From complexity to policy: Exploring the motivations behind choices in the Participatory Value Evaluation of the National Environmental Program

A Latent Class Cluster Analysis

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Preface

This master thesis is about the research; From Complexity to Policy: exploring the motivations behind choices in the Participatory Value Evaluation of the National Environmental Program. I think writing my thesis was the most intense, but also most educational, period of my studies. Because I had to wait until the dataset was available before I could begin coding, I worried about whether I would meet the deadline. Nevertheless, the dataset became available just in time, enabling me to complete the research within the given timeframe successfully. I am grateful for the opportunity at the Knowledge Hub for Participation at the Ministry of Infrastructure and Water Management to write my thesis there. It kept me motivated to work on a real-life case, and everyone was very helpful to contribute to my thesis. I would particularly like to thank my supervisor Tom Schuurmans, who was always available for a brainstorming session or to provide critical feedback. I am also thankful for the freedom and trust that he gave me during the process.

I would also like to thank Gerdien de Vries and Niek Mouter from my thesis committee for their guidance. A special thanks to Niek Mouter who was always able to help me and steer me in the right direction. His enthusiasm for Participatory Value Evaluation really inspired me. I would also like to thank Mark Beumer, the project leader of the NMP Participatory Value Evaluation, for his cooperation. He helped me a lot in creating the codebook and coding. Finally, I would like to thank my family, friends, and roommates for their unconditional support throughout my studies, especially during the stressful periods of my thesis.

It gives a double feeling to end my time as a student, but I really enjoyed it and made memories for life. I look forward to the future!

I hope you will enjoy reading my thesis.

S. van der Kaaij
Delft, August 2023

Summary

The Dutch government is facing a series of major societal challenges, ranging from concerns about climate change to the alarming issue of housing shortage. When making policy for such major societal tasks, it is necessary to involve all stakeholders from the beginning to discuss the various perspectives, interests, opportunities, and threats. This involvement is also called *'public participation'*. A common definition for public participation is that *'it encompasses a group of procedures designed to consult, involve and inform the public to allow those affected by a decision to have input into that decision'*. Public participation results in higher quality and easier decisions, more trust in decision-makers, and increased public and organisational knowledge. Several methods and guidelines for public participation are available in the literature. The main difference between these methods is society's required input level. Some public participation methods only require opinions as input, like public opinion surveys, while others elicit judgments and decisions on which policies will be based.

An example of the latter is a so-called *'Participatory Value Evaluation' (PVE)*. A PVE is an online evaluation method, in which citizens can advise the government on a specific decision-making problem. The online approach leads to a low barrier to participation and high cost-effectiveness. Due to the low barrier to participation, not only enthusiastic proponents and opponents participate, but also the so-called *'silent majority'*. In this way, the PVE can potentially lead to a better representation of the population's perspectives. All PVEs consist of so-called *'choice tasks'* where the participant can choose possible policy options/measures, the impact of which is also shown, taking into account the constraints to be met by the government. After making their selections, participants can motivate their chosen measures. These written arguments reflect the ideas, concerns, and values of the PVE participants. Examples of cases in which the PVE has been used as a public participation method include the development of a long-term COVID-19 strategy, Dutch climate policy, and choices about additional wind turbines in a municipality.

To get a clear overview of population perspectives emerging from the PVE, a Latent Class Cluster Analysis (LCCA) can be used. A LCCA is a clustering technique in which individuals can be clustered based on the similarity in choices they have made. Individuals are probabilistic assigned to a cluster based on a latent categorical variable that explains the individuals' responses on a set of observed indicators. The main idea of the LCCA is that a discrete latent variable can explain the observed associations between a set of indicators so that, conditional on the latent class variable, these associations become unimportant. In practice, when the government has a clear overview of the different subgroups, the government knows for example from which groups they can expect resistance when certain measures will be introduced. For policy-makers, it is interesting to examine why certain subgroups view measures in a certain way. These motivations for choices can be found in the qualitative data of the PVE.

To get an overview of the population perspectives, it is common to estimate an LCCA model with the quantitative data from the PVE. However, this has never been done with the qualitative PVE data, while these reflect the ideas, concerns, and values of the participants. Including qualitative data in the LCCA has the potential to validate the clusters generated by the LCCA and provide new insights. In this way, the complexity of citizens' opinions is preserved. Ultimately, this can give policy-makers more direction for policy-making. However, including more data can also lead to information overload for policy-makers. Therefore, in order to investigate this knowledge gap, the following research question has been formulated:

What is the added value for policy-making of including the qualitative arguments from a Participatory Value Evaluation alongside the quantitative data in the Latent Class Cluster Analysis?

The case-study approach has been used to analyse the added value of the qualitative analysis method. The case is the Participatory Value Evaluation for the National Environmental Program ('Nationaal Milieu Programma') (NMP). The Dutch Ministry of Infrastructure and Water Management (IenW) is developing the NMP. The NMP describes the route to a healthy, clean, and safe living environment by 2050 for the Netherlands, which means that health damage from environmental pollution is negligible.

The NMP focuses on three main tasks; vital ecosystems, a healthy living environment, and a sustainable, circular economy. For this research, the first choice task of the PVE has been analysed. This is a strategic choice task, which has the goal of analysing what values citizens drive when they would be able to make environmental policy. Within the choice task, participants can divide fifty points over nine statements. After that, they can argue why they divided the points this way.

To develop a method for including qualitative arguments in the LCCA, a literature review on Qualitative Content Analysis (QCA) was conducted in chapter 3. In a QCA, information can be quantified objectively and systemically. The method develops a codebook, which contains all possible categories (codes) that can be assigned to each piece of text. Researchers can organise, analyse, and quantify qualitative data by applying codes to various text segments. Based on the results from the literature review, it was chosen to execute inductive QCA. Inductive means that the different categories are derived from the data obtained. Additionally, to ensure the quality of the QCA method, the paradigm of trustworthiness was adopted, which includes four criteria: *credibility, transferability, trustworthiness, and confirmability*. To begin with, a codebook was developed, containing both statement-specific and general categories. The statement-specific categories could only be used to code arguments of the corresponding statement, while the general categories could be used to code arguments from every statement. Once the codebook was verified, it was used to code respondents' qualitative arguments for allocating points among the statements (n=1472).

After this, the LCCA models were estimated in chapter 6. Firstly, the quantitative *'base-case'* model was estimated. In this model, the nine statements were included as indicators and nine socio-demographics as covariates. From these socio-demographics, education and polluted environment were statistically significant. Four clusters were identified within the population regarding environmental policies. 1) Predominantly neutral (60.9 per cent), 2) Unconditionally environmentally friendly (19.0 per cent), 3) Costs over environmental protection (12.8 per cent), and 4) Protectors of low-income people (7.3 per cent).

Finally, in the second part of chapter 6, three qualitative LCCA models were estimated. The coded qualitative arguments were added as covariates to the quantitative base-case model. The first model contained all sub-categories from the codebook. In contrast, the second model only contained the overaching main categories for these sub-categories. For the third model, the categories were chosen by the researcher. It can be concluded for all three models that the distribution of arguments across clusters often corresponded to the distribution of points over the clusters. Next to this, the predictive power of the qualitative LCCA models is approximately five times higher than the quantitative LCCA model. Furthermore, the coded arguments influence the explanatory power of socio-demographic characteristics to a greater or lesser extent. The same socio-demographic factors remain statistically significant, but one previously insignificant socio-demographic has become statistically significant. This characteristic could predict class membership, despite not being initially recognised for its impact.

The LCCA results were presented to policy-makers from the NMP in a focus group, to examine if the qualitative LCCA models add value to policy-making. The results of this focus group are presented in chapter 7. According to policy-makers, there was added value in including qualitative arguments in the LCCA. Not in the way of adjusting policies but to adjust governmental communication strategies accordingly. Next to this, including more qualitative data does not lead to an information overload for policy-makers; an LCCA model with 36 variables is a manageable number of variables. Very important to mention is that no conclusion can yet be drawn on the added value for policy-making in general, as the method has only been tested with one case, and the added value is highly context-dependent. Different conclusions might therefore emerge from other cases.

Continuing on the context-dependency of the added value of a qualitative LCCA analysis, the policy-makers identified seven factors that can be used to assess whether costs outweigh benefits. A distinction can be made between Context-dependent General factors, which can be determined based on the PVE topic, and Context-dependent Quantitative LCCA factors, which can be determined based on the results from the quantitative LCCA.

Context-dependent general factors

1. **Political sensitivity PVE topic**: Whether the PVE topic is politically sensitive.
2. **Controversial PVE topic**: Whether there are significant differences in opinions on the PVE topic within society.
3. **Stage of the policy process**: Whether something can still be done with the PVE input or not.

Context-dependent Quantitative LCCA factors

4. **Expected resistance from the particular cluster against policy**: Whether the point distribution within a given cluster indicates strong opposition to the policy in question.
5. **Needing people from a particular cluster**: Whether you need support for your policy from a specific cluster.
6. **Relative size of clusters with the most outspoken people**: Size of outspoken cluster(s) relative to the more neutral cluster(s).
7. **Clarity of clusters**: Whether a clear distinction between the clusters can be observed based on the quantitative data in the LCCA clusters.

In conclusion, this research showed that including qualitative data along quantitative data in an LCCA can make it possible to tailor governmental communication strategies to the identified clusters. In this way, there is a richer overview of all societal perspectives that can be effectively responded to. Second, because the complexity of citizens' opinions is preserved and communicated to policy-makers, this can lead to better policies that are more responsive to citizens' needs and concerns. Finally, citizens may feel more recognised and heard when qualitative data are analysed comprehensively.

Next to this societal impact, this research also has an academic impact. It has never been tried to include the qualitative data of a PVE in an LCCA. This research has answered the curiosity of PVE researchers to analyse qualitative arguments more thoroughly. From a broader perspective, there is a lack of literature on a method to include qualitative data in an LCCA and an assessment of its added value. This study revealed that a qualitative LCCA model can serve as an additional validation step of the quantitative LCCA model. Furthermore, this research identified seven factors that can be used to assess whether it is worth performing such an analysis. These factors can serve as a starting point for further research in this domain.

The following recommendations are proposed to further optimize this new method. First, it is recommended to explore ways to standardise the QCA method. Next to this, it is recommended to investigate the possibilities of automated QCA methods to save time. Furthermore, it is recommended to investigate which method is most suitable to include the general categories in the qualitative model. Moreover, it should be further investigated from which threshold the number of variables in an LCCA model leads to an information overload. Additionally, efforts should be made to enhance the model fit of qualitative LCCA models. Furthermore, it is necessary to conduct more case-studies and differentiate the cases based on the seven factors that could potentially assess the added value of the method. Finally, it is recommended to explore further how governmental communication strategies can be tailored based on qualitative data to reach different subgroups effectively.

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Abbreviations

AIC	Akaike Information Criterion
BIC	Bayesian Information Criterion
BVR	Bivariate Residual Values
CAQDAS	Computer-aided/assisted qualitative data analysis software
DCE	Discrete Choice Experiment
IenW	Ministry of Infrastructure and Water Management
KKP	'Kennisknooppunt Participatie'
LCCA	Latent Class Cluster Analysis
NMK	'Nationaal Milieubeleidskader'
NMP	'Nationaal Milieu Programma'
NOVI	'Nationale Omgevingsvisie'
PVE	Participatory Value Evaluation
QCA	Qualitative Content Analysis

Translations

Nationaal Milieubeleidskader	National Environmental Policy Framework
Nationaal Milieu Programma	National Environmental Program
Nationale Omgevingsvisie	National Environmental Strategy
Kennisknooppunt Participatie	Knowledge Hub for Participation

1 Introduction

The Dutch government is facing a series of major societal challenges, ranging from concerns about climate change to the alarming issue of housing shortage. When making policy for such major societal tasks, it is necessary to involve all stakeholders from the beginning to discuss the various perspectives, interests, opportunities, and threats (Heijnen, 2022). This involvement is also called *'public participation'*. A common definition for public participation is *'it encompasses a group of procedures designed to consult, involve and inform the public to allow those affected by a decision to have input into that decision'* (Rowe & Frewer, 2000, p. 6). Public participation results in higher quality and easier decisions, more trust in decision-makers, and an increase in public and organisational knowledge (Beierle, 1999; Rowe et al., 2008). Several methods and guidelines for public participation are available in the literature. The main difference between these methods is society's required input level. Some public participation methods only require opinions as input, like public opinion surveys, while others elicit judgments and decisions on which policies will actually be based (Rowe & Frewer, 2000).

1.1. Participatory Value Evaluation

An example of the latter is a so-called *'Participatory Value Evaluation (PVE)'*. A PVE is an online evaluation method where citizens can advise the government on a specific decision-making problem. A PVE can be used as a method for public participation. The online approach leads to a low barrier to participation and high cost-effectiveness (Mouter, Shortall, et al., 2021). Due to the low barrier to participation, not only enthusiastic proponents and opponents participate, but also the so-called *'silent majority'*. In this way, the PVE can potentially lead to a better representation of the population's perspectives (Mouter, Koster, & Dekker, 2021).

Examples of cases in which the PVE has been used as a public participation method include the development of a long-term COVID-19 strategy (Mouter et al., 2022), Dutch climate policy (Mouter, Beek, et al., 2021) and choices about additional wind turbines in a municipality (de Vries et al., 2022). All PVE consist of so-called *'choice tasks'* where the participant can choose possible policy options/measures, the impact of which is shown, taking into account the constraints to be met by the government. These may include, for example, the government's budget and implementation capacity. In the case of the PVE on Dutch climate policy, individuals could choose from a range of measures proposed by the government to reduce greenhouse gas emissions. Each measure was associated with a specific reduction effect. There were two constraints: 1) the combined impact of the chosen measures should result in a minimum reduction of 27 megatons of CO2 emissions, and 2) expenditure could not exceed 25 billion euros. After making their selections, participants were requested to motivate their chosen measures (Mouter, Beek, et al., 2021).

1.2. Latent Class Cluster Analysis

To get a clear overview of population perspectives emerging from the PVE, a Latent Class Cluster Analysis (LCCA) can be used. Through the LCCA, individuals can be clustered based on the similarity in choices they have made (Molin et al., 2015). It is a clustering technique in which individuals are probabilistic assigned to a cluster based on a latent categorical variable that explains their responses on a set of observed indicators (Molin et al., 2015). The main idea of the LCCA is that a discrete latent variable can explain the observed associations between a set of indicators so that, conditional on the latent class variable, these associations become unimportant. In practice, when the government has a clear overview of the different subgroups, it knows from which groups they can expect resistance when specific measures will be introduced (Mouter et al., 2022). For policy-makers, it is interesting to explore why people view measures in a certain way. These motivations for choices can be found in the qualitative data of the PVE. These written arguments reflect the ideas, concerns, and values of the PVE participants. Participants in the PVE stress the advantage of being able to provide written motivations; this allows for justifying a particular choice made. It also enables the differentiation between various subcategories of a specific choice option in cases where such differentiation is not initially specified within the choice option (Mouter, Hernandez, & Itten, 2021).

According to Gilar-Corbi et al. (2020), Jiang et al. (2020) and Magee et al. (2018), including the qualitative data in the LCCA can make it possible to investigate the underlying behavioural reasons of respondents better and understand the difference in preferences. However, including more data can also lead to information overload for policy-makers. This phenomenon is called the *'dilution effect'*. An abundance of information can make it more difficult to decide what information is relevant and valuable to make good decisions (Ramaswamy, 2006). Additionally, de Vries et al. (2014) found that adding more information can decrease the perceived quality of the provided information, potentially weakening the impact of the main message.

1.3. Knowledge gap

As mentioned in the previous section, incorporating the qualitative data from a PVE into an LCCA can be valuable to policy-makers as they have a better understanding of the underlying motivations of various societal subgroups. By grouping individuals based on the similarity of their arguments and values, tailored policies can be formulated to address the specific needs of different subgroups within society. However, the qualitative data obtained by the PVE has never been added to the LCCA model. Mouter, Koster, & Dekker (2021) only included quantitative data in the LCCA. The qualitative data was analysed separately from the quantitative data through Qualitative Content Analysis. In this process, the coders first defined the types of arguments by analysing a sample. Subsequently, a larger dataset of arguments was coded to see which arguments were mentioned a lot by respondents (Geijsen et al., 2022). Next to this, Volberda (2020) carried out an LCCA analysis with PVE data. Qualitative data was not included in the LCCA, but interviews with experts were conducted to discuss the cluster analysis findings.

From a broader perspective, whether qualitative data obtained through data collection methods other than the PVE had been previously included in an LCCA model was investigated. Consideration was also given to whether any opinions were expressed regarding the added value of the method.

Firstly, Mitchell & Schmitz (2021) described a Computer-Aided Qualitative Data Analysis method to code qualitative data. The Computer-Aided Qualitative Data Analysis can develop a codebook containing all possible categories (themes) that can be assigned to each piece of text. A *'code'* is a label representing a specific category or theme from the codebook. Researchers can organise, analyse, and quantify qualitative data by applying codes to various text segments. After this, the coded data can be analysed with an LCCA. They also provided a clear overview of the process of including coded qualitative data in an LCCA. Niederkrotenthaler et al. (2010) and Rohm et al. (2013) used a coding scheme to use the qualitative data in the LCCA. Both coding schemes were developed based on the qualitative data obtained during the research. The qualitative data entailed media reports and written social media diaries, respectively. Niederkrotenthaler et al. (2010) used the qualitative data as covariates and indicators in the LCCA model, while Rohm et al. (2013) used the qualitative data only as indicators. Neither of the two articles discussed something about the added value of including qualitative data in an LCCA. McCool-Myers et

al. (2022) and Winter et al. (2019) also coded the qualitative data, which was gained from the open-ended questions, but did not include the coded data as input variables in the LCCA. Both articles extracted inductive themes from the responses and compared this with the LCCA profiles. Inductive means that the different categories are determined by reading through the responses (Elo & Kyngäs, 2008). According to both articles, the qualitative analysis validated the cluster characteristics and provided more context for choices. Next to this quantitative way to include qualitative arguments, Magee et al. (2018) organised a focus group to understand the identified clusters by the LCCA better. The focus group validated the clusters that emerged from the LCCA and led to new insights and nuances that had not emerged from the LCCA. Important to mention is that the data from all the mentioned literature was not extracted from a quantitative data collection method, such as a Discrete Choice Experiment (DCE).

Concluding the above qualitative data obtained by the PVE has never been added to the LCCA model. Therefore, it can be concluded that there is a lack of literature on a method to include the qualitative arguments of a PVE in an LCCA. However, other articles that didn't include the qualitative data in the LCCA, but compared the qualitative data with the LCCA clusters, concluded that the qualitative analysis validated the clusters and gave more insights into the clusters. This gives reason to investigate the knowledge gap of including qualitative PVE data in an LCCA. Therefore, to investigate this knowledge gap, the following main research question has been formulated:

What is the added value for policy-making of including the qualitative arguments from a Participatory Value Evaluation alongside the quantitative data in the Latent Class Cluster Analysis?

