligde vaten in diepe ondergrondse opslagruimtes. Experts weten dat deze opslagmethode de eerste eeuwen veilig is en dat er geen lekkage zal ontstaan. Experts denken dat daarna de kans op lekkage uitermate klein is, maar erkennen dat er onzekerheden bestaan, omdat moeilijk te voorspellen is wat er precies gebeurt onder de grond. Sommige experts menen dat het in 2030 mogelijk is kernafval zo te bewerken, dat het niet langer dan ongeveer 200 tot 300 jaar sterk radioactief is.
Andere experts twijfelen of deze techniek van kernafvalbewerking al genoeg ontwikkeld is om in 2030 te kunnen gebruiken. Lekkage kan gevaar voor de gezondheid opleveren bij planten, dieren en mensen wanneer de lekkage bijvoorbeeld vlakbij grondwater optreedt. Dit kan voorkomen worden door kernafval niet in de buurt van grondwater op te slaan, maar het is nooit zeker of zich na duizenden jaren nog steeds geen grondwater in de buurt van de opslagplaats bevindt. Al met al is de beste voorspelling die experts kunnen doen dat de kans op gevaar voor de gezondheid van planten, dieren en mensen door lekkage uitermate klein is.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_73 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_73 , 1]

Elektriciteit uit kerncentrales
Kernafval
Bij het geschikt maken van uranium voor gebruik in kerncentrales, maar vooral bij gebruik in de kerncentrales zelf, ontstaat kernafval. Een deel van dit kernafval is na gebruik duizenden jaren zeer radioactief, dat wil zeggen, het zendt zeer veel straling uit. In dit pakket zal kernafval waarschijnlijk opgeslagen worden in sterk beveiligde vaten in diepe ondergrondse opslagruimtes. Experts weten dat deze opslagmethode de eerste eeuwen veilig is en dat er geen lekkage zal ontstaan. Experts denken dat daarna de kans op lekkage uitermate klein is, maar erkennen dat er onzekerheden bestaan, omdat moeilijk te voorspellen is wat er precies gebeurt onder de grond. Sommige experts menen dat het in 2030 mogelijk is kernafval zo te bewerken, dat het niet langer dan ongeveer 200 tot 300 jaar sterk radioactief is.
Andere experts twijfelen of deze techniek van kernafvalbewerking al genoeg ontwikkeld is om in 2030 te kunnen gebruiken. Lekkage kan gevaar voor de gezondheid opleveren bij planten, dieren en mensen wanneer de lekkage bijvoorbeeld vlakbij grondwater optreedt. Dit kan voorkomen worden door kernafval niet in de buurt van grondwater op te slaan, maar het is nooit zeker of zich na duizenden jaren nog steeds geen grondwater in de buurt van de opslagplaats bevindt. Al met al is de beste voorspelling die experts kunnen doen dat de kans op gevaar voor de gezondheid van planten, dieren en mensen door lekkage uitermate klein is.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_73 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_73 , 2]

Elektriciteit uit kerncentrales
Kernafval
Bij het geschikt maken van uranium voor gebruik in kerncentrales, maar vooral bij gebruik in de kerncentrales zelf, ontstaat kernafval. Een deel van dit kernafval is na gebruik duizenden jaren zeer radioactief, dat wil zeggen, het zendt zeer veel straling uit. In dit pakket zal kernafval waarschijnlijk opgeslagen worden in sterk beveiligde vaten in diepe ondergrondse opslagruimtes. Experts weten dat deze opslagmethode de eerste eeuwen veilig is en dat er geen lekkage zal ontstaan. Experts denken dat daarna de kans op lekkage uitermate klein is, maar erkennen dat er onzekerheden bestaan, omdat moeilijk te voorspellen is wat er precies gebeurt onder de grond. Sommige experts menen dat het in 2030 mogelijk is kernafval zo te bewerken, dat het niet langer dan ongeveer 200 tot 300 jaar sterk radioactief is.
Andere experts twijfelen of deze techniek van kernafvalbewerking al genoeg ontwikkeld is om in 2030 te kunnen gebruiken. Lekkage kan gevaar voor de gezondheid opleveren bij planten, dieren en mensen wanneer de lekkage bijvoorbeeld vlakbij grondwater optreedt. Dit kan voorkomen worden door kernafval niet in de buurt van grondwater op te slaan, maar het is nooit zeker of zich na duizenden jaren nog steeds geen grondwater in de buurt van de opslagplaats bevindt. Al met al is de beste voorspelling die experts kunnen doen dat de kans op gevaar voor de gezondheid van planten, dieren en mensen door lekkage uitermate klein is.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_74

Elektriciteit uit kerncentrales
Veiligheid kerncentrales
De kerncentrales in dit pakket zijn zo gebouwd, dat er geen mensen nodig zijn om fouten in

het systeem te controleren of te verhelpen. Om de kerncentrales heen komt een beschermingskoepel. Hierdoor zijn deze kerncentrales veiliger dan de huidige kerncentrales, en veel veiliger dan bijvoorbeeld de kerncentrale in Tsjernobyl was. De kerncentrales in dit pakket zijn bijvoorbeeld net zo veilig als de huidige chemische industrie in Nederland. De kans op een ernstig ongeluk is zeer klein. Een voorbeeld van een zeer ernstig ongeluk met de kerncentrales in dit pakket is wanneer er een ongeluk gebeurt met de reactor. Mensen die zich binnen anderhalve kilometer van de centrale bevinden moeten dan evacueren. Een gebied van ongeveer 20 bij 40 kilometer rondom de centrale zal dan minimaal een jaar volledig onbruikbaar zijn, maar mogelijk veel langer. De kans op het ernstige ongeluk in dit voorbeeld is minder dan 1 keer per tweehonderdduizend jaar. De kans op ongelukken met nog ingrijpendere gevolgen is nog veel kleiner.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_74 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_74 , 1]

Elektriciteit uit kerncentrales
Veiligheid kerncentrales
De kerncentrales in dit pakket zijn zo gebouwd, dat er geen mensen nodig zijn om fouten in het systeem te controleren of te verhelpen. Om de kerncentrales heen komt een beschermingskoepel. Hierdoor zijn deze kerncentrales veiliger dan de huidige kerncentrales, en veel veiliger dan bijvoorbeeld de kerncentrale in Tsjernobyl was. De kerncentrales in dit pakket zijn bijvoorbeeld net zo veilig als de huidige chemische industrie in Nederland. De kans op een ernstig ongeluk is zeer klein. Een voorbeeld van een zeer ernstig ongeluk met de kerncentrales in dit pakket is wanneer er een ongeluk gebeurt met de reactor. Mensen die zich binnen anderhalve kilometer van de centrale bevinden moeten dan evacueren. Een gebied van ongeveer 20 bij 40 kilometer rondom de centrale zal dan minimaal een jaar volledig onbruikbaar zijn, maar mogelijk veel langer. De kans op het ernstige ongeluk in dit voorbeeld is minder dan 1 keer per tweehonderdduizend jaar. De kans op ongelukken met nog ingrijpendere gevolgen is nog veel kleiner.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_74 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_74 , 2]

Elektriciteit uit kerncentrales
Veiligheid kerncentrales
De kerncentrales in dit pakket zijn zo gebouwd, dat er geen mensen nodig zijn om fouten in het systeem te controleren of te verhelpen. Om de kerncentrales heen komt een beschermingskoepel. Hierdoor zijn deze kerncentrales veiliger dan de huidige kerncentrales, en veel veiliger dan bijvoorbeeld de kerncentrale in Tsjernobyl was. De kerncentrales in dit pakket zijn bijvoorbeeld net zo veilig als de huidige chemische industrie in Nederland. De kans op een ernstig ongeluk is zeer klein. Een voorbeeld van een zeer ernstig ongeluk met de kerncentrales in dit pakket is wanneer er een ongeluk gebeurt met de reactor. Mensen die zich binnen anderhalve kilometer van de centrale bevinden moeten dan evacueren. Een gebied van ongeveer 20 bij 40 kilometer rondom de centrale zal dan minimaal een jaar volledig onbruikbaar zijn, maar mogelijk veel langer. De kans op het ernstige ongeluk in dit voorbeeld is minder dan 1 keer per tweehonderdduizend jaar. De kans op ongelukken met nog ingrijpendere gevolgen is nog veel kleiner.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_75

Elektriciteit uit kerncentrales
Beveiliging centrales tegen aanslagen
Sommige mensen zijn bezorgd om terroristische aanslagen op kerncentrales met ernstige gevolgen. De centrales in dit pakket zijn zeer goed beveiligd. Ongelukken met de reactor zijn zeer moeilijk te bewerkstelligen door bommen of vliegtuigcrashes op of in de buurt van de centrales. Sabotage door werknemers is niet onmogelijk, maar is wel moeilijk.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_75 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_75 , 1]

Elektriciteit uit kerncentrales
Beveiliging centrales tegen aanslagen
Sommige mensen zijn bezorgd om terroristische aanslagen op kerncentrales met ernstige gevolgen. De centrales in dit pakket zijn zeer goed beveiligd. Ongelukken met de reactor zijn zeer moeilijk te bewerkstelligen door bommen of vliegtuigcrashes op of in de buurt van de centrales. Sabotage door werknemers is niet onmogelijk, maar is wel moeilijk.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_75 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_75 , 2]

Elektriciteit uit kerncentrales
Beveiliging centrales tegen aanslagen
Sommige mensen zijn bezorgd om terroristische aanslagen op kerncentrales met ernstige gevolgen. De centrales in dit pakket zijn zeer goed beveiligd. Ongelukken met de reactor zijn zeer moeilijk te bewerkstelligen door bommen of vliegtuigcrashes op of in de buurt van de centrales. Sabotage door werknemers is niet onmogelijk, maar is wel moeilijk.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_76

Elektriciteit uit kerncentrales
Kerncentrales en kernwapens
Verspreiding van kernwapens houdt in dat landen die deze wapens nu niet hebben, deze kunnen ontwikkelen, of dat ze in bezit komen van terroristen. Deze verspreiding van kernwapens wordt volgens sommige experts waarschijnlijker door de ontwikkeling en het gebruik van kerncentrales. Sommige experts denken dat er een risico is dat wanneer kennis verzameld wordt over kerntechnologie voor kerncentrales, er ook meer kennis ontstaat over kernwapens. Daarnaast denken sommige experts dat de ontwikkeling van materiaal voor kerncentrales, mogelijk ook tot meer materiaal leidt dat voor kernwapens gebruikt kan worden. Andere experts stellen dat er geen verband is tussen de ontwikkeling en het gebruik van kerncentrales en de verspreiding van kernwapens.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_76 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_76 , 1]

Elektriciteit uit kerncentrales
Kerncentrales en kernwapens
Verspreiding van kernwapens houdt in dat landen die deze wapens nu niet hebben, deze kunnen ontwikkelen, of dat ze in bezit komen van terroristen. Deze verspreiding van kernwapens wordt volgens sommige experts waarschijnlijker door de ontwikkeling en het gebruik van kerncentrales. Sommige experts denken dat er een risico is dat wanneer kennis verzameld wordt over kerntechnologie voor kerncentrales, er ook meer kennis ontstaat over kernwapens. Daarnaast denken sommige experts dat de ontwikkeling van materiaal voor kerncentrales, mogelijk ook tot meer materiaal leidt dat voor kernwapens gebruikt kan worden. Andere experts stellen dat er geen verband is tussen de ontwikkeling en het gebruik van kerncentrales en de verspreiding van kernwapens.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_76 **STAAT DIRECT ONDER DE VORIGE VRAAG**
INDIEN [VRAAG 7041_76 , 2]