1.4. Research approach

The case-study approach has been used to analyse the added value of the qualitative analysis method. The case is the Participatory Value Evaluation for the National Environmental Program ('Nationaal Milieu Programma') (NMP). The Dutch Ministry of Infrastructure and Water Management (IenW) is developing the NMP. The NMP describes the route to a healthy, clean, and safe living environment by 2050 for the Netherlands, which means that health damage from environmental pollution is negligible. The NMP focuses on three main tasks; vital ecosystems, a healthy living environment, and a sustainable, circular economy (Heijnen, 2022). According to Heijnen (2022), State Secretary of the Ministry of IenW, involving all stakeholders early in the process is essential when working on such a major societal task. It was therefore chosen to deploy a PVE.

In a broader perspective, the NMP is a response to environmental pollution, one of the three planetary crises, and to the European Green Deal (Arcadis, 2022). The European Green Deal is a road map to a climate-neutral economy by reducing carbon emissions by at least 50 per cent by 2030 and achieving carbon neutrality by 2050 (Sikora, 2021).

1.5. Research questions

To answer the main research question, four sub-questions have been identified. The article by Mitchell & Schmitz (2021) provides a clear overview of the process of including coded qualitative data in an LCCA. Therefore, in this research, the same procedural steps will be used. First, a codebook must be developed, and the data must be coded (sub-question 1), after which it must be validated (sub-question 2). Then the LCCA can be performed, and the results can be interpreted (sub-questions 3 and 4).

Qualitative Analysis method

1. How can the qualitative arguments of a Participatory Value Evaluation be processed for inclusion in a Latent Class Cluster Analysis?

As mentioned in the previous parts, the lack of literature on a method to include the qualitative arguments of PVE in the LCCA shows a knowledge gap. Therefore, this sub-question will investigate which methods exist to process the qualitative arguments to include them in the LCCA.

2. How can the quality of the method to include the qualitative arguments of a Participatory Value Evaluation in a Latent Class Cluster Analysis be assessed?

The method to include the qualitative arguments in an LCCA is developed must be legitimate. Therefore, the quality of the method must be assessed.

To answer the first two sub-questions, *a literature review* will be conducted on methods for including qualitative arguments in the LCCA. As mentioned in section 1.3, a few articles included qualitative arguments using Qualitative Content Coding. Therefore, the literature review will focus on the methodology of Qualitative Content Coding and its quality.

Results
3. What insights does the quantitative Latent Class Cluster Model provide regarding the various clusters within the population?
This sub-question investigates the clusters that emerge from the standard quantitative LCCA model. Important to mention is that the specific outcomes of the quantitative LCCA from the case-study are not relevant to answering the main research question but are necessary to compare the results of the qualitative LCCA model with.

4. What does the LCCA model with qualitative input alongside quantitative input imply for and add to policy-making?
To answer the main research question, it is necessary to examine how the results of an LCCA model with qualitative input and quantitative input differ from those of an LCCA model with only quantitative input.

The first step for answering research questions three and four is to estimate the *LCCA model* with quantitative data. After that, the coded qualitative data will be added to the LCCA. The added value of adding the qualitative arguments will be investigated by means of a *focus group* with policy-makers from the Ministry of IenW. Ultimately, the main research question will be answered by attempting to generalise the potential added value of the qualitative method for the NMP case to the added value for PVEs in general.

1.6. Relevance research

1.6.1. Societal relevance

In the previous section, the knowledge gap on including qualitative arguments of a PVE in the LCCA emerged. Addressing this gap is essential from a societal viewpoint, primarily in terms of political considerations and, secondly, from the citizens' point of view.

For policy-makers, including qualitative arguments of a PVE in the LCCA can be of added value for providing more direction to decisions and policies. Firstly, individuals can be grouped based on the similarity of their arguments and values, which could provide more insights for policy-making. Secondly, it could be that the explanatory power of socio-demographic characteristics in the LCCA disappears if you add qualitative data. This could mean that conclusions are now being drawn in PVEs that are not valid. The combination of these two added values leads to three possible scenarios:

1. Qualitative data gives more insights for policy-making, the explanatory power of socio-demographics disappears: conclusions currently drawn in PVEs are (partially) invalid; the qualitative analysis leads to a more valid model. Additionally, the qualitative data offers valuable insights for policy-making.

2. Qualitative data gives more insights for policy-making, and the explanatory power of socio-demographics doesn't disappear: conclusions currently drawn in PVEs are probably valid, and the qualitative analysis is an extension for gaining more in-depth insights.

3. Qualitative data gives no extra insights for policy-making: qualitative analysis has no added value.

It is important to mention for the three scenarios that it remains a case-study with one case. Therefore, further research involving multiple cases should be conducted to generalise the results to other contexts.

The substantive rationale of public participation by Fiorino (1990) can be used to classify this political viewpoint. According to the substantive rationale, public participation can improve the quality of decisions by gaining new knowledge from non-experts. This research gains new knowledge by preserving the complexity of citizens' opinions. This, in turn, has positive implications for citizens because it can lead to better policies that are more tailored to their needs and concerns. Additionally, citizens can feel more acknowledged and heard when the qualitative data will be analysed more extensively. According to Levesque et al. (2017), trust among participants grows when opinions in a participation process are taken seriously. If qualitative data is ignored or not comprehensively analysed, citizens may feel that nothing is being done with their input, which can lead to distrust (Smith, 2001).

1.6.2. Academic relevance

Besides the societal perspective, there is also an academic perspective. As described in section 1.3, it has never been tried to include the qualitative data of a PVE in an LCCA. From a broader perspective, there is a lack of literature on a method to include qualitative data in an LCCA and a concrete assessment of its added value. This research will answer the curiosity of PVE researchers to analyse qualitative arguments more thoroughly. This involves not only PVE researchers but also choice modelers and other researchers engaged in large-scale participation with a quantitative component. This research will address the academic knowledge gap about including qualitative PVE arguments in the LCCA alongside the quantitative data. As mentioned before, it is not yet clear whether more information leads to better decisions or whether it leads to an information overload for policy-makers. To investigate this, the LCCA model with only quantitative data as input will be compared to the LCCA model with both quantitative and qualitative data as input.

1.6.3. Relevance to CoSEM

This research is part of the Complex Systems Engineering and Management (CoSEM) program. The CoSEM program is about designing interventions in socio-technical systems. In this case, using a PVE in policy-making for the NMP represents the socio-technical system. The PVE method has already been covered many times in courses from the transport track. The contribution of this research is to improve the functioning of the socio-technical system by making use of more PVE information in policy-making. Next to this, in the case of complex systems, PVE information is becoming increasingly complex these days. The complexity arises from the variety of opinions and the amount of information collected. This complexity makes it more challenging to process and accurately present this information to policy-makers. As mentioned before, the PVE tries to transfer participants' complexity in terms of ideas, concerns, and values to policy-makers. It is important to ensure this complexity is preserved and communicated to policy-makers.

1.7. Report structure

The next chapter will elaborate on the relevant aspects of a Participatory Value Evaluation by means of a literature review. After that, a literature review on Qualitative Content Analysis will be conducted in chapter 3. After that, the research methodology will be described in chapter 4. Chapter 5 will discuss the results of the Qualitative Content Analysis, and chapter 6 will discuss the results of the Latent Class Cluster Analysis. Based on these results, chapter 7 will describe the policy implications of the developed method. Chapter 8 will answer the main question by attempting to generalise the potential added value of the qualitative method for the National Environmental Program case to the added value for Participatory Value Evaluations in general. In the last chapter, the recommendations and limitations will be discussed.

2

Background information: Participatory Value Evaluation

As mentioned in the introduction, the Participatory Value Evaluation (PVE) is used as a method for public participation in policy-making for the NMP. However, initially, the method was designed to economically evaluate possible public projects. The aim was to provide policy-makers with insights on the most optimal choice of public project(s) by asking for input from a representative sample of citizens. The projects were ranked based on societal value (Dekker et al., 2019; Mouter et al., 2019). An example is a PVE to analyse the impact of Dutch flood risk mitigating projects. Later on, the PVE was used as a method for public participation. These two aims are significantly different because involving citizens in policy-making is an end in itself and not a means to calculate the social value of public policies (Dekker et al., 2019).

2.1. Public participation

A common definition for public participation is *'it encompasses a group of procedures designed to consult, involve and inform the public to allow those affected by a decision to have input into that decision'* (Rowe & Frewer, 2000, p. 6). Public participation results in higher quality and easier decisions, more trust in decision-makers, and an increase in public and organisational knowledge (Beierle, 1999; Rowe et al., 2008). Several methods and guidelines for public participation are mentioned in the literature. The main difference between these methods is society's required input level. Some public participation methods only require opinions as input, like public opinion surveys, while others elicit judgments and decisions on which policies will be based (Rowe & Frewer, 2000). An example of the latter is the PVE.

One of the most well-known classifications of participation forms is the participation ladder introduced by Arnstein (2019). This ladder outlines eight distinct levels of citizen participation, as depicted in Figure 1.

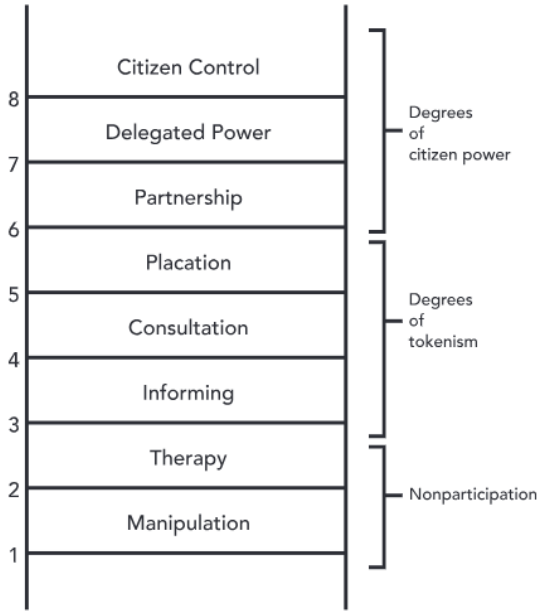

Figure 1: Ladder of citizen participation by Arnstein
Source: (Arnstein, 2019)

Methods for participation can be classified based on the extent to which citizens have the power to make decisions. In the first two levels, there is no participation; these are manipulation and therapy. In the three levels after that, there is more but limited space for participation, called *'tokenism'*. The corresponding levels are informing, consultation, and placation. Citizens have the right to express their opinions, but there is no assurance that the expressed opinions will be respected. The last three levels give actual power to the citizens: partnership, delegated power, and citizen control. The PVE can be placed in the *'tokenism'* level; citizens advise the governance on a decision-making issue but have no direct power to change the status quo.

Next to the role of the citizens, there is also a role for the government. According to Visser et al. (2019), the government can adopt four distinct roles, each defining the level of influence citizens have in the participatory process. These roles, namely *'knowing along, thinking along, co-determining, and self-organizing'*, are distinguished to categorize different forms of participation (see Table 1). The PVE falls under the *'thinking along'* level.

Table 1: Roles of the government public participation
Source: (Visser et al., 2019)

	Role of the government	**Role participant**
Know along	Communicate issue, decision or service	Be informed
Think along	Organise process to think together about or work on an issue, decision or service	Participate in process to think together about or work on an issue, decision or service
Co-determine	Working on an issue from shared ownership	Working on an issue from shared ownership
Self-organise	Facilitate, encourage and provoke	Initiate to address issue, decision or service

In this context, the government takes the initiative to set up the PVE and create a platform for collective thinking and deliberation on the subject of the PVE. Participants can think along by completing the PVE.

2.2. Participatory Value Evaluation

2.2.1. Design

A PVE is a mixed-method approach. In mixed-method research, qualitative and quantitative methods are combined in one study (Henry et al., 2015). The quantitative parts are the so-called *'choice tasks'*. These choice tasks typically consist of three elements: (1) The possible policy options/measures of the government, (2) the impact of these policy options, and (3) choice constraints; these are similar to the constraint to which the government must adhere. This can, for example, be governmental budget and implementation capacity. Then the participant has to choose which policy option(s) they prefer, taking into account the constraints. The qualitative part consists of the written arguments underpinning the choices made in the choice task. In this way, the design enables citizens to give a recommendation about the choices the policy-makers should make (Mouter, Shortall, et al., 2021). In the case of the PVE on Dutch climate policy, individuals were allowed to select from a range of measures proposed by the government to reduce greenhouse gas emissions. Each measure was associated with a specific reduction effect. There were two constraints: 1) the combined impact of the chosen measures should result in a minimum reduction of 27 megatons of CO2 emissions, and 2) expenditure could not exceed 25 billion euros. After making their selections, participants were requested to provide a rationale for their chosen measures (Mouter, Beek, et al., 2021).

2.2.2. Strengths and weaknesses

As mentioned at the beginning of this paragraph, the PVE is evolved from a purely economic evaluation method to a public participation method. Research has shown that a PVE is an effective method for public participation for several reasons. Firstly, due to the online approach, there is a low barrier to participation, which can potentially lead to a better representation of the population's perspectives. Not only enthusiastic proponents and opponents participate, but also the so-called *'silent majority'* (Mouter, Shortall, et al., 2021). For example, in citizen panels, another method for public participation, the majority of attendees consist of people with the most stake in the decision (Itten & Mouter, 2022). Another example is that in common participation methods, there is an overrepresentation of people concerned about the environment (Mouter, Shortall, et al., 2021). Secondly, the online approach leads to high efficiency and cost-effectiveness because there is flexibility in time, place, legal limits, and physical presence (Royo & Yetano, 2015). Thirdly, due to the design and content of a PVE, it is assumed that the participants' perspectives are a better reflection of the perspectives of the entire population in comparison to other participation methods. Sometimes, citizens' perceptions do not match policy designs, which leads to insufficient policy attention for important topics (Mouter, Shortall, et al., 2021). Despite these strengths, one weakness of the PVE method is mentioned a few times by participants, namely the level of complexity. Some participants criticize the PVE because it is too complex, while others find it too simplified (Farshchi & Rizk, 2020; Mouter, Hernandez, & Itten, 2021; Mouter, Koster, & Dekker, 2021). As already mentioned in the introduction, participants in the PVE stress the advantage of being able to provide written motivations. This allows for a differentiation between various subcategories that may not be apparent in the choice task (Mouter, Hernandez, & Itten, 2021). Consequently, through a more comprehensive analysis of the qualitative data, it is hypothesized that individuals who typically struggle to convey the desired complexity level in the choice task can overcome this limitation by providing written arguments. However, it is important to note that this approach will not address the concerns of those who find the PVE too complex. To address their concerns, it is necessary to modify the actual content of the PVE.

3

Qualitative Content Analysis

In order to analyse the written arguments that reflect the ideas, concerns, and values of the PVE participant, thematic analysis can be used. Thematic analysis is often described as Qualitative Content Analysis (QCA). In Europe, QCA is one of the most used methods for analysing qualitative data (Kuckartz, 2019; Mayring, 2014). QCA is assumed to be a valid and reproducible method to divide a large amount of qualitative data into a manageable number of categories (Elo & Kyngäs, 2008; Hsieh & Shannon, 2005; Kuckartz, 2019). Qualitative data are written, oral or visual information, which can be from various sources, such as interviews, documents, or newspapers. By using QCA, this information can be quantified objectively and systemically (Elo & Kyngäs, 2008). The method has the goal to divide the information into categories (codes) and develop a coding system (codebook) (Kuckartz, 2019). In this way, conclusions can be drawn from the data, and new knowledge and/or insights can be gained. This paragraph will further elaborate on the development of categories, the coding process, testing the quality of the process, and the strengths and weaknesses.

3.1. Category development method

As mentioned at the beginning of this paragraph, QCA aims to divide the qualitative data into categories. Kuckartz (2019) defines a category as: *'Categories are basic concepts of cognition; they are, generally speaking, a commonality between certain things: a term, a heading, a label that designates something similar under certain aspects'*(Kuckarts, 2019, p. 184). The method for developing the categories can be either inductive or deductive. Which method is chosen depends on the purpose of the study. Inductive means that the categories are derived from the data obtained, while deductive means that the categories are derived from existing knowledge or theory. The inductive approach is chosen when there is not enough knowledge about a topic or when knowledge is fragmented. The deductive approach is chosen when the categories can be based on former knowledge, and the purpose of the study is to test a theory (Elo & Kyngäs, 2008; Hsieh & Shannon, 2005; Mayring, 2014; Zhang & Wildemuth, 2009). Both approaches have three phases; preparation, organisation, and reporting (Elo & Kyngäs, 2008). Nevertheless, there is no standardised way to analyse the qualitative data (Assarroudi et al., 2018; Elo & Kyngäs, 2008). The following paragraphs will elaborate on the methods to code inductively and deductively. Appendix B shows an overview of the used literature.

3.1.1. Inductive categories

1. Preparation

The preparation phase begins with choosing the unit of analysis. This is about choosing the part of the textual data that must be classified. This can be a word or a theme (Elo & Kyngäs, 2008; Zhang & Wildemuth, 2009). Within QCA, a theme is most often chosen as the unit of analysis. When themes are chosen as the unit of analysis, the main focus lies in identifying and categorizing expressions related to specific ideas or concepts (Zhang & Wildemuth, 2009). For instance, when investigating what people find important in environmental policy, themes that may emerge from the text could be *'waste management'* or *'biodiversity conservation'*. According to Mayring (2014), the selection criterion must be defined next to the analysis unit. This consists of the category definition and the level of abstraction. Firstly, the category definition describes the qualitative data being sought. For instance, in the context of environmental policy,

the category definition could encompass *'aspects or subjects that people find important for environmental policy'*. Secondly, the level of abstraction describes how broad the categories will be. A high level of abstraction provides broader categories that encompass several related subthemes. The themes mentioned for environmental policy have a high level of abstraction, where *'biodiversity conservation'* is treated as a subcategory. On the other hand, a low level of abstraction entails examining more specific subcategories within a broader theme. For *'biodiversity conservation'*, this could include subcategories like *'habitat conservation'* and *'reducing animal hunting'*. Elo & Kyngäs (2008) adds the sampling step, meaning only a sample of the dataset is coded. The whole dataset is coded in the articles by Mayring (2014) and Zhang & Wildemuth (2009).

2. Organisation
Elo & Kyngäs (2008) and Hsieh & Shannon (2005) describe the same inductive approach in their research, which is also called *'Conventional Content Analysis'*. According to this approach, the organisation phase consists of open coding and defining categories. Open coding includes first reading through all the text and freely generating categories. After this, these categories are grouped under higher-order categories. Following up on the example, *'habitat conservation'* and *'reducing animal hunting'* can be subcategories that are grouped under one higher-order category. Lastly, in the abstraction phase, each main category gets a name using topic-specific language. This can be, for example, *'biodiversity conservation'*. According to Hsieh & Shannon (2005), the inductive approach has the advantage that it can capture the complexity of the textual data by directly inferring categories from the data. Hsieh & Shannon (2005) recommends 10 to 15 categories to cover the whole dataset. The number of themes must represent the complexity and depth of the data.