Elektriciteit uit kerncentrales
Kerncentrales en kernwapens
Verspreiding van kernwapens houdt in dat landen die deze wapens nu niet hebben, deze kunnen ontwikkelen, of dat ze in bezit komen van terroristen. Deze verspreiding van

kernwapens wordt volgens sommige experts waarschijnlijker door de ontwikkeling en het gebruik van kerncentrales. Sommige experts denken dat er een risico is dat wanneer kennis verzameld wordt over kerntechnologie voor kerncentrales, er ook meer kennis ontstaat over kernwapens. Daarnaast denken sommige experts dat de ontwikkeling van materiaal voor kerncentrales, mogelijk ook tot meer materiaal leidt dat voor kernwapens gebruikt kan worden. Andere experts stellen dat er geen verband is tussen de ontwikkeling en het gebruik van kerncentrales en de verspreiding van kernwapens.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_77

Elektriciteit uit kerncentrales
Betrouwbaarheid van de energievoorziening
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat er altijd voldoende energie beschikbaar is. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals we nu sterk afhankelijk zijn van het Midden-Oosten voor olie). Uranium kan uit veel landen en verschillende werelddelen worden ingevoerd. De kans dat de uranium die nodig is voor deze centrales niet ingevoerd kan worden is daarom zeer klein. Ook kunnen gemakkelijk reserves van uranium gemaakt worden, aangezien uranium in verhouding weinig ruimte inneemt. De betrouwbaarheid van energie uit deze centrales is daarom groot.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_77 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_77 , 1]

Elektriciteit uit kerncentrales
Betrouwbaarheid van de energievoorziening
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat er altijd voldoende energie beschikbaar is. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals we nu sterk afhankelijk zijn van het Midden-Oosten voor olie). Uranium kan uit veel landen en verschillende werelddelen worden ingevoerd. De kans dat de uranium die nodig is voor deze centrales niet ingevoerd kan worden is daarom zeer klein. Ook kunnen gemakkelijk reserves van uranium gemaakt worden, aangezien uranium in verhouding weinig ruimte inneemt. De betrouwbaarheid van energie uit deze centrales is daarom groot.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_77 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_77 , 2]

Elektriciteit uit kerncentrales
Betrouwbaarheid van de energievoorziening
Deskundigen vinden hoge betrouwbaarheid van de energievoorziening belangrijk, dat betekent dat er altijd voldoende energie beschikbaar is. De brandstoffen daarvoor moeten we deels invoeren uit andere landen. We willen daarbij niet afhankelijk zijn van de politiek van slechts enkele landen (zoals we nu sterk afhankelijk zijn van het Midden-Oosten voor olie). Uranium kan uit veel landen en verschillende werelddelen worden ingevoerd. De kans dat de

uranium die nodig is voor deze centrales niet ingevoerd kan worden is daarom zeer klein. Ook kunnen gemakkelijk reserves van uranium gemaakt worden, aangezien uranium in verhouding weinig ruimte inneemt. De betrouwbaarheid van energie uit deze centrales is daarom groot.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_78

Elektriciteit uit kerncentrales
Prijs
Sommige experts verwachten dat de prijs van elektriciteit uit kerncentrales ongeveer gelijk zal zijn aan de prijs van elektriciteit uit huidige kolencentrales. De prijs zal hoger worden wanneer meer veiligheidsmaatregelen genomen worden, of wanneer afval uit de centrale bewerkt wordt om de duur van de radio-activiteit te verminderen. Sommige experts schatten dat elektriciteit uit kernenergie daardoor ongeveer een vijfde duurder wordt. De kosten voor het bouwen van een kerncentrale zijn erg hoog, het is onbekend of en hoeveel dit de prijs van elektriciteit uit kernenergie kan verhogen.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_78 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_78 , 1]

Elektriciteit uit kerncentrales
Prijs
Sommige experts verwachten dat de prijs van elektriciteit uit kerncentrales ongeveer gelijk zal zijn aan de prijs van elektriciteit uit huidige kolencentrales. De prijs zal hoger worden wanneer meer veiligheidsmaatregelen genomen worden, of wanneer afval uit de centrale bewerkt wordt om de duur van de radio-activiteit te verminderen. Sommige experts schatten dat elektriciteit uit kernenergie daardoor ongeveer een vijfde duurder wordt. De kosten voor het bouwen van een kerncentrale zijn erg hoog, het is onbekend of en hoeveel dit de prijs van elektriciteit uit kernenergie kan verhogen.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_78 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_78 , 2]

Elektriciteit uit kerncentrales
Prijs
Sommige experts verwachten dat de prijs van elektriciteit uit kerncentrales ongeveer gelijk zal zijn aan de prijs van elektriciteit uit huidige kolencentrales. De prijs zal hoger worden wanneer meer veiligheidsmaatregelen genomen worden, of wanneer afval uit de centrale bewerkt wordt om de duur van de radio-activiteit te verminderen. Sommige experts schatten dat elektriciteit uit kernenergie daardoor ongeveer een vijfde duurder wordt. De kosten voor het bouwen van een kerncentrale zijn erg hoog, het is onbekend of en hoeveel dit de prijs van elektriciteit uit kernenergie kan verhogen.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 7041_79

Elektriciteit uit kerncentrales
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

0 ❑ Onbelangrijk
1 ❑ Nadeel
2 ❑ Voordeel

VRAAG 7042_79 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_79 , 1]

Elektriciteit uit kerncentrales
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein nadeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot nadeel

VRAAG 7044_79 **STAAT DIRECT ONDER DE VORIGE VRAAG**

INDIEN [VRAAG 7041_79 , 2]

Elektriciteit uit kerncentrales
Bijdrage aan het broeikaseffect
De bijdrage aan het broeikaseffect door CO2 uitstoot in Nederland wordt sterk verminderd door dit pakket: de totale uitstoot van CO2 in Nederland naar de lucht wordt 17% minder dan de hoeveelheid die nu uitgestoten wordt.

1 ❑ 1 Heel klein voordeel
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9 Heel groot voordeel

VRAAG 173

Dit zijn uw oordelen over het pakket Elektriciteit uit kerncentrales.
..
Radioactieve straling bij normaal bedrijf
Kernafval
Veiligheid kerncentrales
Beveiliging centrales tegen aanslagen
Kerncentrales en kernwapens
Betrouwbaarheid van de energievoorziening
Prijs
Bijdrage aan het broeikaseffect
..
Klik nu de knop 'Bereken' aan voor uw totale nadeelscore en uw totale voordeelscore voor dit pakket.

VRAAG 176
Dit zijn uw oordelen over het pakket Elektriciteit uit kerncentrales.
..
Radioactieve straling bij normaal bedrijf
Kernafval
Veiligheid kerncentrales
Beveiliging centrales tegen aanslagen
Kerncentrales en kernwapens
Betrouwbaarheid van de energievoorziening
Prijs
Bijdrage aan het broeikaseffect
..
TOTALE NADEELSCORE:
TOTALE VOORDEELSCORE:
Tik een 9 in om verder te gaan:

9 ❑ Verder

VRAAG 174
Wat is uw totaaloordeel over elektriciteit uit kerncentrales,
op een schaal van slecht naar goed?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 175
Vul nu uw totaaloordeel over dit pakket in, uitgedrukt in een rapportcijfer (van 1 tot 10).

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 201 **INFORMATIE SCHERM**
U hebt net zeven pakketten beoordeeld. Op dit scherm en enkele volgende schermen gaat u
bepalen welke drie pakketten van de zeven pakketten uw voorkeur hebben om in de
toekomst op grote schaal toegepast te worden.
De totale nadeel- en voordeelscores en de rapportcijfers die u gaf ziet u hier.
Nadeel Voordeel Rapport
score score cijfer
1. Verbetering van energiezuinigheid
2. Verbetering van energiezuinigheid en
vermindering materiaalgebruik en energiegebruik
3. Elektriciteit van windmolens op zee
4. Omzetting van biomassa naar autobrandstof en elektriciteit
5. Grote centrales waar kolen of gas wordt omgezet
in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
6. Grote centrales waar aardgas wordt omgezet
in waterstof en waarbij CO2 ondergronds wordt opgeslagen
7. Elektriciteit uit kerncentrales

VRAAG 203 **INFORMATIE SCHERM**

Bij het bepalen van uw voorkeuren voor pakketten, zou u gebruik kunnen maken van de rapportcijfers. Het zou kunnen dat u, nu u alle informatie over de pakketten hebt gelezen en kunt vergelijken, door deze vergelijking anders bent gaan denken over sommige pakketten. In dat geval kunt u in het overzicht een nieuw rapportcijfer geven.

VRAAG 204 **STAAT DIRECT ONDER DE VORIGE VRAAG**

Wilt u één of meer pakketten een nieuw rapportcijfer geven?

1 ❑ Ja
2 ❑ Nee
↳ *GA VERDER NAAR VRAAG 207*

VRAAG 2051

Verbetering van energiezuinigheid Nieuw rapportcijfer

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 3001_1

Heeft respondent het eigen oordeel over
Verbetering van energiezuinigheid
bekeken?

9 ❑ Ja

VRAAG 2052

Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Nieuw rapportcijfer

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 3002_1

Oordeel over
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
bekeken?

9 ❑ Ja

VRAAG 2053
Elektriciteit van windmolens op zee Nieuw rapportcijfer

1	❑	1
2	❑	2
3	❑	3
4	❑	4
5	❑	5
6	❑	6
7	❑	7
8	❑	8
9	❑	9
10	❑	10

VRAAG 3003_1
Oordeel over
Elektriciteit van windmolens op zee
bekeken?

9	❑	Ja

VRAAG 2054
Omzetting van biomassa naar autobrandstof en elektriciteit Nieuw rapportcijfer

1	❑	1
2	❑	2
3	❑	3
4	❑	4
5	❑	5
6	❑	6
7	❑	7
8	❑	8
9	❑	9
10	❑	10

VRAAG 3004_1
Oordeel over
Omzetting van biomassa naar autobrandstof en elektriciteit
bekeken?

9	❑	Ja

VRAAG 2055
Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Nieuw rapportcijfer

1	❑	1
2	❑	2
3	❑	3
4	❑	4
5	❑	5
6	❑	6
7	❑	7
8	❑	8
9	❑	9
10	❑	10

VRAAG 3005_1
Oordeel over
Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
bekeken?

9 ❑ Ja

VRAAG 2056
Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
Nieuw rapportcijfer

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 3006_1
Oordeel over
Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
bekeken?

9 ❑ Ja

VRAAG 2057
Elektriciteit uit kerncentrales Nieuw rapportcijfer

1 ❑ 1
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7
8 ❑ 8
9 ❑ 9
10 ❑ 10

VRAAG 3007_1
Oordeel over
Elektriciteit uit kerncentrales
bekeken?

9 ❑ Ja

VRAAG 6211 **INFORMATIE SCHERM**
We willen u nu vragen welke drie van de zeven pakketten uw voorkeur zou hebben om op grote schaal toegepast te worden. U kunt niet alle combinaties van pakketten kiezen.
Het is bijvoorbeeld niet mogelijk drie pakketten te kiezen die alle drie bijna alleen maar elektriciteit opwekken, omdat Nederland niet zoveel elektriciteit nodig heeft.
Het tweede pakket "Verbetering van energiezuinigheid" kan alleen gekozen worden als ook het eerste pakket "Verbetering van energiezuinigheid" gekozen is.
Het tweede pakket "Verbetering van energiezuinigheid" gaat er namelijk vanuit dat de maatregelen uit het eerste pakket al genomen zijn.
De volgende combinaties zijn niet mogelijk:
De pakketten
- "Elektriciteit van windmolens op zee",

- "Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen"
- "Elektriciteit uit kerncentrales"
kunnen niet alle drie samen. Wel is een combinatie van twee van deze drie mogelijk, met nog één van de andere pakketten erbij.
De pakketten
- "Omzetting van biomassa naar autobrandstof en elektriciteit"
- "Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen"
kunnen ook niet samen gekozen worden, omdat elk van beide pakketten op zichzelf voldoende brandstof levert voor bijna al het autovervoer.

VRAAG 208 **MEERVOUDIGE VRAAG**

Bepaalt u nu uw keuze welke pakketten uw voorkeur hebben.

1 ❑ Verbetering van energiezuinigheid
2 ❑ Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
3 ❑ Elektriciteit van windmolens op zee
4 ❑ Omzetting van biomassa naar autobrandstof en elektriciteit
5 ❑ Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
6 ❑ Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
7 ❑ Elektriciteit uit kerncentrales

VRAAG 2081 **INFORMATIE SCHERM**

INDIEN [# Q208 , 1 & Q208 , 2]

Let op
U heeft niet het eerste pakket
"Verbetering van energiezuinigheid".
aangeklikt, maar wel het tweede pakket
"Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik"
Dat kan niet - het tweede pakket is een aanvulling op het eerste en
kan dus alleen gekozen worden als het eerste ook gekozen is.
Druk op [Enter] of klik [OK] om uw antwoord te verbeteren:

INDIEN [# Q208 , 1 & Q208 , 2] VERWIJDER UIT Q208 Q208 GA VERDER NAAR VRAAG 208

VRAAG 2082 **INFORMATIE SCHERM**

INDIEN [VRAAG 208 , 3 & Q208 , 5 & Q208 , 7]

Let op
U heeft de pakketten
- Elektriciteit van windmolens op zee
- Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
- Elektriciteit uit kerncentrales
aangeklikt; deze drie pakketten samen leveren teveel elektriciteit op
en kunnen dus niet samen gekozen worden.
Druk op [Enter] of klik [OK] om uw antwoord te verbeteren:

INDIEN [VRAAG 208 , 3 & Q208 , 5 & Q208 , 7] VERWIJDER UIT Q208 Q208 GA VERDER NAAR VRAAG 208

VRAAG 2083 **INFORMATIE SCHERM**

INDIEN [VRAAG 208 , 4 & Q208 , 6]

Let op
U heeft de pakketten
- "Omzetting van biomassa naar autobrandstof en elektriciteit"
- "Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen"
aangeklikt; deze twee pakketten samen leveren teveel brandstof voor autovervoer op
en kunnen dus niet samen gekozen worden.
Druk op [Enter] of klik [OK] om uw antwoord te verbeteren.

VRAAG 210

Misschien vond u één of meer van de pakketten volstrekt onaanvaardbaar.
Is er bij de zeven pakketten die u beoordeelde, één of meer voor u zo onaanvaardbaar,
dat u denkt actie te ondernemen wanneer in Nederland overwogen wordt dit pakket
grootschalig te gaan toepassen?

1 ❑ Ja
2 ❑ Nee

VRAAG 211 **MEERVOUDIGE VRAAG**

INDIEN [VRAAG 210 , 1]

Kunt u hier aangeven van welke pakketten u grootschalige toepassing
echt onaanvaardbaar vindt?

1 ❑ Verbetering van energiezuinigheid
2 ❑ Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
3 ❑ Elektriciteit van windmolens op zee
4 ❑ Omzetting van biomassa naar autobrandstof en elektriciteit
5 ❑ Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
6 ❑ Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
7 ❑ Elektriciteit uit kerncentrales

VRAAG 6213 **INFORMATIE SCHERM**

Er is u even eerder gevraagd drie pakketten te kiezen die u het beste vond.
Daarbij waren echter niet alle combinaties van drie pakketten mogelijk.
Stel dat wel alle combinaties mogelijk zouden zijn geweest,
welke drie pakketten zou u dan gekozen hebben?
Hierbij kan het pakket
- "verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik"
nog steeds alleen gekozen worden in combinatie met het eerste pakket
- "verbetering van energiezuinigheid".
Als u wilt kunt u hierbij gebruik maken van de
rapportcijfers en de totale nadeel- en voordeelscores.

VRAAG 212 **MEERVOUDIGE VRAAG**

Bepaalt u nu uw keuze welke pakketten in dat geval uw voorkeur hebben.

1 ❑ Verbetering van energiezuinigheid
2 ❑ Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
3 ❑ Elektriciteit van windmolens op zee
4 ❑ Omzetting van biomassa naar autobrandstof en elektriciteit
5 ❑ Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
6 ❑ Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
7 ❑ Elektriciteit uit kerncentrales

VRAAG 2121 **INFORMATIE SCHERM**

INDIEN [# Q212 , 1 & Q212 , 2]

Let op
U heeft niet het eerste pakket
"Verbetering van energiezuinigheid".
aangeklikt, maar wel het tweede pakket
"Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik"
Dat kan niet - het tweede pakket is een aanvulling op het eerste en
kan dus alleen gekozen worden als het eerste ook gekozen is.
Druk op [Enter] of klik [OK] om uw antwoord te verbeteren:

INDIEN [# Q212 , 1 & Q212 , 2] VERWIJDER UIT Q212 Q212 GA VERDER NAAR VRAAG 212

VRAAG 221

In hoeverre vindt u dat u over voldoende informatie beschikt om een keuze te kunnen maken tussen de verschillende mogelijkheden voor energie?

1 ❑ 1 Onvoldoende
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Voldoende

VRAAG 222

In hoeverre had u meer of minder informatie over gevolgen willen hebben voor u uw oordeel gaf over alle gevolgen in de enquête?

1 ❑ 1 Minder
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Meer

VRAAG 223

In hoeverre vindt u de informatie over gevolgen in de enquête partijdig of onpartijdig?

1 ❑ 1 Partijdig
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Onpartijdig

VRAAG 224

In hoeverre vindt u de informatie over gevolgen eenzijdig?

1 ❑ 1 Eenzijdig
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Niet eenzijdig

VRAAG 225

Hoe duidelijk vindt u de informatie over gevolgen?

1 ❑ 1 Onduidelijk
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Duidelijk

VRAAG 226
In hoeverre vindt u de informatie over gevolgen volledig?

1 ❑ 1 Onvolledig
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Volledig

VRAAG 227
In hoeverre was de informatie over gevolgen voor u nieuw en onbekend?

1 ❑ 1 Onbekend
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Bekend

VRAAG 228
In hoeverre vindt u de hoeveelheid informatie in de enquête gepast?

1 ❑ 1 Te weinig informatie
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Te veel informatie

VRAAG 229
In hoeverre vindt u het prettig dat de informatie en werkwijze soms herhaald werden?

1 ❑ 1 Irritant
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Prettig

VRAAG 301
Was er een moment tijdens het beantwoorden van de vragen dat u iets onduidelijk vond of dat u niet begreep wat u moest doen?

1 ❑ Ja
2 ❑ Nee

VRAAG 302 **OPEN VRAAG**
INDIEN [VRAAG 301 , 1]

Kunt u hier in uw eigen woorden aangeven wat u onduidelijk of onbegrijpelijk vond?

VRAAG 230
In hoeverre heeft de werkwijze u geholpen bij het maken van een keuze?

1 ❑ 1 Niet geholpen
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Wel geholpen

VRAAG 231
In hoeverre vindt u de werkwijze begrijpelijk?

1 ❑ 1 Niet begrijpelijk
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Begrijpelijk

VRAAG 232
In hoeverre vindt u de werkwijze eenvoudig of ingewikkeld?

1 ❑ 1 Eenvoudig
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Ingewikkeld

VRAAG 233
De mogelijkheden waaruit u kon kiezen stonden vast.
In hoeverre voelde u zich hierdoor beperkt in uw keuze?

1 ❑ 1 Beperkt
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Niet beperkt

VRAAG 7051_1
Mogelijk bent u door de informatie die u gekregen heeft anders gaan
denken over de opwekking en het gebruik van energie en de gevolgen daarvan.
Hierover wordt een vijftal vragen gesteld. U kunt antwoord geven door het getal tussen 1 en 7
aan te geven dat uw mening het beste weergeeft.
In hoeverre is uw mening over de verschillende manieren om energie op te wekken of te gebruiken
veranderd?

1 ❑ 1 Helemaal niet veranderd
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Sterk veranderd

VRAAG 7051_2
In hoeverre is uw mening over het broeikaseffect en de gevolgen daarvan veranderd?

1 ❑ 1 Helemaal niet veranderd
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Sterk veranderd

VRAAG 4072_1
In hoeverre heeft u door de informatie meer argumenten gekregen voor uw keuze voor pakketten om CO2 uitstoot te verminderen?

1 ❑ 1 Geen extra argumenten
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Veel extra argumenten

VRAAG 4073_1
In hoeverre bent u door de informatie in het algemeen anders gaan denken over verschillende manieren om CO2 uitstoot te verminderen?

1 ❑ 1 Niet anders gaan denken
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Wel anders gaan denken

VRAAG 4074_1
Graag zouden we nog willen weten hoe u denkt over een aantal zaken, welke veel te maken hebben met het broeikaseffect of energieopwekking. Omdat het hier soms over zaken gaat, waarover u in de enquête geen informatie heeft ontvangen, is het bij deze vragen ook mogelijk om geen mening te geven. U kunt dan op de knop 'geen mening' klikken.
In hoeverre bent u er van overtuigd dat het klimaat op aarde de afgelopen eeuw gemiddeld warmer is geworden?

1 ❑ 1 Helemaal niet overtuigd
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer overtuigd
9 ❑ Geen mening

VRAAG 4074_2
In hoeverre bent u er van overtuigd dat het klimaat op aarde de komende eeuw gemiddeld nog warmer zal worden?

1 ❑ 1 Helemaal niet overtuigd
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer overtuigd
9 ❑ Geen mening

VRAAG 4074_3
In hoeverre bent u overtuigd dat de opwarming van de aarde het gevolg is van CO2 uitstoot door de mens?

1 ❑ 1 Helemaal niet overtuigd
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer overtuigd
9 ❑ Geen mening

VRAAG 4075_1
In hoeverre denkt u dat het voor Nederland noodzakelijk is zich te beschermen tegen de mogelijke gevolgen van een warmer klimaat zoals overstromingen, bijvoorbeeld door het ophogen van dijken of het versterken van de zeewering?

1 ❑ 1 Helemaal niet noodzakelijk
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer noodzakelijk
9 ❑ Geen mening

VRAAG 4076_1
Kunt u aangeven in hoeverre u het eens bent met de volgende stellingen?
Het heeft geen zin om CO2 uitstoot te verminderen in Nederland, als andere landen in de wereld, zoals de Verenigde Staten of China, hun CO2 uitstoot niet verminderen.

1 ❑ 1 Helemaal mee oneens
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Helemaal mee eens
9 ❑ Geen mening

VRAAG 4076_2
Als landen op elkaar wachten om CO2 uitstoot te verminderen, is er kans dat we te laat zijn, dus moet Nederland CO2 uitstoot gaan verminderen, ook als andere landen dat niet doen.

1 ❑ 1 Helemaal mee oneens
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Helemaal mee eens
9 ❑ Geen mening

VRAAG 4076_3
De Nederlandse overheid moet meer uitgeven aan de ontwikkeling en toepassing van technieken die CO2 uitstoot verminderen, ook als dit ten koste gaat van andere beleidsterreinen zoals zorg of onderwijs.