Next to the description of the inductive coding process by Elo & Kyngäs (2008) and Hsieh & Shannon (2005), Mayring (2014) and Zhang & Wildemuth (2009) describe a slightly different inductive coding process. Zhang & Wildemuth (2009) add the step that tests the code book on a text sample before coding the whole text. Both articles stress the importance of the Constant Comparative Method during open coding and categorization. In this method, categories are also freely generated, but it is possible to reuse the same categories during the open coding process. For every piece of text, it has to be checked whether there is already a suitable existing theory or whether a new category has to be developed. There must be a constant comparison, ensuring that the entire category remains adequately represented when assigning text to an existing category. The Constant Comparative Method ensures that inductive coding not only stimulates original insights but can also make differences between categories clear. The process stops if no new categories occur. According to Mayring (2014), this point is usually reached when 10 to 50 per cent of the text has been analysed. After that, all defined categories must be checked and revised if needed. Mayring (2014) recommends 10 to 30 categories to cover the whole content. It is important to develop a codebook, which includes main category names with corresponding codes (*'biodiversity conservation' (AA)*), a description of the category (*'arguments showing that preserving biodiversity is most important'*), illustrative examples (*'make sure habitats are preserved'*) and subcategories with corresponding codes (*'habitat conservation" (AA1)* and *'reducing animal hunting' (AA2)*) (Zhang & Wildemuth, 2009). Lastly, both articles add the step of checking and revising the defined categories and checking the consistency between the coders, which means checking the inter-coder reliability.

3. Reporting
The last step, the reporting phase, is the same for the four described articles. In this phase, final conclusions are drawn. For instance, when examining environmental policy, frequencies of different categories can be calculated, allowing final conclusions to be formulated based on the data analysis. This means, for example, that the frequencies of the main categories *'biodiversity conservation'* and *'waste management'* will be determined. Furthermore, a general description of every category is formulated in the reporting phase (Elo & Kyngäs, 2008; Hsieh & Shannon, 2005; Mayring, 2014; Zhang & Wildemuth, 2009).

3.1.2. Deductive categories

1. Preparation
The preparation phase is in the articles by Elo & Kyngäs (2008), Hsieh & Shannon (2005), Mayring (2014), and Zhang & Wildemuth (2009) almost described in the same way as the inductive approach. However, the definition of the selection criterion, unlike the inductive approach, is not part of the deductive approach by Mayring (2014).

2. Organisation
The organisation phase starts with deriving the categories from theory (Elo & Kyngäs, 2008; Hsieh & Shannon, 2005; Mayring, 2014; Zhang & Wildemuth, 2009). It could be, for example, that the categories *'biodiversity conservation'* and *'waste management'* emerge from theories that describe key aspects of environmental policy. The deductive approaches by Hsieh & Shannon (2005) and Elo & Kyngäs (2008) differ from each other and the inductive method described in the previous paragraph. Hsieh & Shannon (2005) describes two ways for carrying out the deductive approach. The difference between these two approaches is that the first approach highlights the text before coding the text with the already defined categories, while the second approach immediately starts with coding all the text. Elo & Kyngäs (2008) distinguish between a structured and unconstrained method. Within the unconstrained method, there is the freedom to change the predefined categories and add new categories while coding the text, but this is not allowed for the structured method. The articles by Mayring (2014) and Zhang & Wildemuth (2009) describe the same steps as for inductive coding; the only difference is that the subcategories and categories are defined in advance instead of during the coding process.

3. Reporting
The reporting phase is in the articles by Elo & Kyngäs (2008), Hsieh & Shannon (2005), Mayring (2014), and Zhang & Wildemuth (2009) almost described in the same way as the inductive approach. However, the substantive output of the phase is different; the confirmatory and non-confirmatory evidence for a theory on which the predefined categories are based is described (Hsieh & Shannon, 2005). In the context of environmental policy, this entails examining whether the data supports the emergence of the theoretical categories and the extent to which they occur.

3.1.3. Coding

Some choices have to be made for the actual coding of the data. Firstly, it can be done manually or automatically. Automated coding means that the text is automatically analysed by computer software (Hase, 2023). Methods for automatic coding are, for example, Computer-Aided/Assisted Qualitative data Analysis Software (CAQCAS), Natural Language Processing (NLP), and machine learning (Nelson et al., 2021). The primary advantage of automated coding in comparison to manual coding is the time-saving potential. However, automated coding requires a significantly larger time investment to pre-process data, hence it is only justifiable for large data samples. Next to this, there are concerns regarding reliability and validity. One of the main issues is that human interpretation is still needed both before and after the automated analysis (de Graaf & van der Vossen, 2013). Next to this, automated coding lacks the ability to fully capture the complexity of qualitative data, as it lacks the interpretive abilities inherent in humans (de Graaf & van der Vossen, 2013; Hase, 2023). For example, automated coding has limitations in detecting synonyms and interpreting multiple meanings of words within different contexts (de Graaf & van der Vossen, 2013). While automatic coding cannot fully replace manual coding, it can be a valuable extension to the manual process, offering an additional validation step. This means that it can confirm the findings of the manual coding process (de Graaf & van der Vossen, 2013; Hase, 2023).

A second coding choice is deciding whether one argument can be assigned to multiple themes (codes). In practice, this would mean that an argument about both biodiversity conservation and waste management could be assigned two codes: *'biodiversity conservation'* and *'waste management'*. Alternatively, when assigning just one code, it must be decided which of the two codes best represents the main message of the argument. According to Elliott (2018), there is no consensus about this in the literature; on the one hand, you should use one code because that is how the main message comes out. On the other hand, to keep the main message, it is sometimes necessary to use multiple codes.

3.2. Quality of Qualitative Content Coding

For scientific relevance, it is important to test the quality of the results. First, it is important that researchers describe the methodology and findings transparently and comprehensively (Elo & Kyngäs, 2008; Zhang & Wildemuth, 2009). According to Hsieh & Shannon (2005), a difficulty of the inductive QCA method is defining categories that are a good presentation of the content. The defined categories must be checked for representation of the whole context. This is defined as *'internal validity'*, which is part of the paradigm of reliability and validity, or the trustworthiness paradigm by Lincoln & Guba (1985).

3.2.1. Paradigm of reliability and validity

In academic research, the concepts of validity and reliability have been well-established since 1900 (Saleh & Marais, 2006; Shaw & Crisp, 2011). Mayring (2014) also uses these concepts for measuring the quality of QCA. Validity relates to whether what should be measured is measured, while reliability is about the consistency of the measurement. There are several measurements for validity and reliability. Validity can, for example, be measured by checking the content of the defined categories with literature or discussing them with a group of experts. Reliability can, for example, be measured by checking the inter-coding reliability. The inter-coder reliability can be calculated by comparing the researchers' coded text and calculating the percentage of agreement (Mayring, 2014).

3.2.2. Paradigm of trustworthiness

Zhang & Wildemuth (2009) stress the importance of using the trustworthiness paradigm by Lincoln & Guba (1985) for measuring the quality, instead of the classical reliability and validity criteria, because this method is more directed at qualitative research. The paradigm of trustworthiness consists of four criteria; *credibility, transferability, dependability, and confirmability.*

Credibility means that the researcher accurately represents the studied topic. Credibility can be ensured, for example, by involving (independent) researchers throughout the process. *Transferability* means that the researcher should make it possible to transfer the findings to research on another subject. It is not up to the researcher to decide whether this is possible, but he should provide a detailed description of the method that allows the other researcher to decide on transferability. *Dependability* means that there should be consistency between the steps taken during the study. In this way, the method can also be followed by other researchers. Finally, *confirmability* means that the conclusions drawn in the study are consistent with all data obtained during the study. Both dependability and confirmability can be checked by using audits. An audit is the use of independent researchers who check the dependability and confirmability of the study by checking the unprocessed data, coding manuals, and methodology (Zhang & Wildemuth, 2009).

The articles by Elo et al. (2014) and Graneheim & Lundman (2004) also propose this paradigm to measure trustworthiness because this paradigm is most suitable for qualitative research. The article by Elo et al. (2014) also stresses the importance of separating the analysis of trustworthiness into three different phases. Within the preparation phase, the data collection method, sampling strategy, and unit of analysis must be checked. Secondly, for the organisation phase, credibility and confirmability are important; the categorization, interpretation, and representativeness must be checked. More than one researcher must be involved to maintain credibility and confirmability. It is recommended that there should be one main researcher and one or more controlling researchers. These researchers regularly discuss the categorization and/or coding process. This can be qualitative, e.g., through discussion, or quantitative, e.g., by measuring inter-coder reliability. Inter-coder reliability involves comparing the coded text from different researchers and calculating the percentage of agreement between them. Lastly, transferability, confirmability, and credibility are important for reporting the results in the reporting phase. This can be ensured by presenting the results transparently and well-organised. Dependability is important for reporting the analysis process in the reporting phase. This can be ensured by providing a comprehensive overview of the steps taken during the process.

3.3. Strengths and weaknesses

As mentioned at the beginning of this paragraph, QCA is one of the most used methods for analysing qualitative data (Kuckartz, 2019). It is a valid and reproducible method for dividing a large amount of data into clear categories (Elo & Kyngäs, 2008; Hsieh & Shannon, 2005; Kuckartz, 2019). However, it can be concluded that there is no standardised way to execute a QCA. This results in the researcher deciding on the best method to perform the specific QCA. Therefore, the results of the QCA depend on the capabilities of the researcher (Assarroudi et al., 2018; Elo & Kyngäs, 2008). Next to this, even when considering the paradigms to ensure quality, QCA remains a subjective method that relies on the researcher's judgment (Graneheim & Lundman, 2004). Next to this, QCA is time-intensive due to handling huge amounts of data. This can cause you to overlook small, but important details (Elo & Kyngäs, 2008).

4

Methodology

As mentioned in the introduction, this research will answer the following main research question:

What is the added value for policy-making of including the qualitative arguments from a Participatory Value Evaluation alongside the quantitative data in the Latent Class Cluster Analysis?

This chapter will elaborate on the methodology used to answer the main research question. Firstly, the main research approach will be discussed; a case-study on the National Environmental Program PVE. Second, the followed QCA method will be discussed. After that, the LCCA as a data analysis method of the PVE will be discussed. Lastly, it will be elaborated on the focus group.

4.1. Case-study

The case-study approach will be used to analyse the added value of the qualitative analysis method. A case-study is an empirical method that investigates a phenomenon (*'the case'*) in a real-world context (Yin, 2018). In this research, the case is the use of a PVE for the development of the National Environmental Program (NMP). The associated design is a single-case study design. This is chosen because the NMP PVE is a common case, meaning that the case is comparable to PVEs on other topics. Subsequently, this research is a holistic case-study, because only one PVE is conducted for the NMP. The holistic case-study has the risk that the abstraction level is too high and that too general conclusions will be drawn (Yin, 2018). The ultimate goal of the case-study is to make analytic generalisations from the case-study. Analytical generalisation is described as *'the logic whereby case-study findings can apply to situations beyond the original case-study, based on the relevance of similar theoretical concepts or principles'* (Yin, 2018, p. 349). This research attempts to generalise the potential added value of the qualitative method for the NMP case to the added value for PVEs in general. However, generalisation is limited because the information is obtained from one case (Yin, 2018).

4.1.1. NMP case

4.1.1.1. Context

Elaborating on the NMP case, Figure 2 shows a simplified overview of the policy programs with which the NMP is linked. On a global level, the UN defined three planetary crises; climate change, environmental pollution, and biodiversity loss (Arcadis, 2022). Within the SDG's planetary issues are addressed (United Nations, 2021). The NMP focuses on the crisis of environmental pollution and corresponding SDGs. A more elaborated overview of the policy programs is provided in Appendix C.

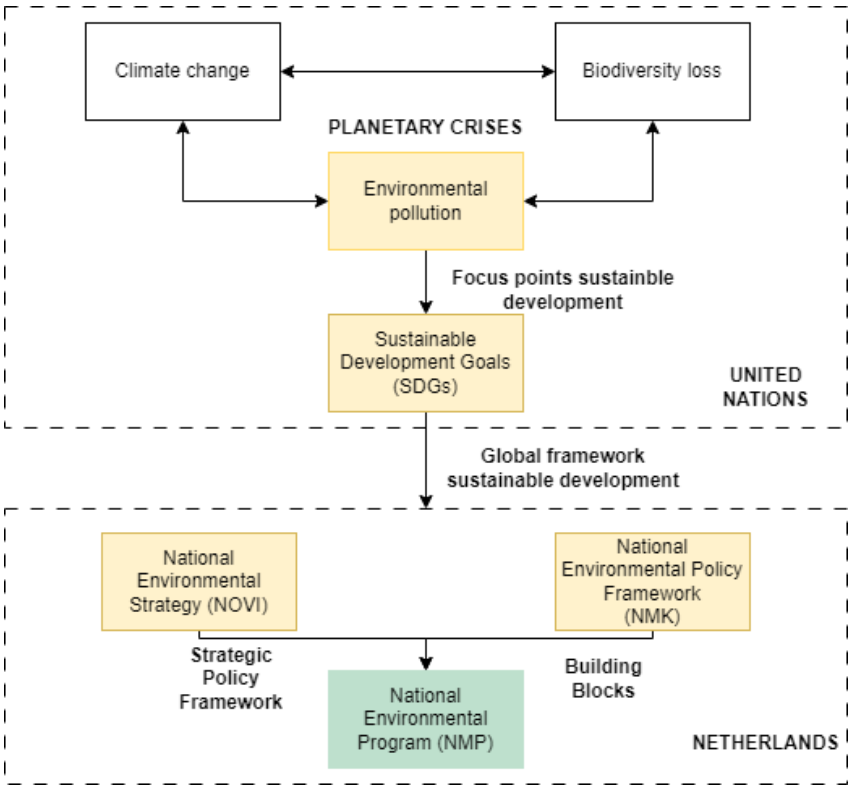

Figure 2: Policy programs related to NMP
Source: (Arcadis, 2022)

On a national level, the Dutch government released the *'National Environmental Strategy'* (NOVI) and the *'National Environmental Policy Framework'* (NMK) in conjunction with each other (Arcadis, 2022). The NOVI provides a long-term vision for the development of the living environment in the Netherlands (Ministerie van Binnenlandse Zaken en Koninkrijkrelaties, 2020). The NMK focuses on protecting human-, animal-, and plant- health, strengthening ecosystems, and respecting the boundaries of the earth system (Arcadis, 2022).

The NOVI provides the government's strategic policy framework for the NMP, while the NMK describes starting points and building blocks needed to shape further and develop environmental ambitions (van Veldhoven-van der Meer, 2020).

4.1.1.2. Content

The NMP describes the route to a healthy, clean, and safe living environment by 2050 for the Netherlands, which means that health damage from environmental pollution is negligible. The NMP focuses on three main tasks; vital ecosystems, a healthy living environment and a sustainable, circular economy (Heijnen, 2022). Vital ecosystems consist of the themes soil and water, a healthy living environment consists of stress factors, chemicals, and environmental safety, and lastly, a sustainable and circular economy consists of circular economy, biotechnology and passing on environmental damage (Arcadis, 2022).

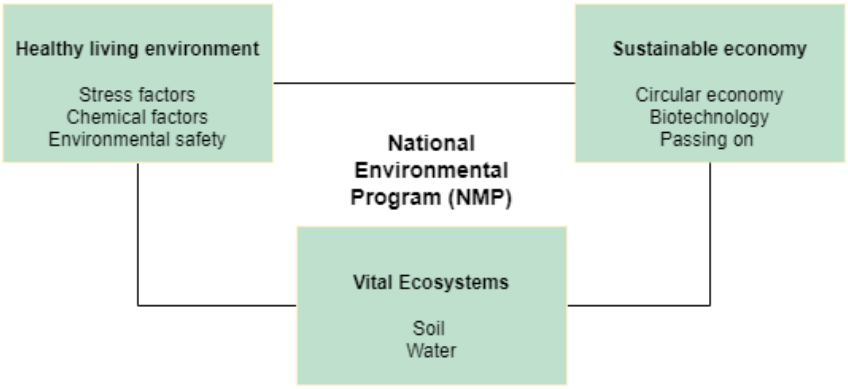

Figure 3: National Environmental Program
Source: (Arcadis, 2022)

4.1.1.3. Participatory Value Evaluation NMP

A PVE for policy-making of the NMP was conducted by the research organisation Populytics, which is a spin-off from the TU Delft, commissioned by the Ministry of Ienw. The PVE is part of the informal participation process. Informal participation moments are not legally required, like formal participation moments, but these moments are organised to obtain knowledge and ideas from society and to test ideas (Ministerie van IenW, 2022). The second chapter stressed that in common participation methods, there is an overrepresentation of people concerned about the environment, but that PVE is assumed to represent the entire population as completely as possible. Therefore, it was expected that the NMP PVE could provide useful insights into citizens' views on environmental policies.

Zooming in on the design of the NMP PVE, there are two choice tasks. The first choice task is a strategic choice task, which aims to analyse what values citizens drive when they can make environmental policy. It is asked what the participant considers important when making environmental policy. There are nine statements displayed, over which they can divide fifty points. After that, they can argue why they divided the points this way. The second choice task is a DCE. A DCE can be used to elicit preferences towards certain interventions. Two or more alternatives are presented in the experiment. These alternatives consist of the same attributes, but the attribute levels differ. The participant has to choose one alternative. In this way, respondents' preferences can be compared (Abiiro et al., 2014). Next to this, in the end, the participant has to answer questions about the environment in the Netherlands, the PVE, and the participant himself (socio-demographic characteristics).

This research focused on analysing the first choice task because this choice task is most suitable for identifying different sub-groups regarding environmental policies. This task gives insight into underlying values for environmental policies, which are not directly observable. An LCCA model can help understand these underlying values. This will be further explained in paragraph 4.3. Appendix D presents an overview of this choice task.

Populytics provided the anonymised data. The data came from the so-called *'soft-launch'*, which consisted of two parts. First, a pilot soft-launch with 500 respondents was conducted to test the PVE. Then some changes were made, and the remaining 1484 respondents were collected.

4.2. Content analysis

In chapter 3, a literature review on Qualitative Content Analysis is conducted to answer sub-questions 1 and 2. Methods of conducting a QCA (3.1) and ensuring quality were examined (3.2). Firstly, it was looked in the database Scopus for articles that described the methodology of QCA with the following search string: TITLE-ABS-KEY('Qualitative Content Analysis' AND 'Methodology'). This resulted in thousands of search results, time constraints led to the decision to only include literature review articles. Literature reviews on methods for performing QCA provide a comprehensive overview of methods used in various papers. This resulted in only two articles. The article by Assarroudi et al. (2018) presented a clear overview of articles that described the methodology of a deductive QCA, and the article by Elo & Kyngäs (2008) presented a literature review on both inductive and deductive QCA. This literature review brought together all the knowledge about inductive and deductive coding between 1988 and 2005. It was chosen to include the same articles as in the literature review of Assarroudi et al. (2018) in this research, because this literature review included the literature review by Elo & Kyngäs (2008) and useful new articles published after 2005. These new articles are from Mayring (2014) and Zhang & Wildemuth (2009). Next to this, the literature by Kuckartz (2019) was also included by forward snowballing in the article Mayring (2014). The articles by Elo & Kyngäs (2008) and Hsieh & Shannon (2005) have been presented and discussed together for the inductive approach, because the same inductive approach is used. For the literature about the quality of the QCA, the articles by Elo et al. (2014) and Graneheim & Lundman (2004) have also been included by forward snowballing within the article by Assarroudi et al. (2018). Both articles reviewed literature about the quality of QCA.

4.2.1. Content analysis PVE

Specifying the previously mentioned theory to this research, the QCA method for this research will be defined. An overview of the method is shown in Figure 4. Firstly the category development method is discussed, followed by steps taken to ensure quality. Finally, the methodology followed for the QCA of this study is presented.

4.2.1.1. Category development method

Specifying the previously mentioned theory to this research, this study aims to gain more substantive knowledge about people's underlying motivations, therefore this study focused on identifying *thematic* categories. This means identifying the main theme of the message for each open answer given by a respondent. As there is insufficient knowledge about the themes that might be identified from the PVE arguments to define the categories in advance, an *inductive* approach was adopted. The literature review about inductive content coding, section 3.1.1, revealed no standardised way to execute an inductive QCA. Therefore, the methods described by the literature review have been combined in this research. The three phases, preparation, organisation, and reporting, and the steps described by Elo & Kyngäs (2008) were used as the main guide, as this was the only available literature review on inductive coding. Another reason is that the article is cited by many other researchers who used the QCA methodology. Because the article does not elaborate on the coding process, it is combined with more elaborated research by Hsieh & Shannon (2005) Mayring (2014) and Zhang & Wildemuth (2009).

Firstly, next to describing the unit of analysis, the selection criterion by Mayring (2014) are also defined to describe the coding process as delineated and clear as possible. Next to this, it is chosen to start with the whole dataset instead of taking a sample in order to include all possible relevant categories. Also, the Constant Comparative Method has been used, which means that during the open coding process categories are freely generated, but the same category can be assigned to one argument during the open coding process. Because only the article by Mayring (2014) describes when the development of categories stops, this has been used as a rule of thumb; after no new categories are found, the development of categories stops. The literature review revealed no clear guideline for the desired number of categories, Hsieh & Shannon (2005) recommends between 10 to 15 categories, and Mayring (2014) recommends 10 to 30 categories to cover the whole content. However, no guideline for category reduction was used because this selection can be made by the LCCA model based on significance. This will be further explained in section 4.3. Next to this, the article by Elo & Kyngäs (2008) does not describe the reviewing and adaptation of categories, therefore, the step of adapting rules and categories after no new categories are found by Mayring (2014) has been used. Lastly, in order to make sure that the codebook was valid to code the whole dataset, it was first tested on a sample (Zhang & Wildemuth, 2009).

4.2.1.2. Coding choices

As described in section 3.1.3, some choices had to be made for the actual coding process. First, it had to be decided whether coding would be done manually or automatically. As this research aims to identify underlying motivations for choices, it was assumed that this would not be possible with automated coding. It has the inability to fully capture the complexity of qualitative data, as it lacks the interpretive abilities inherent in humans (de Graaf & van der Vossen, 2013; Hase, 2023). Secondly, one code was assigned to each argument for two reasons. First, the main message should be extracted from the argument, therefore the analysis should focus on what the main message is. Secondly, it is technically not possible to include arguments with multiple codes in the LCCA model.

4.2.1.3. Quality of Qualitative Content Coding

The literature review about the quality of Qualitative Content Coding, section 3.2, revealed that there is no standardised way to assess the quality of QCA. The quality of QCA can be assessed using the paradigm of reliability and validity or the paradigm of trustworthiness by Lincoln & Guba (1985). It was chosen to measure the quality of the QCA in this study with the paradigm of trustworthiness for two reasons. This method is more focused on qualitative research, and it is the most commonly used paradigm for evaluating the quality of a QCA (Elo et al., 2014).

According to Elo et al. (2014), it was also important to measure the reliability of the different phases separately. For the preparation phase, the trustworthiness was not considered because no sample was taken, the data collection was not part of this research, and the entire answer was chosen as the unit of analysis. For the organisation phase, the involvement of more than one researcher was important for ensuring credibility and confirmability. Therefore, in this study, there were discussions with another researcher. This person lead researcher at the research organisation Populytics and was responsible for the NMP PWE. At three points, there was a discussion with another researcher:

1) After the categories were developed by the researcher conducting this study, they were checked by the other researcher and discussed later. As a result of the discussion, some adjustments were made to some of the categories.
2) Testing the codebook on a sample by both researchers revealed that the codebook was not fully usable for coding the dataset. Therefore, the findings were shared and discussed with the other researcher, leading to modifications being made to the codebook. This is consistent with the step of testing the codebook on a sample of Mayring (2014).
3) The doubtful cases encountered during the coding process were discussed. Through this discussion, definitive codings were determined for all arguments.

For the reporting phase, according to Elo et al. (2014), trustworthiness is important in two parts of the reporting process; reporting of the analysis process and reporting of the results. For the analysis process, it is important to provide a comprehensive overview of the steps taken to ensure dependability. The QCA process overview in the next section provides this overview. For reporting the results, the results should be presented transparently. This is ensured in this study by discussing all results transparently, which also means discussing the problems/illogical results.

An overview of the whole process is presented in Figure 4 and elaborated on in the next paragraph.

4.2.2. QCA process overview

Preparation

1. Unit of analysis
Entire answer to why the respondent distributed the points in a particular way across the statements (nine answers per respondent).
It was looked for a *theme* in a response.

2. Selection criterion
Category definition:
Motivations for why a specific amount of points is given for the statement.
Level of abstraction:
Concrete motivations for why they assigned certain points to a statement.

Organisation

3. Open coding

Firstly, the data has been open-coded, which means that codes are freely generated for every statement. According to the Constant Comparative method, using an already-defined category for an argument yet to be coded was also possible. Important to mention is that the codebook is developed based on two sources. After the soft-launch, it turned out that participants did not understand all the questions from choice task 1 correctly. For example, they gave zero points while mentioning in the comments that they thought that statement was very important. Therefore, choice task 1 of the PVE was adjusted and re-sampled among 1484 respondents. Nevertheless, the categories for most statements, with the exception of statements two, four, and seven, are still based on data from the first 500 respondents of the soft-launch, as these statements did not change significantly. Because statements two, four and seven were changed after the first soft-launch, the corresponding arguments were not representative. Therefore, these categories were later developed based on the second soft-launch with 1484 respondents. An overview of the choice task is presented in Appendix D. Free code generation stopped when no new categories were found. Subcategories that only occurred one time were excluded.

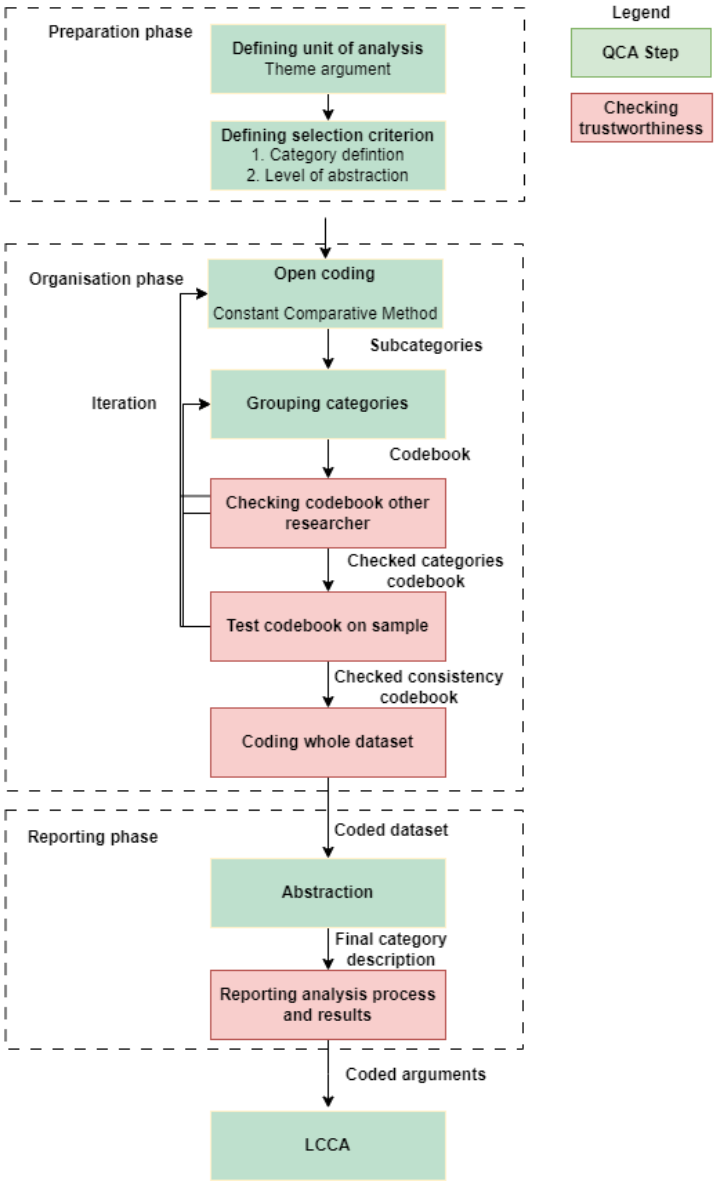

Figure 4: Overview Qualitative Content Analysis process

4. Grouping list of categories
After that, the subcategories were grouped under overarching topics, also some subcategories were merged or adjusted. Statement-specific categories and general categories have been identified. Statement-specific categories relate to a motivation given specifically for a particular statement, while general categories include arguments that are not statement specific; these were mentioned for different statements.

One important choice is that it was sometimes chosen not to include a new subcategory for a specific statement when the subcategory contained the main message of another statement. For example, although statement 1 was focused on the control of the government, certain arguments related to governmental control were also present in statements 2 and 4. These arguments were related to governmental control over the improvement of the environment and the protection of health, respectively. In such cases, the choice was made not to introduce a new category for government control but rather to categorise these arguments under broader categories: *'protection of the environment is a core government task'* and *'protection of health is a core government task'*. The result of this phase is the development of a codebook that contains a category, possible subcategories, a description and a code. In the description, it is described what does and does not fall under this category and provides synonyms for arguments. For some categories, an illustrative example was given.

5. Checking of codebook by another researcher: trustworthiness
A researcher from the research organisation Populytics was also involved in defining the categories. This researcher was familiar with the dataset. The codebook was checked by the researcher and provided with written feedback. Thereafter, the codebook was revised. Verification of this revised codebook later took place in a physical meeting through discussion. After that, the final version of the codebook has been created.

6. Testing codebook on sample: trustworthiness
When there was a final version of the codebook, coding of the whole dataset could be started. The codebook was first tested on a sample of 500 respondents. Statements two and seven were checked by the other researcher. This increased the trustworthiness because the dataset used to develop the codes for these statements was the same as the sample dataset (second soft-launch). The other statements were checked by the researcher of this study. One column was added to the Excel sheet for every statement, in this column the arguments were coded according to the codebook. An argument was not coded if no category fitted it. When there was doubt about the assignment of a code, a specific code was used for the argument. These cases were later discussed with the other researcher. It turned out that minor adjustments needed to be made to the codebook, this included modifying an existing category or adding one. These adjustments were first discussed in a meeting with the other researcher. After that, the final version of the codebook has been delivered. It was decided not to remove categories, as they could still occur later in the dataset.

7. Coding whole text: trustworthiness
After the final codebook was created, the remaining 983 respondents for the nine statements were coded. The arguments from all statements, except the first 500 arguments of statements 2 and 7, were coded by the researcher of this study. In the end, the doubtful cases were discussed.

Reporting

8. Abstraction
After the whole dataset was coded, the codebook was checked again. Based on insights from the entire dataset, some category names and/or descriptions were changed. An overview of the whole codebook is shown in Appendix E.

9. Reporting analysis process and results: trustworthiness

Reporting of the analysis process
The previously mentioned steps describe in a detailed way how the QCA process was executed. The data file of the first soft-launch on which the codebook is largely based, and the final coding sheet with arguments and corresponding codes, can be found in two separate Excel files. The final coding sheet also includes the frequencies of the different categories. In this way, there is a comprehensive overview of the steps taken during the process, which ensures trustworthiness.

Reporting of the results
The results are presented in two ways. Firstly, the frequencies of the different categories have been analysed and discussed in chapter 5. After that, the codes which did not occur in the dataset, frequency 0, were removed. This could occur because the codebook for the majority of the statements was created on the first 500 respondents of the soft-launch. The overall results were discussed by means of the frequencies. Furthermore, the coded dataset formed the input for the second way of describing results; the LCCA model. The coding process was a means to define the LCCA model, and to be able to answer the research question. The development of the LCCA model will be further explained in section 4.3. To ensure trustworthiness, results were presented in a transparent way, which means that it was also mentioned when there were some issues/illogical results.

4.3. Latent Class Cluster Analysis

To get a clear overview of population perspectives emerging from the PVE, a clustering method can be used. The LCCA method will be used in this research to answer sub-questions 3 and 4. In comparison to the traditional clustering methods the LCCA assigns individuals probabilistically to clusters instead of deterministically. In this way, individuals are prevented from being assigned to the wrong cluster. In addition, there are other advantages over deterministic clustering methods. First, statistical tests can be used to determine the optimal number of classes. Second, the significance of the variables in the model can be determined, and finally, variables can be of different measurement scales (Molin et al., 2015).

Through the LCCA individuals can be clustered based on the similarity in choices they have made (Molin et al., 2015). It is a clustering method, in which individuals are probabilistic assigned to clusters based on a latent nominal variable that explains the individuals' responses on a set of observed indicators. Conditional on the latent class variable, the observed associations between a set of indicators become insignificant (Molin et al., 2015). This is called local independence. The formula below shows the basic structure of an LCCA model according to Vermunt & Magidson (2016):

$$f(\mathbf{y}_i|\mathbf{z}_{\text{cov},i}) = \sum_{x=1}^{K} P(x|\mathbf{z}_{\text{cov},i}) \prod_{t=1}^{T} f(y_{it}|x) \tag{1}$$

$$\begin{aligned} y_i &= \text{all responses of individual i} \\ \mathbf{z}_{\text{cov},i} &= \text{all covariate values of individual i} \\ x &= \text{latent variable} \\ T &= \text{amount of indicators} \\ y_{it} &= \text{response of individual i to indicator t} \end{aligned}$$

The formula shows the probability of having a specific response pattern to the indicators for the individual i. As can be seen, there are two probabilities. Firstly, the probabilities of belonging to a certain class by having specific covariate values, and secondly the probabilities of a specific response pattern, given latent class membership. The former is called the structural model, and the latter the measurement model (Molin et al., 2015; Vermunt & Magidson, 2016). An overview of the structure of an LCCA is provided in Figure 5. Both models will be further explained in the following paragraphs.

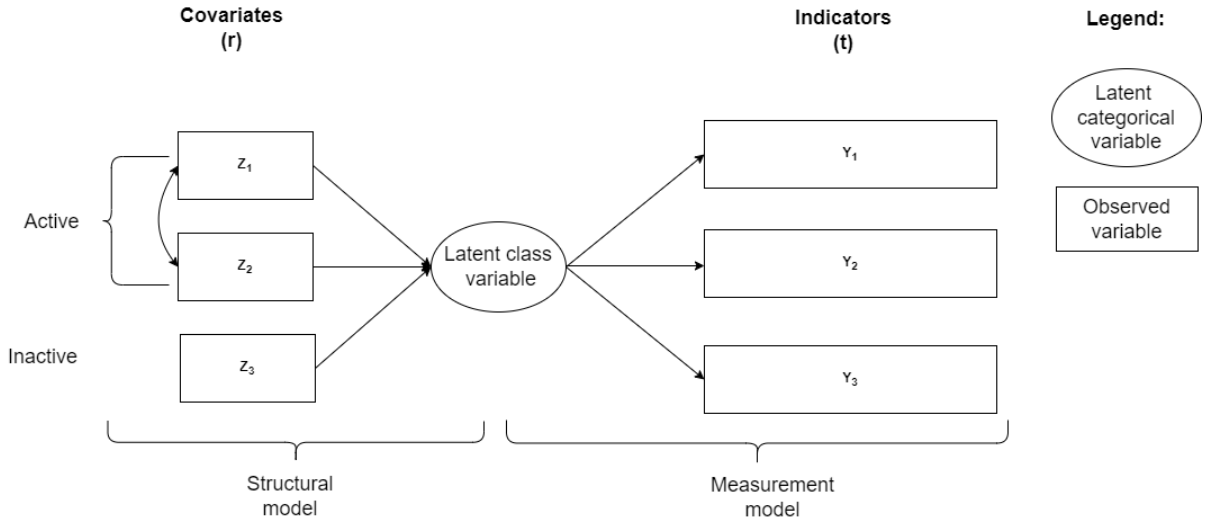

Figure 5: Structure Latent Class Cluster Model
Source: (Molin et al., 2015)

4.3.1. Measurement model

Firstly, the measurement model is estimated. The measurement model tries to find internal homogeneous latent clusters based on the indicators (Molin et al., 2015). The indicators can be continuous, nominal or count variables (Vermunt & Magidson, 2002). The goal of the LCCA is to minimise the differences in people's preferences within the clusters and to maximise the differences in people's preferences between clusters. Next to this, the LCCA tries to find the most parsimonious model, which means having a model which describes the associations between the indicators, with the smallest number of latent classes (Molin et al., 2015).

4.3.1.1. Model fit

For measuring the model fit of the measurement model, there are global and local fit measures. Firstly, the global model fit is about evaluating the statistically optimal amount of classes. If there is a manageable amount of responses, the *'chi-squared goodness-of-fit test'* can be used. Next to this, information criteria can be used, which takes into account the model fit and parsimony. The loglikelihood Bayesian Information Criterion (BIC) has been shown in previous research to be suitable for LCCA models (Molin et al., 2015; van 't Veer et al., 2023). Next to this, the loglikelihood Akaike Information Criterion (AIC) can be used. The model with the minimum AIC (LL) or BIC (LL) is the model with the most optimal amount of clusters (van 't Veer et al., 2023). For local fit, the Bivariate Residual Values (BVR) can be used. This value measures the residual association of the indicators in the model. As mentioned at the beginning of this paragraph, conditional on the latent class variable the observed associations between a set of indicators become insignificant. If the BVR is smaller than 3.84, it indicates that there is no significant covariance between the indicators (van 't Veer et al., 2023).