1 ❑ 1 Helemaal mee oneens
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Helemaal mee eens
9 ❑ Geen mening

VRAAG 4076_4
'De vervuiler moet betalen.' In het geval van CO2 uitstoot betekent dit dat bijvoorbeeld energiebedrijven zelf moeten opdraaien voor de extra kosten die ze maken om bij energieopwekking uitstoot van CO2 te voorkomen.

1 ❑ 1 Helemaal mee oneens
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Helemaal mee eens
9 ❑ Geen mening

VRAAG 234
Iedere Nederlander betaalt mee aan energieopwekking via diverse belastingen.
Een deel van het belastinggeld gaat via subsidies naar energiebedrijven. Dit betekent dat ook mensen die heel zuinig zijn met energie, via die belastingen flink bijdragen aan de betaling van energieopwekking. Wat vindt u hiervan?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 4076_5

'De overheid moet ook financieel stimuleren dat vervuiling voorkomen wordt.'
In het geval van CO2 uitstoot betekent dit dat bijvoorbeeld energiebedrijven niet helemaal zelf moeten opdraaien voor de extra kosten die ze maken om bij energieopwekking uitstoot van CO2 te voorkomen, maar dat de overheid door haar beleid deze kosten vermindert.

1 ❑ 1 Helemaal mee oneens
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Helemaal mee eens
9 ❑ Geen mening

VRAAG 6220 **INFORMATIE SCHERM**

De overheid kan de ontwikkeling en toepassing van elk van de zeven energie pakketten in meer of mindere mate financieel steunen bijvoorbeeld door subsidies of belastingvoordeel.
We vragen u om het beschikbare overheidsbudget dat we op 70 punten stellen te verdelen over de zeven pakketten.
Als u van mening bent dat de ontwikkeling en toepassing van elk energiepakket in gelijke mate door de overheid moet worden gesteund dan geeft u elk pakket 10 punten (7 pakketten maal 10 punten is 70 punten). Als u vindt dat de helft van de overheidssteun (dat is dus 35 punten) besteed moet worden aan bijvoorbeeld het pakket "Elektriciteit van windmolens op zee" dan vult u 35 in achter dit pakket en kunt u nog in totaal 35 punten toekennen aan een of meer van de zes overige pakketten.
U kunt maximaal 70 punten (dat wil zeggen de hele overheidssteun) aan één pakket toewijzen en minimaal 0 punten (dat wil zeggen geen enkele overheidsteun naar dit pakket). Het aantal punten dat u aan de pakketten toewijst moet optellen tot 70.

VRAAG 3101 **OPEN VRAAG**

Verdeel nu de overheidssteun door punten in te vullen achter de pakketten.
(Totaal 70 punten)
Verbetering van energiezuinigheid
Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
Elektriciteit van windmolens op zee
Omzetting van biomassa naar autobrandstof en elektriciteit
Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
Elektriciteit uit kerncentrales

VRAAG 235

Wat vindt u er van als de overheid meebetaalt aan de ontwikkeling van kolen- en gascentrales met afvang en opslag van CO2, wanneer dit ten koste gaat van de ontwikkeling van 'groene' energie (windenergie, zonne-energie, biomassa)?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 236
Wat vindt u er van als de overheid meebetaalt aan de ontwikkeling van kerncentrales, wanneer dit ten koste gaat van de ontwikkeling van 'groene' energie (windenergie, zonne-energie, biomassa)?

1 ❑ 1 Zeer slecht
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer goed
9 ❑ Geen mening

VRAAG 4077_1
Eerder kreeg u informatie over biomassa met en zonder certificaat. Biomassa die op een verantwoorde manier gemaakt wordt krijgt waarschijnlijk een certificaat (vergelijkbaar met bijvoorbeeld het keurmerk voor hardhout).
De gevolgen van biomassa zijn voor een deel afhankelijk van de manier waarop het gemaakt wordt (dus met of zonder certificaat). In hoeverre vindt u het van belang dat Nederland alleen biomassa met certificaat invoert?

1 ❑ 1 Niet belangrijk
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer belangrijk
9 ❑ Geen mening

VRAAG 312
Zou u het pakket "omzetting van biomassa naar autobrandstof en elektriciteit" een ander cijfer geven wanneer het zeker zou zijn dat Nederland ook biomassa zonder certificaat invoert?

1 ❑ ja
2 ❑ nee
9 ❑ Geen mening

VRAAG 4078_1
In welke richting zou u uw rapportcijfer voor het pakket 'omzetting van biomassa naar autobrandstof en elektriciteit' veranderen?

1 ❑ 1 Een veel lager cijfer
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Een veel hoger cijfer

VRAAG 4077_2
Vindt u het van belang dat Nederland investeert in onderzoek en ontwikkeling van 'groene' energie (windenergie, zonne-energie, biomassa)?

1 ❑ 1 Niet belangrijk
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer belangrijk
9 ❑ Geen mening

VRAAG 4077_3
Vindt u het belangrijk, dat Nederland investeert in de ontwikkeling van technologieën om energie op te wekken met zonlicht?

1 ❑ 1 Niet belangrijk
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Zeer belangrijk
9 ❑ Geen mening

VRAAG 4076_6
Het is mogelijk om in de komende tientallen jaren met behulp van zonne-energie in landen rond de evenaar elektriciteit op te wekken, bijvoorbeeld in Noord-Afrika. In hoeverre bent u het eens met de stelling, dat Nederland zonne-energie uit Noord-Afrika zou moeten invoeren?

1 ❑ 1 Helemaal mee oneens
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Helemaal mee eens
9 ❑ Geen mening

VRAAG 4079_1
U hebt eerder niet voor een of beide pakketten 'verbetering van energiezuinigheid' gekozen. Was een reden voor u om dit niet te kiezen, dat u weinig vertrouwen had dat alle maatregelen in deze pakketten de benodigde CO_2 uitstoot besparing zullen opleveren (bijvoorbeeld doordat bedrijven of mensen geen energiezuinige apparaten, huizen of auto's zullen gebruiken)?

1 ❑ 1 Geen overweging
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Wel een overweging
9 ❑ Geen mening

VRAAG 313
Soms zijn veel mensen tegen een bepaalde manier om energie op te wekken. Mogelijk verwacht u dit ook bij pakketten in deze enquête. Was de mogelijke weerstand van andere mensen tegen een pakket voor u een overweging?

1 ❑ Ja, bij één of meer pakketten was dit een overweging
2 ❑ Nee, dit was voor mij bij geen enkel pakket een overweging

VRAAG 3141 **MEERVOUDIGE VRAAG**

INDIEN [VRAAG 313 , 1]

Bij welke pakketten was dit voor u een overweging?

1 ❑ Verbetering van energiezuinigheid
2 ❑ Verbetering van energiezuinigheid en vermindering materiaalgebruik en energiegebruik
3 ❑ Elektriciteit van windmolens op zee
4 ❑ Omzetting van biomassa naar autobrandstof en elektriciteit
5 ❑ Grote centrales waar kolen of gas wordt omgezet in elektriciteit en waarbij CO2 ondergronds wordt opgeslagen
6 ❑ Grote centrales waar aardgas wordt omgezet in waterstof en waarbij CO2 ondergronds wordt opgeslagen
7 ❑ Elektriciteit uit kerncentrales

VRAAG 237

Kunt U aangeven hoe zuinig U Uzelf vindt met energie?

1 ❑ 1 Helemaal niet zuinig
2 ❑ 2
3 ❑ 3
4 ❑ 4
5 ❑ 5
6 ❑ 6
7 ❑ 7 Heel erg zuinig
9 ❑ Geen mening

VRAAG 7061_1

Hier ziet u een aantal uitspraken over energie.
Wilt u voor elke uitspraak zeggen in welke mate u het met de uitspraak eens of oneens bent?
U kunt uw antwoord geven door een van de zeven antwoordmogelijkheden aan te geven.
Op welke manier er energie opgewekt wordt maakt mij niet veel uit.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_2

Ik heb voor mezelf een duidelijke afweging gemaakt tussen de voor-
en nadelen van verschillende manieren om energie op te wekken.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_3

Ik voel me niet betrokken bij energievoorziening.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_4
Als er een documentaire over energievoorziening op de televisie komt,
zorg ik er voor dat ik daar naar kan kijken.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_5
Op welke manier er op grote schaal energie opgewekt wordt,
heeft voor mijzelf belangrijke consequenties.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_6
Als er op televisie over het broeikaseffect wordt gesproken,
zoek ik een ander kanaal.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_7
Als er in de krant iets wordt geschreven over de energievoorziening,
dan sla ik dat over.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 7061_8
Ik wil mijn mening over het broeikaseffect ook openlijk laten blijken door bijvoorbeeld
een affiche voor het raam, het dragen van een button of een sticker op de auto.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 251

Ik heb de film "The day after tomorrow", die een plotselinge omslag van het klimaat naar een nieuwe ijstijd uitbeeldde, gezien.

1 ❑ Ja
2 ❑ Nee

VRAAG 252

Ik heb de film "An Inconvenient Truth", de documentaire over Al Gore's presentatie over het broeikaseffect, gezien.

1 ❑ Ja en ik heb het boek van Al Gore hierover gelezen
2 ❑ Ja, ik wel de film gezien, maar ik heb het boek niet gelezen
3 ❑ Nee, ik heb de film niet gezien, maar ik heb wel het boek gelezen
4 ❑ Nee, ik heb de film niet gezien en het boek niet gelezen

VRAAG 7061_9

Ik zoek op internet wel eens op webpagina's die te maken hebben met het broeikaseffect of energievoorziening.

1 ❑ geheel mee oneens
2 ❑ tamelijk mee oneens
3 ❑ beetje mee oneens
4 ❑ noch mee eens, noch mee oneens
5 ❑ beetje mee eens
6 ❑ tamelijk mee eens
7 ❑ geheel mee eens

VRAAG 253 **MEERVOUDIGE VRAAG**

Doneert u wel eens aan één of meer van de volgende organisaties?

1 ❑ Greenpeace
2 ❑ Milieudefensie
3 ❑ Stichting Natuur en Milieu
4 ❑ Wereld Natuur Fonds
9 ❑ Nee, geen van deze

VRAAG 254

Heeft u de afgelopen dagen (vanaf donderdag 10 mei) nieuws vernomen over een ongeluk in een centrale?

1 ❑ Nee, niets gezien of gehoord of gelezen
2 ❑ Ja, een ongeluk met een kerncentrale in Frankrijk
3 ❑ Ja, een ongeluk met een kolengestookte elektriciteitscentrale bij de Eemshaven
4 ❑ Ja, een ongeluk met een biomassa energiecentrale in Sittard
5 ❑ Ja, een ongeluk in een windmolenpark nabij Lelystad

VRAAG 9901

Wij danken u zeer hartelijk voor u deelname aan dit onderzoek. Tot zover het invullen van de vragenlijst. Wilt u deze vragenlijst dan nu beoordelen door een rapportcijfer (van 1 tot 10) te geven? Als u deze vragenlijst erg vervelend vond, geeft u een 1. Vond u het uitermate interessant, dan geeft u een 10.

VRAAG 9902

Heeft u verder nog op- of aanmerkingen over deze vragenlijst?

1 ❑ Ja
2 ❑ Nee

VRAAG 9903 **OPEN VRAAG**

INDIEN [VRAAG 9902 , 1]

U heeft de rest van het scherm voor uw op- en aanmerkingen!