4.3.2. Structural model

After it is decided on the number of clusters, the structural model is estimated. The structural model predicts the probability of belonging to a cluster based on personal characteristics. These personal characteristics are the covariates in the model. Covariates can be personal characteristics such as age, gender and attitudinal variables (Molin et al., 2015). As can be seen in Figure 5, the covariates have no direct effect on the indicators, but have an influence on the clusters (latent class variable) (Vermunt & Magidson, 2016). The covariates can be on a categorical or continuous measurement scale (Vermunt & Magidson, 2002).

4.3.2.1. Covariate selection and predictive power

Firslty, it has to be decided which covariates will be added to the model. The Wald statistic can be used for this. If the Wald statistic is higher than 3.84 ($p<0.05$), it is assumed that the covariate is significant. (Molin et al., 2015; van 't Veer et al., 2023). If a covariate is statistically significant, they are likely to have statistically significant relations with the probability of belonging to the identified clusters (Molin et al., 2015). A distinction can be made between active and inactive membership covariates. Active covariates can help to predict class membership, while inactive covariates do not help to predict class membership but can help to understand the composition of each class (Ton et al., 2020). If the Wald statistic of the covariate is insignificant, the covariate is often included as an inactive covariate in the model (Molin et al., 2015; van 't Veer et al., 2023). After the covariates have been added to the model, as inactive or active covariates, it has to be assessed whether the covariates are good prediction of belonging to the identified clusters. The entropy R-squared can be used for this. An entropy R-squared value above 0.8 indicates a good prediction of cluster membership (van 't Veer et al., 2023).

4.3.3. Latent Class Cluster Analysis NMP

4.3.3.1. Data preparation

To estimate the LCCA models, the software Latent Gold has been used. This software package is chosen, because it can easily perform a LCCA. For being able to include the coded data from Excel into LatentGold, a separate column has been made for every statement in which each cell has value 1, the specific category is in the cell, or 0, the specific category is not in the cell. In this way, it was possible to include all the sub- and main categories as separate covariates in the LCCA model. Which made it possible to assess the significance of all main- and subcategories. Two separate Excel sheets have been made, one with all the subcategories, and one with only the main categories.

Firstly, for every subcategory, a separate column has been made. The following Excel function has been used in the column to define if subcategory AA1 is assigned to the argument;

```
=IF($E2=F$1; 1; 0)
```

In row 1, all the subcategories are shown. The formula checks whether the code in column E is the same as the category in row 1. For example, AA1 is situated in cell F1, the formula checks whether the code in E2 is the same as AA1. The function returns 1 if code AA1 is assigned to the argument, otherwise, the function returns 1. Important to mention is that it is chosen to not include the main categories, because these are the *'residual categories'*; everything that can't be assigned to a sub-code ends up in the main category. Therefore, it was assumed that these categories don't provide useful information.

Secondly, for being able to define if a main category is there, the following Excel function has been used;

```
=IF(LEFT(($E2),2) = F$1; 1; 0)
```

In row 1, the specific main categories are shown. The formula checks whether the first two characters of the code in column E are the same as the main category in row 1. For example, AA is situated in cell F1, the formula checks whether the first two characters of the code in E2 are AA. In this way, all subcategories (AA1, AA2, AA3, AA4) are included in this main category.

Third, for the general statements, it was chosen to only use one column for this. The following formula has been used for the subcategories;

```
=IF(OR($E2 = HY$1; $AN2 = HY$1; $BI2 = HY$1; $CG2 = HY$1; $DA2 = HY$1; $DY2 = HY$1; $FA2
= HY$1; $GF2 = HY$1; $HF2 = HY$1); 1; 0)
```

The following formula has been used for the main categories;

```
=IF(OR(LEFT($AM2, 2) = EX$1; LEFT($BB2, 2) = EX$1; LEFT($BS2, 2) = EX$1; LEFT($CI2, 2)
= EX$1; LEFT($DD2, 2) = EX$1; LEFT($DU2, 2) = EX$1; LEFT($E2, 2) = EX$1; LEFT($EJ2, 2) =
EX$1; LEFT($X2, 2) = EX$1); 1; 0)
```

The function returns 1 if that specific general argument J, is in one of the nine columns, otherwise, it returns 0. It is chosen to do this for two reasons. Firstly, adding the general statement to every statement results in too many extra covariates. Secondly, it was assumed that if the respondent mentioned the general category several times, this is the general thrust of all his arguments.

4.3.3.2. LCCA models

The measurement model and the quantitative structural model have the same model characteristics as the model from research organisation Populytics. This means for the measurement model that the same indicators and amount of clusters were chosen, and for the structural model that the same covariates were chosen. In this way, it was possible to compare the new qualitative LCCA model with the quantitative LCCA model.

1. Measurement model

For the measurement model, the nine statements have been included as indicators. These indicators are count variables. It was chosen by Populytics to develop a four-cluster LCCA model, because in this model the distinction between the clusters was the clearest.

Model fit

For deciding on the optimal amount of classes, the global model fit, and the information criteria will be used. The *'chi-squared goodness-of-fit test'* was not used, because there are in this research many possible response patterns, which leads to the rejection of all models (Molin et al., 2015). The BIC(LL) and AIC (LL) criteria were used. The model with the minimum AIC(LL) or BIC(LL) is the model with the most optimal amount of clusters. For measuring the residual association of the indicators, the BVR was used. It was looked at if the BVR is smaller than 3.84, this indicates that there is no significant covariance between the indicators.

2. Structural models

Quantitative structural model: base-case

The following covariates have been added to the model as nominal variables:
- Age
- Education
- Income
- Living situation
- Polluted environment
- Nuisance environment
- Health
- Gender

Qualitative structural models

For the structural model, next to the socio-demographics, the coded arguments have been added to the structural model as nominal covariates. It was chosen to develop three models, in order to investigate which model development method is most suitable for including qualitative covariates. For all three models, backward elimination has been used to select the covariates. In this covariate selection method, first, all covariates are added to the model. After that, insignificant parameters were removed one by one, starting with the most insignificant. The remaining variables are the active covariates, and the removed covariates are the inactive covariates (van 't Veer et al., 2023). It was chosen not to eliminate the socio-demographic variables, because this study examines whether the socio-demographic characteristics become less significant when you add qualitative arguments. In other words, do the qualitative arguments take away explanatory power from these socio-demographic characteristics?

Firstly, a model with all subcategories was estimated. Secondly, in order to reduce the number of parameters it was chosen to also estimate a model with only the main categories. As mentioned at the beginning of this paragraph, the Excel sheet with only the main categories is a sum of the frequencies of the subcategories. Lastly, a subjective policy-focused model was estimated. This model differs from the

first and second models because the researcher makes a decision on relevant covariates to include in the model rather than the software (based on significance). It was chosen to estimate such a model, in order to examine in the focus group whether there is a need from policy-makers for a more focused model. As the PVE is used to see which parts of the environment the NMP should focus on, the subjective model includes trade-offs between the environment and other topics; controlling environmental laws and regulations versus using enforcement capacity for other (more relevant) topics (A), spending money on environment versus spending money on other (more relevant) topics (C), environment versus economy (E), housing (H) and traffic and transport (I). Protection of the environment in general (B) and health (D) were also included. The protection of low incomes (F) and the distributive issue, which includes tackling polluting companies (G), were not included because these are more political issues rather than substantive choices. Additionally, no general categories have been included, since there are no trade-offs between them.

4.4. Focus group

After the models were estimated, a focus group was organised by the researcher of this study to explore the added value of the models. A focus group is a form of group interview, where a researcher asks questions to a group of people to gain insight into what the group thinks about a particular topic. A focus group usually consists of six to eight participants, but there are also small focus groups that consist of four to six participants (Ryan et al., 2014). A small group has the advantages that participants feel more comfortable, there is more room for discussion and it is easier to manage for the researcher. When participants have a lot of knowledge about the topic under discussion, a small focus group is appropriate, while when participants do not have a lot of knowledge about the topic, a larger focus group is preferable. Most common is to include participants with homogeneous characteristics. Homogeneity means that the participants have something in common that is important for the research, for example, profession, age, or gender (Kruger, 2014). To facilitate the focus group, materials such as questionnaires or pictures can be used (Ryan et al., 2014).

4.4.1. Focus group NMP

Goal

On June 21, 2023, from 11:00 am to 12:00 am, a focus group was organised by the researcher of this study. This focus group was entirely devoted to this research. The goal was to examine if the LCCA models that also include qualitative arguments add value to policy-making. In addition, the aim was also to investigate whether there was a preference for the objective or subjective model. Important to mention is that the discussion was not specifically about the added value for the NMP, but for policy-making in general. In this way, the results can be generalised.

Participants

The participants were selected by the researcher based on the profession they have in common. Five policy-makers from the NMP team at the Ministry of IenW were the participants of the focus group. A small five-person focus group was chosen because the policy-makers have a lot of knowledge about the NMP PVE, and it provided more room for discussion.

Design

The researcher took charge of the entire focus group, which was structured into three main parts. Firstly, an overview of the research questions and followed method was presented to the policy-makers. Then the estimated LCCA models were presented through summary tables with the properties of the clusters. Because the goal of the focus group was to discuss what a qualitative model means for policy-making in general, it was chosen to only present one of the first two objective models. The aim of the focus group was not to go into technical detail about the method, and it was expected that this would otherwise be done. Therefore a choice between model 1 (subcategories) and model 2 (main categories) had to be made. In order to decide on which model is the best, both models have been compared with each other in section 6.2.5. Next to this objective model, the quantitative LCCA and the policy-focused model were presented to the policy-makers. Lastly, there was room for discussion and dialogue. There were three discussion questions:

Qualitative model in general
1. What is the added value of a qualitative model for making policy in general?
2. Do the costs for a qualitative model (time) outweigh the benefits (more insight into choices)?

Comparison of models
3. Is there a preference for the objective model (model 1) or the subjective model (model 2)?

Deliverable
The deliverable was a summary of the most important outcomes. These outcomes are discussed in chapter 7.

5

Results QCA

This chapter presents the results of the executed QCA. Firstly, the datset will be described, after that the frequencies of the different categories will be discussed for the statement-specific categories, and lastly the frequencies of the general categories will be discussed.

5.1. Data description

The data used for developing the codebook were obtained from the two rounds of the soft-launch. The data were collected by a panel agency on behalf of the research organisation Populytics. These data were collected from mid-April to early May. The data from the first round with 500 respondents was used to develop codes for statements 1, 3, 5, 6, 8, and 9. The data from the second round with 1484 respondents was used to code statements 2, 4, and 7. Data from the second round were used for the actual coding of the data. As there were some respondents who gave random arguments, these were excluded. This resulted in a dataset with 1472 respondents.

5.2. Descriptive results

As mentioned at the beginning of this paragraph, there are statement-specific categories, Table 1 until Table 9, and general categories, Table 10. This section will discuss the defined categories generally. An overview of the whole codebook is presented in Appendix E. Important to mention is that there is a difference between the statements in how many respondents could be coded. This ranges from 771 to 882 out of 1472 respondents.

5.3. Statement specific categories

Statement 1: The government should always strictly control laws and regulations on the environment. For statement 1, 871 of the 1472 arguments could be coded. Many respondents mentioned that more control is needed for the sake of the environment (56.3 per cent) (AH). The most common subcategories are preventing violation of environmental laws (AH3) and otherwise, laws and regulations are meaningless (AH4). Categories AJ (Control is good, but the government does not control in the right way) and AK3 (Emphasis should be on controlling wealthy citizens) are not mentioned. Next to this, AA3 (trust is more important than control), AC2 (government controls only because there is money to be made) and AD (there is no more time for control) are only mentioned twice.

Table 2: Categories statement 1

Category	Percentage
AA: Too much control is not good	5.2%
AB: Control is no task of the government	1.1 %
AC: Control costs too much money	1.1%
AD: There is no more time for control	0.2%
AE: Strict control is not feasible	2.4%
AF: Enforcement capacity should be used for other things than environment.	0.6%
AG: All laws and regulations should be strictly controlled, not just for the environment	3.6%
AH: More control is needed for the sake of the environment.	56.3 %
AI: Control is good, but the rules and laws being controlled should be checked first.	1.3%
AJ: Control is good, but the government does not control in the right way.	-
AK: Emphasis should be on controlling big polluters	6.8%
AL: Fairness/justice	1.4%
AM: Control is a core task of government	2.4 %
AN: This is already happening	0.9 %

Statement 2: The government must do as much as it can to improve the environment.
For statement 2, 882 of the 1472 respondents could be coded. Many respondents mentioned that protection of the environment is a core task of the environment (20.6 per cent) (BD) and improving the environment is neccessary/urgent (20.7 per cent) (BF). This is mainly caused by the high frequency of BF1; the environment is bad. The category least mentioned argument is that there is no need to do more because citizens have to pay the costs in the end (BB) (0.8 per cent).

Table 3: Categories statement 2

Category	Percentage
BA: There is no need to do more, the government is already doing enough to improve the environment.	3.4%
BB: Don't do more, the citizen has to pay the cost in the end.	0.8%
BC: Protecting the environment is not a government task	6.6%
BD: Protection of the environment is the core task of the government	20.6%
BE: Improving the environment is important for future generations	8.7%
BF: Improving the environment is necessary/urgent	20.7%
BG: Improving the environment is important for health	2.8%
BH: Environment must be improved, but not at any cost	6.9%
BI: The environment is important, but (not all) costs may fall on citizens.	1.5%

Statement 3: The government must ensure that improving the environment costs as little as possible.
For statement 3, 771 of the 1472 arguments could be coded. The most often mentioned argument is that improving the environment does not have to cost as little as possible (30.1 per cent) (CB). This is mainly caused by the high frequency of CB1; the environment is important, and it may cost something. On the other hand, mentioned by many respondents is that cost savings are important for the economy (20.8 per cent) (CC). This is mainly caused by the high frequency of CC1; life is already expensive. The category least mentioned is that cost reduction is good because it can create support for environmental policies (1.4 per cent) (CI).

Table 4: Categories statement 3

Category	Percentage
CA: Environmental improvement does not have to be expensive	6.2%
CB: Improving the environment does not have to cost as little as possible	30.1%
CC: Cost savings are important for the economy	20.8%
CD: Environment has already cost enough	3.4%
CE: This leaves more money for more important/other things than the environment	6.2%
CF: Passing on costs to citizens	10.4%
CJ: Environmental policy can cost something, but not too much.	2.2%
CK: Money must be spent efficiently	4.0%
CI: Cost reduction is good for creating support for environmental policies	1.4%

Statement 4: The government must protect residents' health from pollution and nuisance to the best of its ability.
For statement 4, 846 of the 1472 arguments could be coded. The most often mentioned argument is that health is the most important thing (22.7 per cent) (DC). Next to this, it is often mentioned that the statement is important, but not why (20.2 per cent). The category least mentioned is that addressing pollution is good, but nuisance is subjective (0.8 per cent) (DJ). Next to this, the category that pollution and nuisance are part of life is little mentioned (1.2 per cent) (DB).

Table 5: Categories statement 4

Category	Percentage
DA: Government should not do more to protect the health of citizens.	1.8%
DB: Pollution and nuisance are part of life.	1.2%
DC: Health of people is most important	22.7%
DD: Healthy people are important for the economy	2.8%
DE: Citizens have no control over pollution and nuisance, so the government's job	3.3%
DF: Protecting health is a core government task	14.8%
DG: Air pollution in residential areas must be addressed	2.0%
DH: Protecting health is important from a cost perspective	6.4%
DI: Prevention is better than cure	5.0%
DJ: Addressing pollution is good, but nuisance is subjective	0.8%
DK: Protection of health is not a government task, and is joint responsibility	8.9%

Statement 5: The government must ensure that companies important to the Dutch economy stay here.
For statement 5, 872 of the 1472 argument could be coded. The most often mentioned argument is that businesses are important for socio-economic development (50.6 per cent) (EG). This is mainly caused by the high frequencies of the importance for employment (EG1) and the importance for the economy (EG3). The next most common argument already has a much smaller share. The argument that polluting companies should go and environmentally conscious companies should stay (EJ) has a share of 8.1 per cent. The least mentioned category is that economy is no priority because there are plenty of jobs (0.5 per cent) (EC).

Table 6: Categories statement 5

Category	Percentage
EA: Environment always comes before economy	5.4%
EB: Businesses do not need government support	4.1%
EC: Economy is not a priority, there are plenty of jobs	0.5%
ED: Government has no influence on this; they will leave anyway	3.3%
EE: World is one whole, Netherlands is a too narrow scope	1.6%
EF: Companies ensure independence from other countries	2.9%
EG: Businesses are important for socio-economic development.	50.6%
EH: Companies should stay in the Netherlands	6.2%
EI: Economy is important, but not at the expense of everything else	6.7%
EJ: Polluting companies should go away, environmentally conscious companies should stay.	8.1%

Statement 6: The government must protect lower-income households as much as possible.
For statement 6, 867 of the 1472 respondents could be coded. The most mentioned argument is that low-income people have it hard enough (39.9 per cent) (FJ). This is mainly caused by the frequency of low-incomes struggle to make ends meet (FJ1). The next common argument already has a much smaller share. The arguments that the government should (not) only focus on low-incomes and that low-income people have no/less opportunity to contribute to environmental policies have the same share (12.3 per cent) (FA; FK). The least mentioned categories are that low-incomes should not be protected because in the end working people have to pay for this (0.5 per cent) (FB), more money should go to inhabitants of the Netherlands instead of migrants (0.5 per cent) (FC), and this is not possible (FQ) (0.6 per cent).

Table 7: Categories statement 6

Category	Percentage
FA: The government should (not) only focus on low-incomes	12.3%
FB: Working people should end up paying for this	0.5%
FC: More money should go to residents of the Netherlands instead of migrants	0.5%
FD: Everyone should be protected (regardless of income)	3.9%
FE: People with low incomes should contribute proportionally to the environment	4.4%
FF: Reduce the difference between rich and poor	4.0%
FG: It is fair to help these people	0.7%
FH: It is social to help these people	1.0%
FI: Government's job to protect low-income people	5.2%
FJ: Low-income people have a hard enough time as it is	39.9%
FK: Low-income people have no/less opportunity to contribute to environmental policies.	12.3%
FL: Addressing the cause rather than treating symptoms	1.2%
FM: People with low incomes also pollute less	1.2%
FN: Low incomes should be protected; pay according to ratio	2.0%
FQ: Not possible	0.6%

Statement 7: The government must ensure that residents and businesses that pollute the most do the most.
For statement 7, 852 of the 1472 respondents could be coded. The most mentioned arguments are that it is fair that businesses that pollute the most do the most (29.6 per cent) (GF) and polluting companies and residents are the main target group to address (29.7 per cent) (GG). The high frequency of GF is mainly caused by the high of if you pollute more, you must also do more (GF2). The high frequency of GG is mainly caused by the high frequency of it goes without saying to address this group (GG4). The least often mentioned argument is that residents should be targeted, companies not (0.1 per cent) (GK).