APPENDIX 4: THE TEST OF THE ICQ

The necessity for testing the Information and Choice Questionnaire

There are two main reasons for testing an ICQ. First, as an ICQ in general and our ICQ in particular tries to explain difficult subjects, it is essential to find out if explaining these subjects succeeds using the ICQ. Since one of the goals of the ICQ is to inform respondents, it is necessary to test how well respondents are informed. Second, the ICQ functions as a decision aid. Respondents are not only informed, but the way they are informed is such that it structures the decision making process. Respondents are asked to evaluate options by evaluating the consequences of an option, after which they are able to compare the options and their consequences and make an informed decision. Before evaluating consequences, however, respondents are given several suggestions and exercises to help them decide and evaluate more rationally. As the second goal of an ICQ is to structure the decision process, it is necessary to test if respondents understand these suggestions and exercises and if they make use of these suggestions when evaluating consequences.

Furthermore, as the ICQ entails a complex procedure as well as a lot of difficult information, it is expected that most respondents need quite some time to complete the ICQ. The amount of time that is needed to fill in a questionnaire can become a problem when the questionnaire takes so much time that certain groups of respondents will drop out (e.g. elderly respondents, less interested respondents, etcetera). As this will cause an unrepresentative sample, it is necessary to design a questionnaire that is short enough for all groups in the expected sample. Therefore, it is necessary to test how long it takes respondents to finish the questionnaire.

The test ICQ was designed to test the comprehension of language and procedure as well as to measure the amount of time needed to finish the ICQ. In order to test the comprehension of language and procedure, we added two questions to every part of the questionnaire. After every bit of information or each small series of questions we asked respondents if they thought this information was clear, and if they thought it was not clear, we asked if they could state in their own words what wasn't clear. In order to measure the time needed to finish the questionnaire without all these extra questions, half of the respondents would receive a test ICQ with the extra questions and the other half of the respondents would receive a test ICQ as it was intended, without the extra questions. The test ICQ was a computer-assisted questionnaire, which was send to respondents by TNS-NIPO so they could fill in the questionnaire at home, on their own computer.

Procedure of the test, results and consequent adjustments

<u>Sample</u>

The respondents in the sample were invited by the NIPO to participate in this study in exchange for a bonus. These respondents are part of huge access panel that the NIPO maintains and which consists of all kinds of people. The bonus respondents received for participating in this study was worth approximately 9,30 euros and could be paid out in cash, airmiles, used for store credit or given away to a selection of charities.

The questionnaire was send to the respondents as a computer program that could be very easily opened on their home computer. Respondents were free to participate at a time that suited them. Of the people the NIPO invited to participate, 109 respondents participated and filled in the questionnaire completely.

The sample was of the same composition as the Dutch population. It consisted of 57 men and 52 women, of all ages between 18 and 83. Most respondents (37,6%) had an MBO education, 19,3% had an LO-LBO education, 22 % had an HBO education or WO-candidacy, 7,3% had an MAVO education, 3.7% had a HAVO or VWO education, 10.1% had an WO or postdoctoral education and the rest was unknown.

Time

As explained before, the amount of time it took respondents to finish the questionnaire was important because if it takes too much time, specific groups of respondents drop out and this endangers a representative sample. Two different measures of time were therefore important; first of course the total amount of time it took respondents on average to finish the questionnaire, and second, if this was too long, which parts of the questionnaire took respondents are relatively large amount of time. However, time was recorded by the computer of the respondents, not the respondents themselves. This might look more objective, but the computer does not take into account that some respondents took one or more pauses during the questionnaire, which were sometimes very long (up to several hours). After calculating the amount of time it took respondents to finish all specific parts of the questionnaire, we therefore replaced all clearly deviant times of respondents to finish a part with the average time it had needed all respondents to finish that particular part of the questionnaire.

The mean total time to finish the questionnaire was 79.8 minutes. As we had aimed for a maximum amount of time of 80 minutes, this was a satisfactory result. We did however look at the mean time it took to finish the parts of the questionnaire. There were a few parts that took respondents a long time to finish compared to the other parts of the questionnaire. Specifically the initial evaluations of the energy options took relatively long (5.5 minutes). Furthermore, the evaluations of the consequences of global warming took relatively long (5.9 minutes). The evaluation of the option "improvement of energy efficiency" took long, (6.1 minutes) as did the evaluation of the option "conversion of biomass to car fuel and electricity" (7.2 minutes) and the option " Large plants where natural gas is converted to hydrogen with CCS"(6,1 minutes). The extra questionnaire about energy sources also took respondents long to finish, (6.6 minutes).

Explanation of the ICQ procedure: measures of comprehensibility and adjustments

Calibration and calibration of probability

After a quick introduction of the purpose of the ICQ and kind of task respondents could expect, respondents were given several exemplary questions and exercises to practice the ICQ procedure with. These examples and exercises were used to explain how to evaluate consequences. Respondents were given four negative consequences to evaluate on a scale of one to nine, one being a very small disadvantage, nine being a very big disadvantage. These four consequences differed on two dimensions; the negativity of the consequence and the chance the consequence would occur. The purpose of this was to explain to respondents that it would be logical to rate a certain more negative consequence as more negative, and that it would be logical to rate a chance of less than 100% on something negative (e.g. 50% chance on 100 casualties) as less negative than a certainty (100%) of the same thing occurring. Respondents who followed this advice should not rate something that is not as negative as another consequence at the end of the scale. If something less negative is already rated as the most negative consequence possible, it is not possible anymore to rate something more negative as more negative on the scale. It seems that most respondents understood this already, as only 16.5% of respondents rate "an accident with as a consequence *several* deaths" as negatively as possible on the scale, but 67.9% of respondents rate "an accident with as a consequence *thousands* of deaths" as negatively as possible. Furthermore, it seemed that respondents understood that it would be logical to rate a chance of something negative occurring as less negative than a certainty of something occurring. When respondents were asked to rate "a very small change of an accident with as a consequence thousands of deaths", the percentage of respondents that rated this as a very big disadvantage dropped to 22%, opposed to the 67.9% of respondents that rated a certainty of thousands of deaths as a very big disadvantage.

Evaluation of consequences

Respondents were then given an exemplary ICQ about painkillers. With this exemplary ICQ, respondents were explained how to fully evaluate consequences; For every consequence respondents were asked to state if they thought this consequence was an advantage, a disadvantage or not important. If the consequence was evaluated as an advantage or a disadvantage, respondents could state to what extent they saw it as an advantage or disadvantage on a scale of one to nine (1= "a very small disadvantage" or "very small advantage", and 9= "a very large disadvantage" or " a very large advantage"). After respondents had received 4 consequences of medicine "X", the computer would check if the respondent had evaluated all disadvantages as disadvantages. If this was not the case, the respondent received the following text: "You have evaluated one or more of the consequences of medicine "X" as an advantage. Although you are of course free to think so, something could be said for considering the possible side-effects of a painkiller to be a disadvantage." A minority of respondents actually received this message, 17.6% of respondents considered one of the consequences to be an advantage, 0.8% of respondents considered both consequences to be an advantage.

Consistency

As one of the consequences in the exemplary ICQ about medicine "X" was the same as in the first four negative consequences, respondents that gave equal evaluations of this consequence were explained that this was the logical thing to do. A minority of respondents gave exactly the same evaluation (17.4%). The other respondents were explained that there might be something to be said for giving the same evaluation to the same consequence. To analyze if this comment helped improve respondents' consistency, we compared the evaluations of equal consequences of different policy packages, which were evaluated after this explanation. A comparison of evaluations of the consequence "safety of underground CO_2 storage" showed that a minority of respondents (32.1%) evaluated this consequence exactly the same, and 39.5% of respondents evaluated this consequence nearly the same.[14] It seems some respondents did take notice of the explanation that the same consequence should be evaluated the same, and behaved accordingly.

Respondents' evaluation of the method

The second measure of the comprehensibility of the method of the ICQ consisted of three questions concerning the opinion of respondents on this matter. These questions were asked later on in the questionnaire, after respondents had evaluated the seven options and their consequences, and after they finished the entire choice procedure. The first question was only addressed to the half of the respondents that had not been frequently asked if the information was clear. They were asked if there had been a moment during the answering of the questions that something was not clear or that they had not understood what they were supposed to do. Some of the respondents (3.7%) confirmed there had been such a moment. When asked to specify, different answers were given. Two respondents found it difficult to evaluate some of the consequences because they thought part of the consequence was negative, but part of the consequence was positive. This is true, some consequences start by mentioning something very negative, to go on stating that this has been resolved, diminished or has only a very small change of occurring. However, although this information is not easy to comprehend for some respondents, it is information that experts deemed important and therefore an essential part of the information in the questionnaire. This information was not adjusted.

A majority of respondents thought the method of the ICQ was comprehensible. A minority (6.4%) thought the method was neither comprehensible nor incomprehensible and only one respondent (0.9%) thought the method was incomprehensible. When asked if the method was simple or complicated, 23.9% of respondents thought it was neither simple nor complicated, 49.5% thought it was a bit or rather complicated and 1.8% thought it was very complicated.
It seems that although respondents think the method is complicated, most of them did understand the method.

Processing the technical information

To study how difficult the technical information in the questionnaire was for respondents to process, we asked two sets of questions. First, we tested the knowledge that respondents had about the information that was just given to them. Second, after the questionnaire several questions were asked to study the opinion of the respondents on the quality of the information. We will first discuss the results of the knowledge test.

Knowledge test

Following the information on global warming, respondents were given information on ways to reduce emissions of carbondioxide. It is explained that this questionnaire focuses on seven packages that can help to reduce carbondioxide emissions. Respondents were made clear that three of these seven options are necessary to reduce carbon dioxide emissions by 50%. As respondents have had a lot of information to take in so far, it was questionable if they remembered all of it. To test respondents'

[14] with a margin of 2 points on the totally 19 point scale (i.e. advantage and disadvantage are rated on a nine-point scale, together with "not important" this makes a 19 point scale)

knowledge at this point and to fill in any omissions, respondents received 11 multiple-choice questions on information they had just been given to read. After respondents gave their answer, the right answer would always be displayed on screen once more. Most questions were answered correctly by a large majority of the respondents. Five questions were answered correctly by at least 87% of respondents. We will discuss the questions that proved more difficult for respondents. Three questions were answered correctly by at least 73.4% of respondents. These were the questions about the relation between the packages and reduction of CO_2 emissions. Although the percentage of respondents that answered these questions wrongly is still small, it is nevertheless higher than the percentages found for other questions. It seems respondents found it more difficult to recollect the information that was needed to answer these questions. However, this information is repeated several times in the text before the questions. As more repetition would take up more time and would probably lead to annoyance with at least equally many other respondents, we did not adjust the text about this information.

Two questions were answered correctly by much less respondents. The first question is the question about the amount of degrees the average temperature on earth will rise if CO_2 emission keeps rising as it does now. This question was correctly answered by 55% of respondents with the answer: "probably rise 1.4 to 5.8 degrees Celsius". Most of the respondents that answered wrongly (24.8%) choose the answer: "will certainly rise 1.4 to 5.8 degrees". Several respondents answered that the temperature would rise more than 5.8 degrees Celsius (19.3%). Only one respondent (1%) choose the answer: "might drop 1.4 to 5.8 degrees". Apparently, respondents did remember that the temperature would rise, just not if it was certain and how much exactly.

The second question that was answered correctly by much less respondents was the question about how the use of biomass as an energy source can reduce the amount of CO_2 emissions. A small majority of respondents (53.2%) correctly choose the answer: "because CO_2 does form when generating energy from biomass, but no more so than would have formed if the biomass had decomposed". Several respondents (30.3%) choose the answer: "because no CO_2 is formed when generating energy from biomass", and a few respondents (16.5%) choose the answer: "because although CO_2 is formed when generating energy from biomass, this CO_2 is captured and stored". So although respondents are explained multiple times how the use of biomass reduces CO_2 emissions, this process seems to remain difficult to understand for most respondents. However, it is unlikely that a repetition of this information would lead to more understanding, as the process is already explained multiple times, in different ways.

Respondents' evaluation of difficulty

The second set of questions that was asked to study how difficult the information was for respondents, consisted of seven questions about respondents' evaluation of the quality of the information on a scale of 1 to 7. These questions concerned the amount, the impartiality, the clarity and the completeness of the information. They were asked at the end of the questionnaire, after respondents had evaluated all packages and their consequences, and after respondents had gone through the entire choice procedure. The amount of information was satisfactory for most respondents. When asked if they thought they had enough information to make a choice between the different energy options, only 12.8% of respondents remained on the "not enough" end of the scale.

However, 34.9% of respondents did state a wish for more information before evaluating the consequences of the packages. When asked to what extend they thought the information in the questionnaire was partial or impartial, most respondents (56.8%) answered on the "impartial" end of the scale and 28.4% of respondents answered neither partial nor impartial. A majority of respondents (61.5%) also thought the information was not one-sided, but 10.1% did feel the information was one-sided. Furthermore, a majority of respondents (83.5%) thought that the information about consequences was clear, and 6,4% of respondents thought it was not clear.
When asked if they thought the amount of information was appropriate, 32.1% of respondents thought the amount of information was neither too little nor too much. A substantial part of respondents thought the amount of information was a bit too much (30.3%) or more than a bit too much (24.8%). Only few of the respondents thought the information was either much too much (7.3%), or much too little (0.9%). The majority of respondents thought the information about consequences was complete (77.1%). A substantial part of respondents (56.9%) stated to think that it was comforting that the information was regularly repeated, whereas 25.7% of respondents admitted to find this irritating. This is not surprising, as the majority of respondents also stated to find the information moderately to completely familiar. A minority of respondents either stated to find the information quite (24,8%) to somewhat (14,7%) unfamiliar.

As the background and interests of the respondents in the sample are very different, it was expected that there would be differences in the perception that respondents would have of the information in the questionnaire. What is too much for one is too little for another. However, in general the amount and quality of the information seemed to be appreciated by the majority of the respondents. These results therefore gave no reason to change the amount or wording of the information.

Overall difficulty of language
Half of the respondent received a third measure of comprehensibility of the information in the questionnaire. After each piece of information and every evaluation of consequences, 55 of the 109 respondents were asked "Do you find this information clear?". This question was asked 119 times. Most information was evaluated as clear by all respondents. 74.8% of information was found clear by all respondents, 17.6% of information was found clear by all but one respondent, 5.9% of information was found clear by all but two respondents and 0.8% of the information was found clear by all but three respondents. Another 0.8% was evaluated by seven respondents as unclear. When one or more respondents had stated to find a piece of information unclear, the explanation of the respondent was read and compared to the information to see what the problem could be. However, most of the times the comments respondents made referred not to the incomprehensibility or difficulty of the text but to unrelated matters respondents wanted to share. The few instances that several respondents made comments about the difficulty or incomprehensibility of a part of the text, are described below in more detail.

Presentation of the choice problem and background information
After familiarizing respondents with some elements of the ICQ procedure, respondents were explained in detail what the questionnaire was about. They were told that the questionnaire had been made with the help of a diverse group of energy

experts and that the information in the questionnaire was acknowledged by these experts as a trustworthy account of energy dilemmas and of the consequences of seven options to diminish CO_2 emissions. The respondents were given information on the current use of energy in the Netherlands and the current ways in which energy is produced in the Netherlands. Next, they were explained what the frequent use of oil, gas and coal mean for our climate, by explaining the role of carbon dioxide in global warming. They were then given 9 consequences to evaluate that are expected to occur when the earth's temperature rises as much as expected by scientists. They were also asked to state their overall evaluation on global warming. This overall evaluation was asked for twice; the respondents were asked to give their overall evaluation on a scale of 1 to 7, 1 being very bad and 7 being very good. They were furthermore asked to grade global warming on a scale of 1 to 10.

One of the consequences of global warming that was evaluated by the respondents was mentioned by three respondents as being unclear. This concerned the text about sudden climate change. These respondents stated to be confused by the explanation that global warming can lead to a cooling effect. As it came to pass, the new IPCC report with the most recent scientific information about climate change, mentioned new information about this possible cooling effect due to a diminished thermohaline circulation in the North Pole region. Consequently, the text with the information that respondents found confusion was no longer up to date and was altered to fit more recent scientific evidence. As the more recent scientific evidence suggests that sudden climate change is highly unlikely, because recent projections show that a possible cooling effect would be compensated by the rise in global temperatures. Two expert climate scientists reviewed and approved the adjustments that were made to the information.

Another example: choice procedure

Respondents received a summary of all the information they had to process before. It was announced at this point that they would not only be asked to evaluate the options and their consequences, as they had done in an example before, but that they would also be asked to make a choice between the six options by choosing one of the options. We used an exemplary choice procedure to explain what the real choice procedure would be like. Respondents were shown in a table, what evaluations they had given before in the earlier example of the ICQ procedure of "medicine X". Not only were their evaluations given, but also an explanation how adding these numbers would give respondents their overall scores of disadvantage and advantage of "medicine X". They were explained how to let the computer calculate these scores, and how these scores could be used to further evaluate the option (medicine X) overall. This specific part of the explanation, and the table that was presented to respondents, was much commented on by respondents. Seven respondents commented on either the lack of clarity of the table, the procedure of calculating the scores or the apparent lack of reason for the calculation of overall disadvantage and advantage scores. We therefore tried to improve this part of the text by rewriting and adding explanation of the purpose of the table. We also added information on the purpose and the procedure of calculating the scores.

Conclusions from the test

Respondents understood most of the texts. The language was mostly comprehensible, only a few pieces of text needed to be adjusted. The technical information seemed mostly comprehensible too, although some texts had to be adjusted based on the objective measures of difficulty. The subjective measures of difficulty showed that respondents perceived the quality of the information in the test as quite good. The decision aid, the explanation at the beginning of the test about how to evaluate rationally, was either already being used or picked up by respondents. Most respondents were content with the method, although it was not evaluated as simple by most respondents. This gave us no reason to change this part of the questionnaire. The time respondents needed on average was satisfactory as well.

APPENDIX 5: MORE RESULTS

Table Appendix 5.1.1 SAMPLE
Note 1: TNS-NIPO sampled adult respondents (> 18 years)
Note 2: Distribution data of Dutch population by CBS (2004)

Dutch population			**Sample ICQ**	
Sexe			**ICQ**	
	n	%	n	%
Male	8,045,914	49.5%	467	48.1%
Female	8,212,118	50.5%	504	51.9%
total	**16,258,032**	**100.0%**		
Age			**ICQ**	
	n	%	n	%
<20	3,983,218	24.5%	20	2.1%
20-40	4,552,249	28.0%	360	37.1%
40-65	5,462,699	33.6%	435	44.8%
65-80	1,690,835	10.4%	142	14.6%
80+	552,773	3.4%	14	1.5%
total	**16,258,032**	**99.9%**		
Education			**ICQ**	
	N	%	n	%
bo	664,000	12.1%	-*	-
mavo	461,000	8.4%	74	7.6%
vbo	799,000	14.5%	229*	23.6%
havo/vwo	338,000	6.2%	34	3.5%
mbo	1,850,000	33.7%	352	36.3%
hbo	892,000	16.2%	203	20.9%
wo	491,000	8.9%	74	7.6%
total	**5,495,000**	**100.0%**		
* bo-vbo is combined in sample ICQ				
Province			**ICQ**	
	N	%	n	%
groningen	574,384	3.5%	43	4.4%
friesland	642,066	3.9%	37	3.8%
drenthe	482,415	3.0%	20	2.1%
overijssel	1,105,512	6.8%	59	6.1%
flevoland	359,904	2.2%	13	1.3%
gelderland	1,966,929	12.1%	110	11.3%
utrecht	1,162,258	7.1%	76	7.8%
noord-holland	2,587,265	15.9%	158	16.3%
zuid-holland	3,451,942	21.2%	208	21.4%
zeeland	379,028	2.3%	26	2.7%
noord-brabant	2,406,994	14.8%	146	15.0%
limburg	1,139,335	7.0%	75	7.7%
total	**16,258,032**	**100.0%**		

* This cell is empty because TNS-NIPO has different categories for education, that combine bo (basisonderwijs) with vbo (lowest education level high school)

A5.1.2 Overall evaluations on different scales

The overall evaluations of global warming, carbon dioxide capture and storage (CCS) and the seven options were all measured with two different scales. Respondents were asked to give their overall evaluations on a scale ranging from 1 “very bad” to 7 “very good”. They were furthermore asked to grade on a scale of one to ten. This means that there are two measures for all overall evaluations. To find out if respondents evaluate differently depending on scale type or size, we analyzed the correlations between these two measures for global warming, CCS and the seven options. The correlations were moderate to high, ranging from .63 to .84. This means that these measures are quite similar. Table Appendix A5.1.2 shows the evaluations based on the seven point scale, Table Appendix A5.1.2b shows the evaluations based on grading on a scale of one to ten to compare.

Table Appendix 5.1.2: Overall evaluations on the seven point scale of seven options in the ICQ: percentages for evaluations, means and standard deviations.

Option	1-3	4-5	6-7		Mean	SD
Efficiency	1.0	18.1	80.9	-	6.12	0.87
Efficiency plus	16.9	48.4	34.7	-	4.85	1.32
Wind	3.7	21.6	74.7	-	5.90	1.06
Biomass	2.0	14.3	83.8	-	6.19	0.95
Powerplants + CCS	25.2	53.0	21.9	-	4.42	1.33
Hydrogen + CCS	13.2	48.1	38.7	-	5.01	1.26
Nuclear	29.2	40.0	30.8	-	4.44	1.6

Table Appendix 5.1.2b: Overall evaluations of seven options in the ICQ: percentages for grades, means and standard deviations.