Table 8: Categories statement 7

Category	Percentage
GA: Companies will leave if they have to do more	1.5%
GB: Enough is already being done by businesses and residents	0.9%
GC: Not feasible to tackle biggest polluters the most	2.8%
GD: Not the responsibility of residents and businesses to do anything, but of the government.	0.6%
GE: No finger pointing, it is a collective responsibility	1.9%
GF: It is fair/just to let big polluters do more	29.6%
GG: Polluting businesses and residents are the main target group to address	29.7%
GH: The polluter should pay	19.7%
GI: A distinction must be made between companies	0.6%
GJ: Companies must be addressed, residents not	6.6%
GK: Residents should be targeted, companies not	0.1%

Statement 8: Environmental policy should interfere with building houses as little as possible.
For statement 8, 874 of the 1472 arguments could be coded. The argument that is mentioned a lot is that the housing shortage is more urgent than environmental issues (51.6 per cent) (HD). This is mainly caused by the frequency of the argument that there are too few houses in general (HD3). The next common argument already has a much smaller share. The argument that there should be a balance between housing and the environment has a share of 13.5 per cent (HH). The least mentioned argument is that building homes is important because the population increases through migration (0.7 per cent) (HK).

Table 9: Categories statement 8

Category	Percentage
HA: No point in building more houses, Holland is just too full	4.8%
HB: Environment goes before housing	8.4%
HC: There are enough houses	1.8%
HD: Housing shortage is more urgent than environmental issues.	51.6%
HE: Housing is a primary right	7.0%
HF: There are too many rules regarding building houses	2.9%
HG: Housing is important for the economy	0.9%
HH: A balance must be struck between housing and the environment.	13.5%
HK: Building houses is important, population increase through migration	0.7%

Statement 9: Environmental policy should interfere with traffic and transport as little as possible.
For statement 9, 779 of the 1472 arguments could be coded. The most often-mentioned argument is that transport is important for accessibility (20.4 per cent) (IE). The distribution of frequencies between the subcategories is about the same for this category. Next to this, a common argument is that transport must change; more sustainable (14.9 per cent) (IC). The least mentioned arguments are that environmental policies backfire; more traffic jams lead to more emissions (1.3 per cent) (IH) and that it is not feasible (1.5 per cent) (ID).

Table 10: Categories statement 9

Category	Percentage
IA: Environment is more important than transportation	11.8%
IB: Transportation may be less, there is too much congestion on the road.	9.5%
IC: Transport must change; more sustainable	14.9%
ID: This is not feasible	1.5%
IE: Transportation is necessary for accessibility	20.4%
IF: Transportation is important for the economy	13.4%
IG: Otherwise transport will become even more expensive	3.7%
IH: Environmental policies backfire; more traffic jams lead to more emissions	1.3%
II: A balance must be struck between traffic and the environment	3.9%

5.4. General categories

General categories

For the general categories, out of all the arguments, 345 arguments have been given a general category. This is very little when you consider that this is the total across the nine statements. Next to this, it is important to mention that these arguments are already included in the total number of coded arguments given for each statement. Remarkable is that for the statement about the improvement of the environment, the frequencies of the general categories are high (122) (statement 2). This can be explained because many of the general categories are also much about environmental policy in general. For the statement about ensuring that residents and businesses that pollute the most do the most, the general categories are least mentioned (7) (statement 7). A first glance, this seems illogical because two general categories are about tackling big polluters. However, from these categories becomes not clear why big polluters should do the most, whereas this is a condition for encoding an argument to a statement

The arguments showing the respondent's negative attitude toward the government is most common (32.8 per cent) (JC). This is mainly caused by the argument that people have no trust in the government (JC2). The argument that there is no climate change is not mentioned at all (JD). In addition, the argument that has been mentioned the least is that improving the environment makes no sense if other countries do not participate (8.7 per cent) (JE).

Table 11: General categories

Category	Percentage
JB: Environment is not so important	16.5%
JC: Negative attitude towards government	32.8%
JD: There is no climate change	-
JE: Improving the environment makes no sense if other countries do not participate	8.7%
JF: Costs should be placed on big polluters.	20.9%
JG: Big polluters should be tackled first	21.2%

6

Results LCCA

This chapter presents the results of the estimated LCCA models. Firstly, the descriptive results of the dataset will be described. After that, the measurement model will be discussed. Lastly, the four structural models will be presented.

6.1. Descriptive results

The socio-demographic data of the sample are compared with the socio-demographic data of the Dutch population. This is shown in Table 12. Regarding educational level, the low-level education category includes primary school, VMBO, undergraduate- HAVO and VWO, and MBO level 1. The middle-level education category includes upper secondary- HAVO and VWO, as well as MBO levels 2-4. The high-level education category includes HBO and University. As can be seen, people under 25 are underrepresented in the dataset and people between 25 and 44 are overrepresented in the dataset. Gender is almost the same as in the population. For education, there are more low-educated people in the sample than in the population, and the reverse is true for high educated. Therefore, it can be concluded that the dataset is not fully representative of the Dutch population.

Table 12: Descriptive statistics respondents

Demographic variable	Category	Percentage sample	Percentage population
Age	< 25	11.5	CBS (2021) 27.8
	25-44	33.6	24.9
	45-64	32.0	27.6
	> 65	22.9	19.9
Gender	Men	49.4	CBS (2022) 49.7
	Women	49.9	50.3
Education level	Low	32.1	CBS (2023) 25.5
	Medium	36.1	37.2
	High	31.8	36.6

6.2. Measurement model

As indicators, the nine statements have been included in the model as count variables. The measurement model is the same for the quantitative and qualitative models. This means that it contains the same indicators.

Model fit

In Table 13 below the, BIC(LL), AIC (LL) and number of sig BVR values are presented. As can be seen, the BIC and AIC values are the smallest for the 5-cluster model. However, it was chosen by Populytics to develop a 4-cluster LCCA model because in this model the distinction between the clusters was the clearest. Also, the amount of significant BVR parameters is the lowest. However, there are still a lot of significant BVR parameters, which means that there is significant covariance between the nine indicators. For the 4-cluster model, the BIC (LL) value is 86647.4080, and the AIC (LL) value is 86440.9538.

Table 13: Model fit measurement model

Amount of clusters	BIC (LL)	AIC (LL)	Number of sig. BVR
1	98071.7569	98024.1137	31
2	91501.5279	91400.9476	36
3	88638.4798	88484.9626	36
4	86647.4080	86440.9538	34
5	85348.1422	85088.7510	35

6.3. Structural models

For the structural models, covariates have been added to the model. For all the covariates applies, if they are statistically significant, they have statistically significant relations with the probability of belonging to the identified clusters (Molin et al., 2015). In other words, the parameters are statistically different across the clusters. In this section, the *'profile'* output of Latent Gold will be used to interpret results. The profile output provides information about the probabilities of belonging to different classes for each covariate. These probabilities are adjusted so that they add up to one within clusters (Vermunt & Magidson, 2005) As mentioned in the methodology, the covariates have two levels; 0 and 1. By interpreting the profile output, statements can be made about whether an argument is likely to be mentioned in a particular cluster (1) or not (0). By comparing the probabilities of belonging to the '1' per cluster, statements can also be made about in which clusters people are most/least likely to make a particular argument.

The following section will present the results of the four estimated models. The first model is the quantitative structural model (base-case), which contains eight socio-demographic variables as covariates. The other three models contain the coded arguments as covariates. The results of these three models are compared with the base-case. Next to this, the two objective quantitative models (model 1 and model 2) are also compared.

6.3.1. Quantitative LCCA: Base-case

Firstly, the quantitative LCCA has been developed. As mentioned in the methodology, this model is adopted from the developed model of the research organisation Populytics. Important to mention is that the dataset from the base-case included a few more respondents because the quantitative clustering model was later estimated with a new dataset. For this research, it was necessary to code the dataset earlier. Therefore, the model differed a bit from the model estimated by the research organisation Populytics. However, the profiles and parameters (including significance) were not significantly different from each other. The only difference is that age was in this study just not significant.

Significance and entropy R-squared value

The parameters of education and a polluted environment are highly significant ($p = 1.2 \times 10^{-5}$; $p = 9.4 \times 10^{-4}$). Age is almost significant (p=0.77) and income, living situation, nuisance environment, health, and gender are not significant. The entropy R-squared value is 0.0693.

Description of clusters
An overview of the cluster profiles is shown in Table 14. The cluster size, indicator distribution and covariates are presented. It is important to mention that because the same model is estimated as Populytics, the results have the same essence as the results of Populytics. The report in which these results are incorporated is not published yet, but as a source Populytics (2023b) will be used. Next to this, important to mention is that only the distribution of the (almost) significant covariates is shown. The whole Table is provided in Appendix F. This section will zoom in on the cluster size and cluster descriptions.

Table 14: Cluster profiles base-case

	Cluster1	Cluster2	Cluster3	Cluster4
Cluster Size	60.9	19.0	12.8	7.3
Indicators				
Statement 1: The government should always strictly control laws and regulations on the environment	5.6	8.1	0.9	3.9
Statement 2: The government must do as much as it can to improve the environment	5.8	11.4	0.6	2.0
Statement 3: The government must ensure that improving the environment costs as little as possible	5.0	1.3	8.0	4.0
Statement 4: The government must protect residents' health from pollution and nuisance to the best of its ability	6.5	8.7	4.8	5.9
Statement 5: The government must ensure that companies important to the Dutch economy stay here	5.4	2.1	7.2	5.0
Statement 6: The government must protect lower-income households as much as possible	5.2	5.1	6.1	21.1
Statement 7: The government must ensure that residents and businesses that pollute the most do the most	6.5	11.6	5.5	3.8
Statement 8: Environmental policy should interfere with building houses as little as possible	5.8	1.3	8.9	2.3
Statement 9: Environmental policy should interfere with traffic and transport as little as possible	4.2	0.3	7.9	1.8
Covariates				
Age				
<25	12.6%	10.1%	10.6%	7.0%
25-44	32.9%	35.1%	31.0%	39.7%
45-64	30.2%	34.9%	36.2%	32.6%
>65	24.3%	19.9%	22.1%	20.8%
Education				
Low	29.2%	16.7%	30.5%	40.1%
Average	40.0%	38.1%	41.5%	38.0%
High	30.2%	44.8%	25.9%	22.0%
Polluted environment				
1	12.3%	9.3%	27.2%	19.7%
2	40.4%	38.7%	41.0%	35.1%
3	13.0%	15.3%	11.5%	9.5%
4	30.4%	29.4%	19.2%	31.9%
5	3.9%	7.3%	1.2%	3.8%

Cluster size
The cluster size is 60.9 per cent for cluster 1, 19.0 per cent for cluster 2, 12.8 per cent for cluster 3 and 7.3 per cent for cluster 4. This means that most of the respondents are situated in cluster 1 and the least respondents are situated in cluster 4. Clusters 2 and 3 are in between this.

Description cluster profiles *(Populytics, 2023b)*

Cluster 1: Predominantly neutral
Cluster 1 is the biggest cluster, in which most respondents are situated. Within this cluster, no highest or lowest number of points are assigned to statements in comparison to other clusters. It could therefore be said that this cluster is predominantly neutral. The highest amount of points is given to statement 4: The government must protect residents' health from pollution and nuisance to the best of its ability (6.5) and statement 7: The government must ensure that residents and businesses that pollute the most do the most (6.5). The lowest amount of points is given to statement 9: Environmental policy should interfere with traffic and transport as little as possible (4.2). Relative to the other clusters, this cluster has the highest number of people under 25 and over 65.

Cluster 2: Unconditionally environmentally friendly
Cluster 2 is the second biggest cluster. Within this cluster, many points are given to the environmental-friendly options (statements 1, 2, 4 and 7). The least amount of points is given to cost-related statements; statement 3: The government must ensure that improving the environment costs as little as possible (1.3) and statement 5: The government must ensure that companies important for the Dutch economy stay here (2.1). Next to this, the least number of points were given for the statements about housing (statement 8) and transport (statement 9), 1.3 and 0.3 points respectively. This cluster contains the highest number of highly educated people and the lowest number of low-educated people. Next to this, they find their environment very polluted in comparison to the other clusters (scores 3 and 5).

Cluster 3: Costs over environmental protection
Cluster 3 is the second smallest cluster. People in cluster 3 are opposite to people in cluster 2. They give the lowest amount of points to the environmental-friendly options (Statements 1, 2, 4) and the highest amount of points for cost-related statements (statements 3 and 5). Next to this, the highest amount of points are given for housing (statement 8) and transport (statement 9), 8.9 and 7.8 respectively. This cluster contains most people aged between 45 and 64. In addition, this cluster contains the most average educated people and do not consider their environment polluted at all (scores 1 and 2).

Cluster 4: Protectors of low-income people
Cluster 4 is the smallest cluster. In this cluster, by far the highest number of points is given to statement 6: low-income protection (21.1). Relatively few points are given for the statements about housing (statement 8) and transport (statement 9), 2.3 and 1.8 respectively. Next to this, they give an average amount of points to the environmental-friendly statements (Statements 1,2,4 and 7). In this cluster, people aged between 25 and 54 are overrepresented compared to other clusters. Next to this, this cluster contains the highest number of low-educated people.

6.3.2. Qualitative LCCA: Subcategories (model 1)
Firstly, all the subcategories have been added to the base-case model as nominal covariates. Together with the covariates from the quantitative model, this resulted in 181 covariates. After that, by backward elimination, the insignificant covariates were made inactive. Because of the huge amount of covariates, it was chosen to execute a more efficient approach in conducting the backward elimination procedure; per elimination step, the variables with the lowest and second-lowest significance have been made inactive. In the end, a model with 36 active arguments was estimated. None of the codes from statement 4(D) turned out to be statistically significant.

Entropy R-squared value
The entropy R-squared value is 0.3660.

Comparison with base-case
In comparison to the significance of the socio-demographics added in the base-case-model, the variables education, income and polluted environment have become less significant. However, education and polluted environment are still statistically significant. Health is rarely changed. Age, living situation, nuisance environment and gender have become more significant. Age and living situation have even become significant.

Table 15: Significance socio-demographics base-case versus Model 1 Qualitative LCCA

Covariate	P-value base-case	P-value model 1
Age	0.077	0.040
Education	1.2×10^{-5}	0.011
Income	0.18	0.33
Living situation	0.30	0.015
Polluted environment	0.00094	0.00020
Nuisance environment	0.22	0.15
Health	0.77	0.79
Gender	0.76	0.28

Description of clusters
In Table 16, the distribution of the arguments as covariates can be seen. The percentage shows how likely the individual in that cluster is to give that specific argument.

For the arguments about control by the government, there is a clear distinction between people in cluster 2 and people in cluster 3. People in cluster 2 are more likely to give arguments about the importance of control by the government; there should be consequences for actions (AH2), preventing tampering/abuse/violation (AH3) and otherwise, laws and regulations are pointless (AH4). People in cluster 3 are least likely to give these arguments and stress the fact that strict control is not feasible (AE).

For the arguments about improving the environment by the government, there is also a clear distinction between clusters 2 and 3. People in cluster 2 are more likely to give arguments about the importance of improving the environment; it is a core task of the government (BD), it is important for future generations (BE), it goes badly with the environment (BF1) and the environment is the most important thing (BF3). People in cluster 3 are least likely to give these arguments. Together with people in cluster 4, they are more likely to give the argument that there is no need to do more, the government is already doing enough to improve the environment (BA).

For arguments about cost savings for environmental expenditure, there is also a clear distinction between clusters 2 and 3. People in cluster 2 are more likely to give arguments against cost savings; the environment is important, it may cost something (CB1) and improvement of the environment always costs money (CB4). People in cluster 3 are more likely to give arguments for cost savings; this leaves more money for more important/other things than the environment (CE).

For arguments about ensuring that companies that are important to the Dutch economy stay here, there is a clear distinction between cluster 2 and the other clusters. In cluster 2, people are more likely to give arguments about the subordination of economics to the environment; the environment always comes before the economy (EA), polluting companies should go away, and environmentally conscious companies should stay (EJ). People in the other 3 clusters emphasise the importance of the economy; retaining companies is important for the economy (EG3).

For arguments about the protection of lower-income households, arguments in cluster 4 are most remarkable. People in this cluster are more likely to give arguments about the importance of protecting lower-income households; lower incomes are already struggling to make ends meet (FJ1), lower incomes are always hit the hardest (FJ2), and environmental measures should not lead to additional financial burdens (FJ3). Next to this, people in cluster 4 are also most likely to give the argument that the statement is important (FO). These mentioned arguments are about equally distributed across the other clusters.

For the statement about ensuring that residents and businesses that pollute the most do the most, no clear distinction between the clusters can be observed. The arguments that it is a joint responsibility (GE) and the statement is not important (GM) are equally distributed across all clusters.

For arguments about the trade-off between environmental policies and building homes, there is a clear distinction between cluster 2 and the other clusters. People in cluster 2 are more likely to make arguments describing that the environment goes before housing development (HB), while people in the other clusters are more likely to make arguments describing that building homes is more important, there is a shortage of housing (HD3). People in cluster 3 are most likely to give this argument. The argument that there is not enough housing for Dutch people (HD4) is almost zero for every cluster.

The same applies to the statement about the trade-off between environmental policies and traffic and transport. People in cluster 2 are more likely to make arguments describing that the environment goes before traffic and transport (IA), while people in cluster 3 are more likely to make arguments that traffic and transport are more important, transport is important for commuting (IE1) and transport is important for the economy (IF). People in cluster 3 are most likely to give these arguments. The argument that there should be a balance between transport and the environment is almost equally distributed across all the clusters, but the highest for cluster 1.

Lastly, regarding the general statements, people in clusters 3 and 4 are more likely to give arguments showing that they have no trust in the government and that environmental policy makes no sense if other countries do not participate than people in clusters 1 and 2.