Option	1-3	4-5	6-7	8-10	Mean	SD
Efficiency	0.7	5.5	47.7	46.0	7.33	1.23
Efficiency plus	7.1	32.3	47.9	12.8	5.84	1.54
Wind	1.7	8.7	46.5	43.2	7.15	1.37
Biomass	1.3	5.0	42.2	51.4	7.41	1.32
Powerplants + CCS	11.2	41.0	41.3	6.40	5.34	1.50
Hydrogen + CCS	6.1	28.8	53.1	12.1	5.92	1.44
Nuclear	19.4	31.1	36.9	12.7	5.29	1.96

A5.1.3 Order effects

To avoid the possible influence of order effects on the overall evaluations, the order in which respondents received the information on consequences of the seven options was not the same for all respondents. Six versions of the ICQ were made with different orders. The order of the first version was p1 (“Improvement of energy efficiency”), p2 (“Improvement of energy efficiency and decreased use of material and energy”), p3 (“Electricity from windmills at sea”), p4 (“Conversion of biomass to car fuel and electricity”), p5 (“Large plants were coal or gas are converted into electricity, with CCS”), p6 (“Large plants were gas is converted into hydrogen with CCS”), p7(“Electricity from nuclear plants”). The order of the second version was p4-p7-p6-p1-p2-p3-p5. The order of the third version was p7-p6-p5-p4-p3-p1-p2. The order of the fourth version was p5-p1-p2-p6-p3-p7-p4. The order of the fifth version was p3-p5-p4-p7-p1-p2-p6. The order of the sixth version was p6-p4-p1-p2-p7-p5-p3. By varying the order in which respondents evaluated the options, the chance that an option receives higher or lower evaluations than the other options purely based on its position in the questionnaire becomes very small. To completely rule out this possibility, we analyzed the effect of order on the average overall evaluations of the options. Although the average evaluations of some of the seven options did differ depending on their position in the questionnaire, the effect sizes (partial eta square) of these differences were not higher than .021, which is considered a small effect size by definition of Cohen (Cohen, 1973, 1988). Cohen defines .01 as a small effect size, .058 as a medium effect size, and .137 as a big effect size. As the overall evaluations that are further used in the analyses are an average of overall evaluations from six different order versions, the very minor effect of position is averaged out and it is not considered to be a factor in the analyses that are described below. A table with the average overall evaluations of the seven options per version of the questionnaire is presented in Table appendix 5.1.3. Further explanation of effect size is given in Section 3.8

Table Appendix 5.1.3: Order effects: overall evaluations depending on position in order

	Position						
	1	2	3	4	5	6	7
Efficiency	7.35	7.48	7.01	7.47	7.34	7.11	
Efficiency plus		5.86	6.0	5.43	6.05	5.8	5.68
Wind	7.36		7.14		6.88	7.06	6.92
					7.21		
Biomass	7.37	7.29	7.62	7.6			7.28
				7.28			
Powerplants + CCS	5.77	5.23	5.22		5.20	5.21	5.46
Hydrogen + CCS	6.03	6.19	5.88	5.98		5.61	5.82
Nuclear	5.52	5.53		5.01	5.08	5.52	5.18

Important to notice in Table A5.1.3 is the effect that the order of options has on the two CCS options. When the CCS option “Large plants where coal or gas are converted into electricity with CCS” is the first to be evaluated of all the options, the average overall evaluation is significantly higher than when the option is evaluated later. This is important because it shows an effect of the comparison with other options. Respondents are more positive about this CCS options when they have not received information about the other options yet. The second CCS option, “Large plants where gas is converted into hydrogen with CCS”, is also evaluated significantly higher when it is the first to be evaluated, except for the situation where this CCS option is evaluated as the second option, after the nuclear energy option. When respondents have first been informed about the nuclear option and then second about this CCS option, the CCS option is evaluated even higher on average than when it is evaluated first. It seems that although the comparison with other options makes respondents slightly more negative regarding CCS, the comparison with the nuclear option makes respondents slightly more positive.

A5.1.4 Design effects

As noted in section 2, several respondents were given an extended version of the ICQ. Of the 971 respondents that participated, 291 participants were asked to state their familiarity with the options and evaluate the options before the ICQ started (so without information on consequences of the options). Another 203 participants were asked to evaluate extra consequences of CCS in general during the ICQ.

To find out whether these additional questions had an effect on later evaluations of the options, we analyzed the effect of type of questionnaire on overall evaluations of the seven options with analysis of variance. None of the overall evaluations of the seven options were statistically different between the group that had extra questions before, the group that had extra questions during, or the group that had no extra questions. We also analyzed the effect of type of questionnaire on the percentage of respondents that states not to accept large scale implementation of an option. In correspondence with the lack of effect on the overall evaluations of the options, type of questionnaire had no statistically significant effect on the percentage of respondents that stated not to accept large scale implementation of a option, for any of the seven options. Furthermore, the possible interaction effect of type of questionnaire with the order in which the options were presented on the overall evaluation of a option was tested for all seven options. We wanted to test if the processing and evaluation of consequences of CCS in general might have had more or less effect depending on the position of the options that were processed and evaluated further on in the questionnaire. However, no interaction effects of type of questionnaire with order of presentation were found for any of the seven options.

In conclusion, differences between overall evaluations of CCs options in ICQ 2004 and ICQ 2007 cannot be attributed to differences in design between both ICQ's.

Appendix 5.2: Relation consequence evaluation and rejection

Table appendix 5.2: Mean evaluations of consequences for the group that accepts an option and the group that rejects an option, eta square of difference

	Mean reject	Mean accept	Eta square
Improvement of energy efficiency and decreased use of material and energy			
- some more contribution to improvement of air quality	5.72	6.54	.004
- possible positive economic consequences	0.97	1.72	
- more expensive transport	-5.68	-3.42	.013
- strict regulations for industrial technology and recycling	-4.07	1.01	.05
- more expenses consumers	-3.16	0.32	.031
- drastic regulations for energy use houses and buildings	-5.6	-1.75	.031
- price: at least 20% higher	-6.83	-4.16	.021
- much less contribution to greenhouse effect	5.88	6.2	
Large plants were coal or gas are converted into electricity with CCS			
- possible pollution of coal mine surroundings	-6.49	-5.19	.013
- very small chance of leakage from lines	-4.06	-1.72	.027
- very small chance of leakage from storage	-5.28	-2.71	.035
- high reliability energy supply	-1.08	-0.07	.004
- price: 5% to 20% higher	-3.82	-3.25	
- much less contribution to greenhouse effect	5.53	6.03	
Large plants were gas is converted into hydrogen with CCS			
- need for many new pipelines	-5.88	-3.81	.021
- need for new vehicles	-2.71	-0.95	.008
- great contribution to improvement air quality	5.58	6.56	.007
- decrease of sound level	4.83	5.87	.007
- possible equal safety plants	-3.46	-2.08	.007
- equal safety in daily life	0.42	1.87	.007
- very small leakage from lines	-2.89	-0.72	.016
- very small chance of leakage from storage	-4.47	-2.53	.012
- reliability energy supply	1.3	3.16	.012
- unknown effect economy	-5.33	-3.42	.017
- price: equal to 35% higher	-3.21	-1.78	.005
- much less contribution to the greenhouse effect	5.36	6.26	.006
Electricity from nuclear plants			
- long term consequences low radiation very unlikely	-5.53	-2.17	.088
- very small chance of health risks from highly radioactive waste	-7.28	-3.52	.098
- chance of serious accident < 1:200.000 years	-3.84	-0.2	.073
- terrorist attack reactor close to impossible	-4.95	-1.09	.089
- risk of proliferation: possibly moderate	-6.31	-4.31	.049
- high reliability of energy supply	2.83	4.74	.032
- price: equal to at least 20% higher	-3.77	-2.62	.012
- much less contribution to greenhouse effect	5.64	6.17	.005

The consequences in this table are merely labels. In fact, information consequence was nuanced and elaborate. See Appendix 2 for a full description. Only options that were rejected by more than a few respondents could be analyzed like this. If eta-square is missing, the difference was not significant.

Appendix 5.3: Evaluation of separate consequences

In Appendix A5.3, Tables A5.3.1-A5.3.9 contain the evaluations of each consequence of CO_2 transport and storage and all seven options. For this report, the 19 response categories have been grouped into seven categories: “big disadvantage” (disadvantage evaluated as 7, 8 or 9), “moderate disadvantage” (disadvantage evaluated as 4, 5 or 6), “small disadvantage”(disadvantage evaluated as 1, 2 or 3), “not important”, “small advantage” (advantage evaluated as 1, 2 or 3), “moderate disadvantage” (advantage evaluated as 4, 5 or 6) and “big advantage” (advantage evaluated as 7, 8 or 9).

Table Appendix 5.3.1 :Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of global warming

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
More droughts	79.3	15.4	2.1	2.2	0.3	0.3	0.4	-7.12	2.17
Warmth in cold areas	10.2	6.9	1.7	4.4	9.2	33.7	33.9	3.38	5.19
Extremer storms and rainfall	77.5	16.7	2.7	2.4	0.3	0.1	0.2	-7.12	2.08
Sealevel rise	79.2	14.9	2.9	2.6	0	0.1	0.3	-7.32	2.17
Rising water in and around NL	55.4	21.3	6.0	9.4	0.8	3.3	3.7	-5.21	4.25
Poor countries affected most	78.6	15.4	2.0	2.8	0.1	0.7	0.3	-7.20	2.40
More heat waves	53.8	26.9	6.8	8.0	0.8	2.4	1.3	-5.59	3.47
Less cold waves	11.7	10.9	3.1	15.9	9.0	20.5	29.1	1.94	5.5

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix2 for a full description.

Table Appendix 5.3.2 : Percentages for restricted scale categories plus means and standard deviations.Evaluations of consequences of CO_2 storage

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
Very small chance of leakage from lines	5.4	10.8	9.9	32.5	2.0	14.3	25.1	1.54	4.75
Very small chance of CO2 cloud	11.3	11.8	15.3	30.0	4.9	9.4	17.2	0.11	4.84
Very small chance of leakage from storage	9.4	14.8	15.8	25.6	3.0	13.3	19.2	0.46	5.04
Small chance of damage to lif e in basements	45.3	31.0	16.3	4.9	0	1.0	1.5	-5.40	3.14
Chance of less or more small earthquakes	11.8	16.7	6.4	15.8	10.8	20.7	17.7	0.70	5.23
No contribution to greenhouse effect	1.0	2.5	0	6.4	3.9	16.7	69.5	6.31	3.31

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix2 for a full description.

Table Appendix 5.3.3: Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option "Improvement of energy efficiency"

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- some contribution to improvement of air quality	.2	.4	.2	2.3	3.8	18.9	74.2	6.89	2.13
- less use of natural resources	.5	.8	.3	3.2	2.1	22.9	70.2	6.74	2.45
- more reliability energy supply	.3	.7	.2	5.8	3.4	21.0	68.6	6.54	2.60
- positive economic consequences	.5	1.5	.1	10.4	6.4	28.1	52.9	5.65	3.11
- measures to reduce fuel use for transport	11.1	15.7	7.6	19.4	4.2	14.8	27.2	1.20	5.57
- strict efficiency regulations for industry	1.5	4.3	2.9	29.9	4.6	22.6	34.2	3.51	4.07
- strict efficiency regulations for energy use houses and buildings	2.0	4.2	2.6	17.1	7.1	27.1	40.0	4.27	4.03
- price: lower or higher	17.2	20.9	10.8	30.7	2.7	7.7	10.0	-1.43	4.78
-much less contribution to greenhouse effect	.4	.9	.4	2.7	1.9	22.8	71.0	6.70	2.36

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix2 for a full description.

Table Appendix 5.3.4: Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option "Improvement of energy efficiency and decreased use of material and energy"

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- some more contribution to improvement of air quality	.6	1.0	.5	4.4	3.6	23.4	66.4	6.41	2.73
- possible positive economic consequences	3.2	12.4	6.2	33.7	6.7	16.3	21.6	1.68	4.53
- more expensive transport	33.8	29.2	10.2	13.6	1.5	4.5	7.1	-3.55	4.68
- strict regulations for industrial technology and recycling	11.2	16.2	9.8	19.7	5.1	17.7	20.3	0.71	5.32
- more expenses consumers	10.7	10.3	8.3	45.0	2.8	8.0	14.8	0.11	4.61
- drastic regulations for energy use houses and buildings	22.5	27.0	11.5	15.6	3.0	9.4	11.1	-1.98	5.17
- price: at least 20% higher	40.4	26.7	11.1	12.3	1.8	3.9	3.9	-4.31	4.34
- much less contribution to greenhouse effect	1.1	1.0	.2	5.4	3.0	27.2	62.1	6.18	2.83

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix 2 for a full description.

Table Appendix 5.3.5 : Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option "Electricity from windturbines at sea"

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- Rare visibility of windmills from coast	3.5	3.8	5.5	71.4	1.1	3.8	10.9	0.52	3.35
- less bird deaths caused by windmills	6.1	8.3	11.9	29.7	5.5	13.2	25.3	1.64	4.77
- possible protection of fish population	1.9	2.5	2.5	18.8	10.8	22.8	40.8	4.27	3.88
- less accessibility of sea for fishermen	8.4	17.8	16.7	46.1	2.1	4.9	3.9	-1.31	3.52
- increase in capacity of the grid	3.0	9.2	14.6	61.1	1.1	4.8	6.2	-0.22	3.12
- more jobs	1.2	.6	.2	4.6	7.0	25.2	61.1	6.11	2.86
- price: 10% to 40% higher	26.7	30.1	19.4	21.5	.7	.7	.9	-3.97	3.29
- much less contribution to greenhouse effect	.6	.9	0	3.1	1.1	21.4	72.8	6.77	2.45

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix 2 for a full description.

Table Appendix 5.3.6 : Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option "Conversion of biomass to car fuel and electricity"

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- considerate contribution to improvement air quality	1.6	.9	.2	2.6	3.3	19.5	71.9	6.60	2.86
- positive effects of certified land use	4.6	5.0	1.1	5.4	4.4	23.7	55.7	5.05	4.43
- negative effects of uncertified land use	46.8	35.1	7.7	7.0	0	1.6	1.8	-5.40	3.29
- influence on food production	9.9	10.6	3.7	14.3	6.9	27.3	27.3	2.29	5.28
- high reliability energy supply	2.9	3.2	2.5	13.3	6.9	30.1	41.2	4.47	3.90
- expansion of sea ports	2.1	3.3	.7	11.3	7.3	28.2	47.1	4.92	3.73
- need for gradual replacement cars	3.0	4.4	1.9	30.2	4.8	21.0	34.7	3.44	4.29
- positive economic consequences	.5	.7	.2	8.7	7.4	27.2	55.3	5.83	2.90
- price: equal to 20% lower	.3	.9	.2	13.1	4.8	18.4	62.2	6.02	3.18
- much less contribution to the greenhouse effect	.4	.8	.2	3.0	2.0	19.5	74.2	6.85	2.37

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix 2 for a full description.

Table Appendix 5.3.7: Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option “Large plants were coal or gas are converted into electricity with CO_2 capture and storage”

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- possible pollution of coal mine surroundings	50.5	29.6	7.8	7.5	.4	2.1	2.2	-5.34	3.51
- very small chance of leakage from lines	16.7	24.3	19.2	24.7	.8	5.4	9.0	-1.97	4.48
- very small chance of leakage from storage	24.4	28.3	18.8	17.0	.6	4.9	5.9	-2.99	4.34
- high reliability energy supply	11.3	20.7	9.6	23.5	5.9	17.4	11.6	-0.18	4.94
- price: 5% to 20% higher	24.7	25.0	17.5	27.6	1.1	2.0	2.1	-3.31	3.69
- much less contribution to greenhouse effect	1.8	1.8	.2	5.0	3.2	27.2	60.9	5.97	3.20

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix 2 for a full description.

Table Appendix 5.3.8: Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option “Large plants where natural gas is converted into hydrogen with CO_2 capture and storage”

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- need for many new pipelines	31.9	27.9	11.7	24.9	.6	1.1	1.8	-3.95	3.57
- need for new vehicles	16.8	20.3	8.7	30.4	2.8	9.6	11.5	-1.07	4.93
- great contribution to improvement air quality	1.1	1.3	.3	4.2	3.9	18.5	70.5	6.50	3.01
- decrease of sound level	.3	1.2	0	11.6	6.1	23.5	57.3	5.80	3.10
- possible equal safety plants	13.5	29.1	15.1	30.6	1.9	4.7	5.0	-2.17	4.04
- equal safety in daily life	4.2	5.9	5.8	42.7	4.9	17.1	19.4	1.77	4.18
- very small leakage from lines	11.0	16.8	20.0	30.9	2.1	11.1	8.1	-0.87	4.39
- very small chance of leakage from storage	20.6	28.4	20.0	17.7	1.0	5.6	6.7	-2.66	4.39
- reliability energy supply	2.7	7.0	5.0	23.1	7.0	28.5	26.7	3.03	4.30
- unknown effect economy	25.6	31.9	11.6	24.7	1.0	3.0	2.1	-3.55	3.74
- price: equal to 35% higher	23.8	19.3	9.3	27.4	2.5	8.1	9.7	-1.87	5.01
- much less contribution to the greenhouse effect	1.1	1.1	.3	5.0	3.1	27.2	62.1	6.20	2.83

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix 2 for a full description.

Table Appendix 5.3.9: Percentages for restricted scale categories plus means and standard deviations. Evaluations of consequences of the option "Electricity from nuclear plants"

	Big	Moderate disadvantage	Small	Unimportant	Small	Moderate Advantage	Big	Mean	SD
	-9 to -7	-6 to -4	-3 to -1	0	1 to 3	4 to 6	7 to 9		
- long term consequences low radiation very unlikely	27.6	21.1	13.4	26.2	1.8	3.5	6.5	-2.84	4.53
- very small chance of health risks from highly radioactive waste	44.8	21.6	10.7	10.7	1.9	4.9	5.4	-4.26	4.74
-chance of serious accident < 1:200.000 years	19.9	14.9	17.7	19.2	2.8	10.3	15.2	-0.93	5.39
- terrorist attack reactor close to impossible	23.1	19.8	17.7	17.2	3.1	8.3	10.8	-1.86	5.17
- risk of proliferation: possibly moderate	41.3	24.7	13.8	17.3	.1	1.3	1.4	-4.71	3.63
- high reliability of energy supply	4.4	3.2	1.2	13.8	7.1	28.1	42.1	4.35	4.29
- price: equal to at least 20% higher	22.6	26.5	13.0	28.7	1.2	3.8	4.2	-2.85	4.14
- much less contribution to greenhouse effect	1.9	.5	.5	5.4	4.0	26.7	61.1	6.06	3.08

Note: The aspects and consequences in this table are merely labels. In fact, information regarding consequences was nuanced and elaborate. See Appendix 2 for a full description.

Appendix 5.4: Regression analyses

Table appendix 5.4: Correlation per option of the evaluations of the consequences on the one hand and the overall evaluation on the other

	Correlations	Multiple correlation
Improvement of energy efficiency		
- some contribution to improvement of air quality	0.34	
- less use of natural resources	0.32	
- more reliability energy supply	0.28	
- positive economic consequences	0.25	0.48
- measures to reduce fuel use for transport	0.22	
- strict efficiency regulations for industry	0.25	
- strict efficiency regulations for energy use houses and buildings	0.22	
- price: lower or higher	0.21	
- much less contribution to greenhouse effect	0.37	
Improvement of energy efficiency and decreased use of material and energy		
- some more contribution to improvement of air quality	0.21	
- possible positive economic consequences	0.27	
- more expensive transport	0.36	
- strict regulations for industrial technology and recycling	0.39	0.60
- more expenses consumers	0.38	
- drastic regulations for energy use houses and buildings	0.44	
- price: at least 20% higher	0.35	
- much less contribution to greenhouse effect	0.22	
Electricity from windturbines at sea		
- Rare visibility of windturbines from coast	0.20	
- less bird deaths caused by windturbines	0.21	
- possible protection of fish population	0.20	
- less accessibility of sea for fishermen	0.18	0.50
- increase in capacity of the grid	0.15	
- more jobs	0.28	
- price: 10% to 40% higher	0.22	
- much less contribution to greenhouse effect	0.35	
Conversion of biomass to car fuel and electricity		
- considerate contribution to improvement air quality	0.36	
- positive effects of certified land use	0.44	
- negative effects of uncertified land use	-0.09	
- influence on food production	0.36	
- high reliability energy supply	0.35	0.60
- expansion of sea ports	0.43	
- need for gradual replacement cars	0.29	
- positive economic consequences	0.38	
- price: equal to 20% lower	0.33	
- much less contribution to the greenhouse effect	0.42	

Large plants where coal or gas are converted into electricity with CCS		
- possible pollution of coal mine surroundings	0.18	
- very small chance of leakage from lines	0.34	
- very small chance of leakage from storage	0.35	
- high reliability energy supply	0.20	0.45
- price: 5% to 20% higher	0.12	
- much less contribution to greenhouse effect	0.21	
Large plants where gas is converted into hydrogen with CCS		
- need for many new pipelines	0.33	
- need for new vehicles	0.37	
- great contribution to improvement air quality	0.21	
- decrease of sound level	0.32	
- possible equal safety plants	0.24	
- equal safety in daily life	0.32	0.62
- very small leakage from lines	0.27	
- very small chance of leakage from storage	0.27	
- reliability energy supply	0.28	
- unknown effect economy	0.30	
- price: equal to 35% higher	0.28	
- much less contribution to the greenhouse effect	0.28	
Electricity from nuclear plants		
- long term consequences low radiation very unlikely	0.46	
- very small chance of health risks from highly radioactive waste	0.46	
- chance of serious accident < 1:200.000 years	0.46	
- terrorist attack reactor close to impossible	0.45	0.66
- risk of proliferation: possibly moderate	0.36	
- high reliability of energy supply	0.39	
- price: equal to at least 20% higher	0.25	
- much less contribution to greenhouse effect	0.26	
CCS in general		
-very small chance of leakage from lines	0.29	
-very small chance of CO2 cloud	0.26	
-very small chance of leakage from storage	0.27	0.47
-small chance of damage to life in basements	0.12	
-chance of less or more small earthquakes	0.26	
-no contribution to greenhouse effect	0.40	

The consequences in this table are merely labels. In fact, information consequence was nuanced and elaborate. See Appendix 2 for a full description.

Appendix 5.5: Objective and subjective opinion change

At the end of the questionnaire, respondents were asked four questions about their change in opinion. They were asked how much their opinion about the different ways to use or produce energy had changed, how much their opinion about global warming and its effects had changed, how much more arguments they had received to choose options that reduce CO_2 emissions, and how much the information in general made them change the way they think about ways to reduce CO_2 emissions. Most respondents answered that their opinion, about the different ways to produce energy and global warming and its effects, had changed slightly. The majority of respondents however also states to have gotten more arguments for their choice for options to reduce CO_2 emissions. The majority furthermore admits to have changed the way they think about different ways to reduce CO_2 emissions. These questions correlate highly with each other, and a scale of these four items proved valid and reliable (Factorscores on one scale range between .76 and .88; Cronbach's alpha = .83). To test if self reported change in opinion accurately describes the actual change in opinion, we computed the correlations between self reported change in opinion and actual change in opinion. The latter was measured by the absolute difference between the evaluation of a option before information and the evaluation of a option after information. It seems respondents are not at all accurate in estimating how much they changed their opinion, as the correlations between self reported opinion change and the objective change in opinion regarding global warming and the seven options were almost non-existent, ranging from -.09 to .12. It is possible though that respondents did acknowledge changing their opinion regarding some of the options, but not regarding other options. The self report questions were in general, and not about specific options. Respondents might have answered the more general questions thinking about their average change in opinion, which correlates less to the actual change in opinion of specific options. This might somewhat explain the low correlations. To test this theory, we computed the correlation between self reported change in opinion and the average of the objective changes in opinion. This correlation was also very close to zero, .09 to be exact. This suggests that respondents are either not very accurate in estimating their change in opinion, or not very willing to admit they changed their opinion.