Table 16: Cluster profiles model 1

Arguments	**Percentage**			
Statement 1:				
AE: Strict control is not feasible	1%	0%	7%	0%
AH2: There must be consequences for acting	2%	7%	1%	1%
AH3: Prevent tampering/abuse/violation	8%	13%	1%	3%
AH4: Otherwise, laws and regulations make no sense	13%	22%	2%	6%
AO: Statement is important	7%	6%	4%	6%
AP: Statement is not important	1%	1%	7%	2%
Statement 2:				
BA: No need to do more, government already does enough to improve environment	1%	1%	6%	7%
BD: Protection of environment is core task of government	13%	20%	2%	11%
BE: Improving the environment is important for future generations	5%	10%	0%	7%
BF1: It goes badly with the environment	8%	14%	0%	3%
BF3: The environment is most important	2%	5%	0%	0%
BK: Statement is not important	1%	0%	5%	4%
Statement 3:				
CB1: Environment is important; may cost something	6%	28%	1%	4%
CB4: Improving the environment always costs money	3%	12%	1%	2%
CE: This leaves more money for more important/other things than the environment	4%	0%	6%	2%
Statement 5:				
EA: Environment always comes before economy	1%	11%	2%	2%
ED: Government has no influence on this	1%	5%	2%	1%
EG3: Important for the economy	18%	9%	21%	19%
EJ: Polluting companies should go away, environmentally aware ones stay	4%	12%	2%	4%
EL: Statement is not important	1%	5%	2%	3%
Statement 6:				
FJ1: Lower incomes are already struggling to make ends meet	12%	9%	16%	26%
FJ2: Lower incomes are always hit the hardest	2%	3%	2%	7%
FJ3: Environmental measures should not lead to additional financial burdens	5%	5%	5%	8%
FO: Statement is important	3%	2%	3%	7%
Statement 7:				
GE: No finger-pointing; joint responsibility	1%	1%	2%	1%
GM: Statement is not important	0%	0%	3%	4%
Statement 8:				
HB: Environment comes before housing	3%	16%	1%	3%

HD3: Too few houses in general	26%	14%	36%	17%
HD4: Not enough housing for Dutch people	0%	0%	3%	2%
Statement 9:				
IA: Environment is more important than transport	3%	20%	1%	3%
IE1: Transport is important for commuting	4%	1%	7%	3%
IF: Transport is important for the economy	8%	2%	13%	3%
II: A balance must be found between traffic and transport	3%	1%	1%	1%
IJ: Statement is important	8%	2%	13%	4%
General categories				
JC2: No trust in government	3%	3%	14%	11%
JE: There is no point if other countries do not participate	1%	1%	4%	3%

6.3.3. Qualitative LCCA: Main categories (model 2)

For the second model, all the main categories have been added as covariates to the model. After that, by means of backward elimination, the most insignificant covariates were one-by-one made inactive, until only significant variables remained. None of the codes from statement 4(D) have been included in the model. In the end, a model with 27 active arguments was estimated.

Entropy R-squared value
The entropy R-squared value is 0.3402.

Comparison with base-case
In comparison to the significance of the socio-demographics added in the base-case model, the variables education, income, and polluted environment have become less significant. Age went from almost statistically significant to not significant at all. However, education and polluted environment are still statistically significant. Health and nuisance environment are rarely changed. On the other hand, living situation and gender have become more significant. The living situation is almost significant.

Table 17: Significance socio-demographics base-case versus Model 2 Qualitative LCCA

Covariate	P-value base-case	P-value model 2
Age	0.077	0.16
Education	1.2×10^{-5}	0.0090
Income	0.18	0.53
Living situation	0.30	0.076
Polluted environment	0.00094	0.020
Nuisance environment	0.22	0.37
Health	0.77	0.75
Gender	0.76	0.10

Description of clusters
In Table 18 the distribution of the arguments as covariates can be seen. For the arguments about control by the government, there is only one significant argument. For this argument, there is a clear distinction between people in cluster 2 and people in cluster 3. People in cluster 2 are more likely to give an argument about the importance of control; control is needed for the sake of the environment (AH), while people in cluster 3 are least likely to give this argument.

For the arguments about improving the environment by the government, there is also a clear distinction between clusters 2 and 3. People in cluster 2 are more likely to give arguments about the importance of improving the environment; it is a core task of the government (BD), it is important for future generations (BE), and improving the environment is necessary/urgent (BF). People in cluster 3 are least likely to give these arguments.

For arguments about cost savings for environmental expenditure, there is only one significant argument. The significant statement is; environmental improvement need not cost as little as possible (CB). People in cluster 2 are very likely to give this argument in comparison to the other clusters.

For arguments about ensuring that companies that are important to the Dutch economy stay here, there is a clear distinction between cluster 2 and the other clusters. In cluster 2, people are more likely to give arguments about the subordination of economics to the environment; the environment always comes before the economy (EA) and polluting companies should go away, and environmentally conscious companies should stay (EJ). People in the other 3 clusters emphasise the importance of the economy; retaining companies is important for the economy (EG).

For arguments about the protection of lower-income households, the probability of the argument; low-income people have it hard enough as it is (FJ) is very high in cluster 4. People in this cluster are also most likely to give the argument that the statement is important (FO). The likeliness of people giving an argument that it is fair to help these people is almost zero for all the clusters. This argument also occurs only six times in the entire dataset.

For the statement about ensuring that residents and businesses that pollute do the most, there is a clear distinction between clusters 1 and 2 and 3 and 4. Within clusters 1 and 2, people are more likely to argue that polluters should do the most because this is just (GF), they are the most important target group to address (GG) and the polluter should pay (GH). People in clusters 3 and 4 are less likely to give these arguments.

For arguments about the trade-off between environmental policies and building homes, there is a clear distinction between cluster 2 and cluster 3. People in cluster 3 are more likely to make arguments describing that building homes is more important, building housing is more urgent than environmental issues (HD), and housing is a primary right (HE). People in cluster 2 are more likely to emphasise that there should be a balance between housing and the environment (HH). The argument that the statement is important (HI) is almost zero for every cluster.

For the statement about the trade-off between environmental policies and traffic and transport, people in cluster 3 are more likely to make arguments that transport goes before the environment; transport is necessary for accessibility (IE), transport is important for the economy (IF) and the statement is important (IJ). These arguments are least likely to be mentioned by people in cluster 2. The argument that there should be a balance between housing and the environment (II) is almost zero for every cluster, but the highest for cluster 1.

Lastly, regarding the general statements, people in clusters 3 and 4 are more likely to give arguments showing that the environment is not that important (JB), and that they have no trust in the government (JC) than people in clusters 1 and 2.

Table 18: Cluster profiles model 2

Arguments	**Percentage**			
Statement 1:				
AH: Control is needed for the sake of the environment	35%	54%	10%	15%
Statement 2:				
BA: No need to do more, government already does enough	1%	1%	7%	7%
BD: Protection of environment is core task of government	13%	20%	3%	9%
BE: Improving environment is important for future generations	5%	10%	1%	7%
BF: Improving environment is necessary/urgent	13%	22%	1%	4%
Statement 3:				
CB: Environmental improvement need not cost as little as possible	11%	46%	1%	6%
Statement 5:				
EA: Environment always comes before economy	2%	11%	1%	2%
ED: Government has no influence on this	1%	5%	2%	2%
EG: Businesses matter for socio-economic development	33%	17%	33%	34%
EJ: Polluting companies must go, environmentally aware ones stay	4%	12%	1%	4%
EL: Statement is not important	1%	4%	1%	3%
Statement 6:				
FG:It is fair to help these people	0%	0%	0%	2%
FJ: Low-income people have it hard enough as it is	22%	19%	21%	49%
FO: Statement is important	3%	2%	2%	7%
Statement 7:				
GF: Environmental justice	18%	22%	10%	11%
GG: Polluting companies and residents are the most important target group to tackle	16%	27%	13%	11%
GH: The polluter should pay	12%	15%	6%	9%
Statement 8:				
HD: Building housing is more urgent than environmental issues	32%	17%	42%	29%
HE: Housing is a primary right	5%	2%	5%	3%
HH: A balance must be struck between housing construction and the environment	8%	14%	3%	3%
HI: Statement is important	3%	0%	2%	1%
Statement 9:				
IE: Transport is necessary for accessibility	11%	3%	21%	10%
IF: Transport is important for economy	8%	2%	13%	4%
II: A balance must be found between traffic and transport	3%	1%	1%	1%
IJ: Statement is important	8%	2%	14%	4%
General categories				
JB: Environment is not that important	1%	0%	12%	5%
JC: Negative regard towards government	4%	4%	14%	14%

6.3.4. Comparison models

In the previous sections, a model with all the subcategories (6.3.2) and a model with all the main categories (6.3.3) have been estimated. This section will compare the outcomes of both models with the profiles of the base-case quantitative LCCA (6.3.1), and discuss the similarities and differences between the model with subcategories and the model with main categories. In Table 19 is displayed whether the arguments from the statement match the distribution of points for the corresponding statement. When it matches the cell has been given the same colour, when one of the models matches it has been given a purple colour, and in the cell is presented which model matches the data.

Table 19: Comparison cluster profiles base-case and distribution qualitative arguments

	Cluster1	**Cluster2**	**Cluster3**	**Cluster4**
Cluster Size	60.9	19.0	12.8	7.3
Indicators				
Statement 1: The government should always strictly control laws and regulations on the environment	5.6	8.1	0.9	3.9
Significant arguments statement 1		✓	✓	
Statement 2: The government must do as much as it can to improve the environment	5.8	11.4	0.6	2.0
Significant arguments statement 2		✓	✓	
Statement 3: The government must ensure that improving the environment costs as little as possible	5.0	1.3	8.0	4.0
Significant arguments statement 3		✓	✓	
Statement 4: The government must protect residents' health from pollution and nuisance to the best of its ability	6.5	8.7	4.8	5.9
Significant arguments statement 4	No significant arguments			
Statement 5: The government must ensure that companies important to the Dutch economy stay here	5.4	2.1	7.2	5.0
Significant arguments statement 5		✓	✓	
Statement 6: The government must protect lower-income households as much as possible	5.2	5.1	6.1	21.1
Significant arguments statement 6				✓
Statement 7: The government must ensure that residents and businesses that pollute the most do the most	6.5	11.6	5.5	3.8
Significant arguments statement 7		Model 2		Model 2
Statement 8: Environmental policy should interfere with building houses as little as possible	5.8	1.3	8.9	2.3
Significant arguments statement 8		Model 1	✓	
Statement 9: Environmental policy should interfere with traffic and transport as little as possible	4.2	0.3	7.9	1.8
Significant arguments statement 9		✓	✓	

Firstly, regarding statement 1, in both models, the distribution of the qualitative arguments matches the distribution of points. People in cluster 2 gave the highest amount of points to the statement, while people in cluster 3 gave the least amount of points; people in cluster 2 are most likely to give arguments for control by the government, and people in cluster 3 are least likely to give arguments for control by the government. However, in model 2, only one argument is significant, namely the argument in favour of government control (AH), while in model 1 six arguments are significant

For statement 2, the distribution of arguments also matches the distribution of points. People in cluster 2 gave the highest amount of points to the statement, while people in cluster 3 gave the least amount of points; people in cluster 2 are most likely to give arguments for the improvement of the environment, and people in cluster 3 are least likely to give these arguments. The only difference between the two

models is that in model 1, the argument *'statement is not important'* (BK) is also significant.

The same applies to the connection between the distribution of points over statement 3 and the qualitative arguments given. People in cluster 2 gave the least amount of points to the statement, while people in cluster 3 gave the highest amount of points; people in cluster 2 are least likely to give arguments about the importance of cost savings, while people in cluster 3 are most likely to mention this. However, in model 2 there is only one significant argument, which is the statement against cost savings (CB) while there are three arguments significant arguments in model 1.

For statement 4, there are no significant arguments in either of the two models. Implying that there is no difference in the distribution of different arguments on health protection. This does not match the distribution of points over the statement; people in cluster 2 gave the highest amount of points to this option (8.7) and people in cluster 3 the lowest amount of points (4.8).

For statement 5, both models match the quantitative data; people in cluster 2 argue that the environment comes before the economy, while in the other clusters often the arguments show that the economy comes before the environment. This applies most often to cluster 3. This is also reflected in the quantitative data for statement 5, cluster 3 has the highest score (7.2) and Clusters 1 and 2 have a slightly lower score (5.4 and 5.0 respectively), yet still significantly higher than the score of cluster 2 (2.1).

For statement 6, the importance of the protection of low incomes, expressed in the high amounts of points given by people in cluster 4, is also reflected in the qualitative data; people in cluster 4 emphasise the importance of the protection of low-income households. Next to this, for the other clusters, the arguments are about equally distributed. This corresponds to the distribution of the points over statement 7; the number of points given is almost the same for these three clusters. However, only arguments in favour of the protection of low incomes are included in both models.

For statement 7, the included arguments are completely different for both models. In model 1, the arguments are almost equally distributed over the clusters. This does not match the quantitative data; people in cluster 2 gave the most points to this statement (11.6), then people in cluster 1 (6.5) and cluster 3 (5.5), and the least amount of points were given by people in cluster 4 (3.8). This does match with the distribution of the arguments in model 2; people in clusters 1 and 2 are more likely to argue that polluters should do the most, while people in clusters 3 and 4 are less likely to give these arguments. However, in model 2 are only arguments in favour of ensuring that big polluters do the most significant.

For statement 8, model 1 matches fully the quantitative data, while model 2 matches partially. Confirmed for both models is that people in cluster 2 prefer the environment over housing, while people in cluster 3 prefer housing over the environment. However, in both models, there are different arguments significant. Model 1 contains arguments in favour of and against the statement, while model 2 only contains arguments in favour of the statement. The contradiction of model 2 with the quantitative model is that the argument about a balance between housing and building houses (II) is mentioned most often in cluster 2, while the number of points given for housing is the lowest in this cluster (1.3).

For statement 9, the preference for the environment over transport by people in cluster 2 and the preference for transport over the environment by people in cluster 3 emerge in the qualitative data in both models. The only difference between the two models is that model 1 includes arguments for and against the proposition, while model 2 includes arguments for the proposition only.

Lastly, for the general statements, in both models, the negative attitude/trust in the government emerges. The argument that there is no point if other countries do not participate (JE) is only significant in model 1, while the argument that the environment is not that important is significant in model 2. The latter is most likely to be mentioned in cluster 3, which corresponds to the low amount of points given to environmentally friendly statements by people in cluster 3.

In Table 20 below, an overview of the comparison of the two models is shown. The first criterion is for how many statements the model matches the quantitative base-case model. Matching means if the distribution of points over the clusters is consistent with the distribution of arguments over the clusters. The question mark means it does not confirm the quantitative data, but does not contradict it either. This could be a new, more in-depth, insight that has emerged from the quantitative data. The second criterion is whether both viewpoints are presented. The last criterion is the entropy R-squared of both models.

Table 20: Comparison model 1 and model 2

	Model 1	**Model 2**
Matching quantitative data # statements		
Yes	7	7
No	2 (statement 4 + statement 7)	1 (statement 4)
?	0	1 (Statement 8)
Presenting both viewpoints #statements		
Yes	5	2
No	3	6
Entropy R-squared	0.3660	0.3402

6.3.5. Qualitative LCCA: Policy-focused (model 3)

Thirdly, all categories which include trade-offs between the environment and other issues have been included as covariates. These are the following codes; AF, AH1, AH2, AH3,AH4, BA, BF, CB1, CB2, CB3, CB4, CD, DA, DC, EA, EG1, EG2, EG3, EG4, HB, HD1, HD2, HD3, HD4, IA, IE1, IE2, IF. By means of backward elimination, the insignificant covariates have been made inactive. In the end, AH1, AH2, AH3, AH4, BA, BF1, CB1, CB4, CD EA, EG3, HB, HD3, HD4, IA, IF have been included as active covariates in the model. None of the codes from statement 4(D) have been included as active covariates in the model.

Entropy R-squared value
The entropy R-squared value is 0.2408.

Comparison with base-case
In comparison to the significance of the socio-demographics added in the base-case model, the variables education, income and polluted environment have become less significant. However, education and polluted environment are still statistically significant. Health is rarely changed. On the other hand, age, living situation and gender have become more significant. Age has even become statistically significant.

Table 21: Significance socio-demographics base-case versus Model 3 Qualitative LCCA

Covariate	**P-value base-case**	**P-value**
Age	0.077	0.033
Education	1.2×10^{-5}	0.0014
Income	0.18	0.46
Living situation	0.30	0.080
Polluted environment	0.00094	0.0041
Nuisance environment	0.22	0.069
Health	0.77	0.74
Gender	0.76	0.37

Description of clusters
In Table 22, the distribution of arguments across clusters be seen. For the arguments about control by the government, only the arguments for control of the environment are significant. The argument that enforcement capacity should be used for other things than the environment is not significant (AF). People in cluster 2 are most likely to give these arguments, while people in cluster 3 are least likely to give these arguments. This also corresponds to the quantitative distribution of points over the clusters.

On the other hand, for the statement about the improvement of the environment by the government, there is one statistically significant argument against (BA) and one statistically significant supporting argument (BF1). Regarding the argument for, no need to do more, the government already does enough to improve the environment (BA), people in clusters 3 and 4 are most likely to give this argument, while people in clusters 1 and 2 are least likely to give this argument. People in these clusters are most likely to give the argument for environmental improvement; the environment is in bad shape (BF1). This matches the distribution of points over the statements; cluster 1 (5.8) and cluster 2 (11.4), whereas cluster 3 (0.6) and cluster 4 (2.0).

Following up on this, there is also a clear distinction between an argument for saving costs for environmental improvement and arguments against saving costs for environmental improvement. For the latter, people in cluster 2 are most likely to give arguments showing that cost-cutting is not needed; the environment is important, may cost something (CB1), and improving the environment always costs money (CB4). Contrary to this, people in cluster 3 are least likely to give these arguments and emphasise the importance of cost-cutting; the environment has already cost enough (CD). This also corresponds to the quantitative distribution of points over the clusters

For the statement about the trade-off between environment and economy, there is also a clear distinction between people in clusters 1, 3, and 4 and people in cluster 2. People in clusters 1,3 and 4 are more likely to give an argument indicating that the economy comes before the environment; is important for the economy (EG3) and people in cluster 2 are more likely to give an argument indicating that the environment comes before the economy; environment always comes before the economy (EA). Among the three clusters where the economy takes precedence over the environment, people in cluster 3 are most outspoken about this. This matches the distribution of points over the statements; cluster 1 (5.4), cluster 3 (7.2), and cluster 4 (5.0), while cluster 2 (2.1).

For the trade-off between environment and housing. People in cluster 2 are more likely to give an argument indicating that the environment comes before housing, the environment comes before housing (HB), while people in clusters 1, 3, and 4 are least likely to give this argument. People in clusters 1 and 3 are most likely to give arguments indicating that there is not enough housing; not enough housing in general (HD3). People in cluster 4 are almost as reluctant as people in cluster 2 to give these arguments. This matches the distribution of points over the statements. Participants from clusters 1 and 3 assigned a higher number of points to this statement, with scores of 5.8 and 8.9, respectively. However, individuals in cluster 4 allocated fewer points (2.3), and those in cluster 2 allocated the fewest points (1.3). The argument that there is not enough housing for Dutch people (HD4) is almost zero for every cluster.

Lastly, for the trade-off between the environment and transport, people in cluster 2 are more likely to give an argument indicating that the environment comes before transport; the environment is more important than transport (IA), while people in clusters 1,3 and 4 are least likely to give this argument. People in clusters 1 and 3 are most likely to give arguments indicating that transport is important for the economy (IF). People in cluster 4 are almost as reluctant as people in cluster 2 to give these arguments. This also matches the distribution of points over the statements, which is relatively similar to the previous statement.

Table 22: Cluster profiles model 3

Arguments	**Percentages**			
Statement 1:				
AH1: Compliance enforcement is needed	6%	6%	1%	4%
AH2: There should be consequences for acting	2%	7%	1%	1%
AH3: Prevent tampering/abuse/violation	8%	13%	1%	3%
AH4: Otherwise laws and regulations are pointless	13%	22%	2%	5%
Statement 2:				
BA: No need to do more, government already does enough to improve environment	1%	1%	6%	7%
BF1: The environment is in bad shape	7%	14%	1%	3%
Statement 3:				
CB1: Environment is important, may cost something	6%	28%	1%	4%
CB4: Improving the environment always costs money	3%	12%	1%	3%
CD: Environment has already cost enough	1%	0%	6%	2%
Statement 5:				
EA: Environment always comes before economy	1%	11%	1%	2%
EG3: Important for economy	18%	9%	21%	17%
Statement 8:				
HB: Environment comes before housing	3%	16%	0%	2%
HD3: Not enough housing in general	26%	14%	36%	16%
HD4: Not enough housing for Dutch people	0%	0%	3%	2%
Statement 9:				
IA: Environment is more important than transport	4%	20%	1%	3%
IF: Transport is important for economy	8%	2%	13%	3%

7

Results Focus group

This chapter will discuss the main results of the focus group. The entire summary can be found in Appendix G. Based on the analysis results in the previous section, it is chosen to present model 1 as the objective model, because the entropy R-squared value is better, and the model more often contains arguments for and against the statements (Table 20). Firstly, the added value of qualitative LCCA models for policy-makers in general will be discussed. This means looking at added value without distinguishing between the two models. After that, the objective and subjective models will be compared.

7.1. Added value qualitative LCCA models in general

7.1.1. Cluster sizes

As mentioned in the previous section, people in clusters 2 and 3 often have the highest or lowest likelihood of giving outspoken arguments. However, these clusters contain only 33 per cent of the respondents, while the more neutral people in clusters 1 and 4 contain 67 per cent of the respondents. The question is how to deal with this small but outspoken group. According to multiple policy-makers, it is not feasible to change policies for the most outspoken people in clusters 2 and 3 because the opinions are usually too extreme to adjust the policies to. However, it can be ensured that these groups feel heard. The qualitative analysis makes it possible to respond effectively to the most outspoken individuals by providing a clear overview of the counterarguments. Consequently, governmental communication strategies can be adjusted accordingly. According to one policy-maker, ignoring this group would be the usual response, as it is assumed that they will not support the policy in any way. However, when there are more insights through the qualitative data, it becomes visible why people think something, and governmental communication strategies can be adjusted accordingly.

Unlike the NMP case, which has relatively few respondents in the most outspoken clusters, the added value could be different if more people were in these clusters. In this case, there is more need to adjust policies (partially) for these outspoken people because their opinions are more representative of the overall population and require greater consideration.

However, in the case of the NMP, the extra qualitative analysis was worth it according to the policy-makers; the small group makes a lot of noise, and it is valuable to adjust governmental communication strategies accordingly. When dealing with a controversial topic like the NMP, there must be a clear overview of all the perspectives. Then it is worth the extra costs and time. However, it would make more sense on more controversial or politically sensitive topics. Furthermore, according to one policy-maker the added value of the qualitative analysis also depends on the stage of the policy process in which the PVE is conducted. The main issue is whether something can still be done with the PVE input or not.

7.1.2. Potential pitfalls

In addition to these advantages associated with gaining a better understanding of more extreme perspectives, according to one policy-maker, care must be taken not to focus excessively on extreme opinions. When the government only focuses on extreme views and ignores more moderate opinions, it leads to polarisation in society. The absence of attention to moderate opinions can result in the strengthening of extremes and the exclusion of moderate opinions. According to another policy-maker, it is therefore important not to focus only on points where people disagree but instead to look for starting points to start a conversation. These starting points can also emerge from the qualitative analysis. In addition, it is important to focus the governmental communication strategy not only on people who think that the environment is not important but also on people who think policies are too complex. By tailoring governmental communication strategies to both target groups, their concerns can be effectively addressed, and dialogue can be initiated.

7.1.3. Separation of quantitative LCCA from qualitative LCCA

Although policy-makers see the added value of qualitative analysis in the case of the NMP, the importance of separating the qualitative LCCA analysis from the quantitative LCCA analysis is emphasised by all policy-makers. Certain added value aspects can only be determined once the quantitative model has been estimated. As mentioned earlier, the size of the different clusters plays a role in this determination. Additionally, two factors are crucial in determining the need for additional qualitative LCCA. First, it depends on how clear the clusters that emerge from the quantitative LCCA are. For the NMP PVE, clear clusters emerged, but this might not be the case for other PVEs. In such cases, there would be a need for an additional qualitative LCCA to provide a clearer cluster distinction. Second, the clusters from the quantitative LCCA may give a reason to use the qualitative data to effectively approach people in certain clusters. For example, it may turn out that support from people in a particular cluster is needed or that much resistance is expected from a particular cluster.

7.2. Conclusion focus group

Concluding the above, according to the policy-makers, the added value of qualitative LCCA analysis is context-dependent, and it depends on several factors if the costs outweigh the benefits. Table 23 shows an overview of these factors. A distinction can be made between Context-dependent General factors, which can be determined based on the PVE topic, and Context-dependent Quantitative LCCA factors, which can be determined based on the results from the quantitative LCCA.

Table 23: Seven factors for determining added value qualitative LCCA

Factors	Definition	Example
Context-dependent general factors		
Political sensitivity PVE topic	Whether the PVE topic is politically sensitive	COVID policy
Controversially PVE topic	Whether there are significant differences in opinions on the PVE topic within society	Abortion
Stage of the policy process	Whether something can still be done with the PVE input or not	PVE conducted at the end of policy process; no major policy changes can be made
Context-dependent Quantitative LCCA factors		
Expected resistance from the particular cluster against policy	Whether the point distribution within a given cluster indicates strong opposition to the policy in question	People in a certain cluster give few points to environmentally friendly measures in NMP PVE
Needing people from a particular cluster	Whether you need support for your policy from a specific cluster	People from agricultural organisations that also have to agree to the agricultural agreement
Relative size clusters with the most outspoken people	Size of outspoken cluster(s) relative to the more neutral cluster(s)	Big group of outspoken people; much attention should be paid to them
Clarity of clusters	Whether a clear distinction between the clusters can be observed based on the quantitative data in the LCCA clusters	No clear proponents and opponents can be distinguished in the clusters based on the quantitative data

7.3. Comparison objective and subjective LCCA models

Besides this general added value, a distinction can also be made between the added value of the objective LCCA model and the subjective LCCA model. According to all the policy-makers, it is necessary to start with an objective model and then explore whether this gives rise to estimating a subjective one. It is impossible to decide in advance which variables should be included in the subjective model. Next to this, all policy-makers agreed that 36 variables in the objective model is a manageable number of variables for the objective model; a model with fewer variables is not necessary.

7.4. Point of discussion

It must be mentioned that one policy-makers expresses concern about the potential risks of creating the codebook and coding by one organisation. These people are all in the same bubble. It could be said that the data is manipulated to achieve the desired results. Therefore, exploring ways to make the coding process as objective as possible becomes necessary. One possible solution is to involve an independent third party in the coding process.

8

Conclusion

The major social issues currently faced by the Dutch government require the involvement of all stakeholders early in the policy-making process. A Participatory Value Evaluation (PVE) is a public participation method in which citizens can advise the government on a specific decision-making problem. The PVE information is becoming increasingly complex these days. The complexity arises from the variety of opinions and the amount of information collected. This complexity makes it more challenging to process and accurately present this information to policy-makers. Therefore, it is essential to ensure that this complexity of citizens' opinions is preserved and communicated to policy-makers. The PVE yields two types of information; the selection of policy options in the choice task generates quantitative data, while the motivations underlying the choices provide qualitative data. It is common to estimate a quantitative Latent Class Cluster Analysis (LCCA) model to get an overview of the population perspectives emerging from the PVE, but this has never been done with qualitative data, while the written arguments reflect the ideas, concerns, and values of PVE participants. Including qualitative data in the LCCA may allow validation of the clusters generated by the LCCA and may provide new insights. For example, it allows for a better understanding of the differences in preferences and the underlying behavioral reasons. This can ensure that the complexity of citizens' opinions is preserved. Ultimately, this can give policy-makers more direction for policy-making. However, including more data can also lead to information overload for policy-makers. Therefore, to investigate this knowledge gap, the following research question has been formulated:

What is the added value for policy-making of including the qualitative arguments from a Participatory Value Evaluation alongside the quantitative data in the Latent Class Cluster Analysis?

The case-study approach has been used to analyse the added value of the qualitative analysis method. The Participatory Value Evaluation for the National Environmental Program (NMP) is the case. The Dutch Ministry of Infrastructure and Water Management (IenW) is developing the NMP. The NMP describes the route to a healthy, clean, and safe living environment by 2050 for the Netherlands.

The research approach to answer the main research question consisted of four phases; a literature review on content Qualitative Content Coding (QCA), coding the qualitative NMP PVE data, estimating the qualitative- and quantitative LCCA models, and organizing a focus group with the NMP policy-makers. The literature review focused on the methodology and the quality assessment of content coding. Based on the information from the literature review, a content-coding method for this research was developed. The method was an inductive approach, using the paradigm of trustworthiness to ensure quality. Once the method was clear, the coding could begin. Initially, the categories for the codebook were derived inductively from the data. Subsequently, the codebook was tested on a sample of respondents. Finally, the arguments of all respondents were coded. The coded arguments were then used along with the quantitative data to estimate three qualitative LCCA models. In addition, an LCCA model with only quantitative data was estimated. Lastly, a focus group with policy-makers was organised to explore the added value of qualitative LCCA models for policy-making in general.

8.1. Main research outcomes

In the case of the NMP PVE, there was added value in including qualitative arguments in the LCCA. Not in the way of adjusting policies but to adjust governmental communication strategies accordingly. Next to this, including more qualitative data does not lead to an information overload for policy-makers. An LCCA model with 36 variables is a manageable number of variables; a model with fewer variables is unnecessary. Furthermore, the coded arguments influence the explanatory power of socio-demographic characteristics to a greater or lesser extent. The same socio-demographic factors remain statistically significant, but one previously insignificant socio-demographic has become statistically significant. This characteristic could predict class membership, despite not being initially recognised for its impact. Very important to mention is that no conclusion can yet be drawn on the added value for policy-making in general, as the method has only been tested with one case, and the added value is very context-dependent. Different conclusions might therefore emerge from other cases.

So, the added value of a qualitative LCCA analysis is context-dependent. The policy-makers identified seven factors that can be used to assess whether costs outweigh benefits. Figure 6 shows an overview of these factors. A distinction can be made between Context-dependent General factors, which can be determined based on the PVE topic, and Context-dependent Quantitative LCCA factors, which can be determined based on the results from the quantitative LCCA.

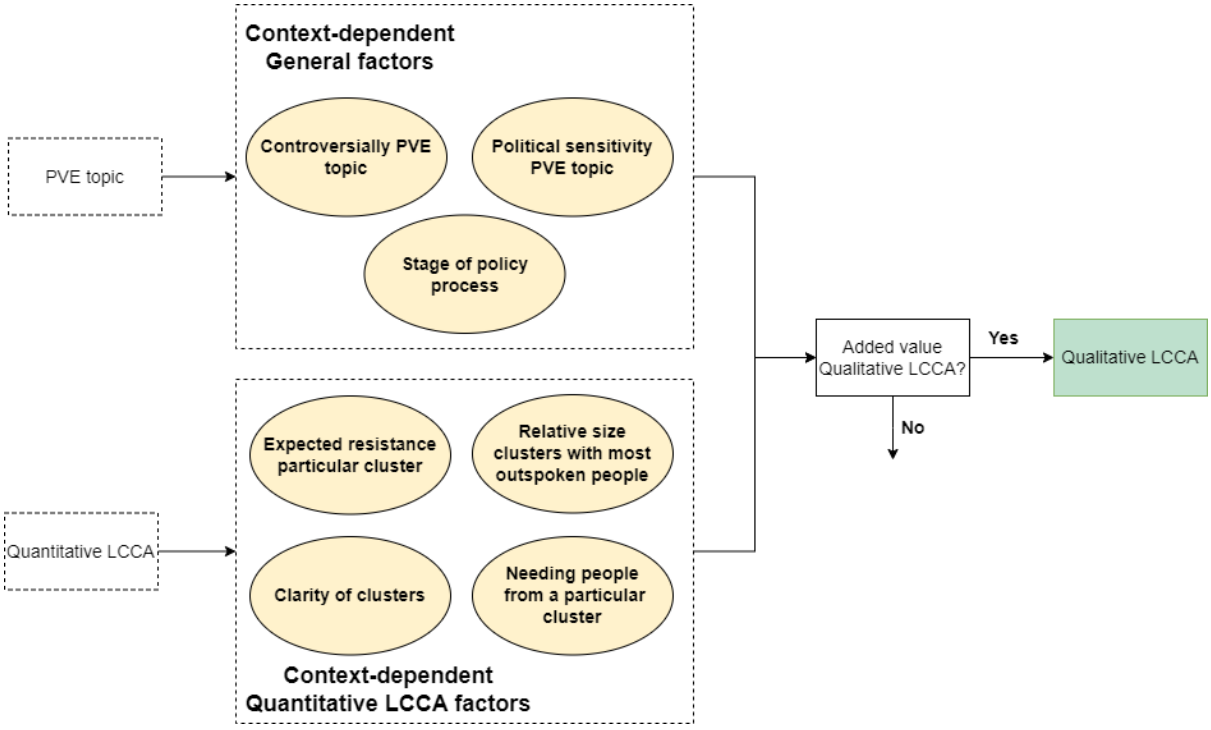

Figure 6: Seven factors determining added value qualitative LCCA

The following paragraphs will answer the sub-questions to provide a more comprehensive explanation and support for the main conclusion.

1. How can the qualitative arguments of a Participatory Value Evaluation be processed for inclusion in a Latent Class Cluster Analysis?
For the first sub-question, it can be concluded that there is no standardised methodology for QCA. The literature review revealed that the specific steps for developing categories differ across the literature. However, inductive and deductive approaches consist of three phases; preparation, organisation, and reporting. By inductive coding, there is insufficient knowledge about a topic to base categories on; therefore, categories are derived from data obtained. For inductive coding, defining the unit of analysis, open coding, and reporting results and the method are part of all methods. Sometimes grouping subcategories under main categories is also part of the method. Lastly, adapting categories and rules and/or checking

the coding consistency is sometimes part of the method. For deductive coding, categories can be based on former knowledge, and testing an existing theory is central. For deductive coding, defining the unit analysis, deriving categories from theory, and reporting the results are part of all methods. Reporting the results consists of providing confirmatory and non-confirmatory evidence for the theory on which the predefined categories are based. Similar to inductive coding, grouping subcategories under main categories or vice versa is part of the method for some deductive coding methods. The same goes for adjusting categories and rules and/or checking coding consistency.

2. How can the quality of the method to include the qualitative arguments of a Participatory Value Evaluation in a Latent Class Cluster Analysis be assessed?
Second, regarding the second sub-question, it can be concluded that there is no standardised way to assess the quality of QCA. The literature review about the quality of QCA revealed that two different paradigms can be used to assess the quality of the coding process. The quality of QCA can be assessed using the paradigm of reliability and validity or the paradigm of trustworthiness.

3. What insights does the quantitative Latent Class Cluster Model provide regarding the various clusters within the population?
Thirdly, it can be concluded that there are four clusters regarding attitudes toward environmental policies. Important to mention is that the specific outcomes of the quantitative LCCA from the case-study are not relevant to answering the main research question but are necessary to compare the results of the qualitative LCCA model with. The following four clusters have been identified:

Cluster 1: Predominantly neutral cluster: In this cluster, most respondents are situated (60.9 per cent). No highest or lowest number of points are assigned to statements within this cluster compared to other clusters. It could therefore be said that this cluster is predominantly neutral.

Cluster 2: Unconditionally environmentally friendly: This cluster is the second biggest cluster (19.0 per cent). Many points are given to environmentally friendly options within this cluster and few to cost-related options. Next to this, people in this cluster consider housing and transport least important in comparison to the other clusters.

Cluster 3: Costs over environmental protection: Cluster 3 is the second smallest cluster (12.8 per cent). People in cluster 3 are opposite to people in cluster 2. They give the lowest amount of points for the environmental-friendly options and the highest amount of points for cost-related statements. Next to this, they consider housing and transport most important in comparison to the other clusters.

Cluster 4: protectors of low-income people: Cluster 4 is the smallest cluster (7.3 per cent). In this cluster, protecting low-income people is by far the most important. Next to this, transport and housing are relatively less important. Lastly, people are predominantly neutral against the environment.

4. What does the LCCA model with qualitative input alongside quantitative input imply for and add to policy-making?
According to the policy-makers, the LCCA model with qualitative input alongside quantitative input was worth it. Although the qualitative data often validates the insights from the quantitative model and generates few new findings, primarily consisting of arguments from individuals within the most outspoken clusters 2 and 3, the qualitative model provides valuable information for tailoring governmental communication strategies for these outspoken clusters. It is not feasible to change policies for these most outspoken people because their opinions are usually too extreme to adjust the policies to. However, the small group makes a lot of noise, and it is valuable to adjust governmental communication strategies accordingly. When dealing with a controversial topic like the NMP, there must be a clear overview of all the perspectives. Then it is worth the extra costs and time. The qualitative analysis makes it possible to respond effectively to the most outspoken individuals by providing a clear overview of the counterarguments. Normally, ignoring this group would be the usual response, as it is assumed that they will not support the policy in any way. But when there are more insights through the qualitative data, it becomes visible why people think something, and governmental communication strategies can be adjusted accordingly. Furthermore, according to the policy-makers it is necessary to start with an objective model and then explore whether this gives rise to estimating a subjective model. It is not

possible to decide in advance which variables should be included in the subjective model.

As mentioned at the beginning of this paragraph, based on the statistical outcomes, it can be concluded that the qualitative data validates most of the quantitative data but does not generate many new insights. For the qualitative LCCA models, three models have been estimated. In all the models, the strong opinions of people in clusters 2 and 3 emerged from the qualitative data. People in clusters 1 and 4 were considerably less outspoken in their arguments. The distribution of arguments across clusters often corresponds to the distribution of points across clusters. However, for both models, the qualitative data does not match the quantitative data for some statements. For one statement in model 1, it is not clear whether it adds a new insight, so it does not match, or whether it does not match the qualitative data. The subjective model fully matches the quantitative data but had a lot fewer arguments included. Next to this, the predictive power of the three qualitative models is approximately five times higher than the quantitative model. Additionally, based on the results of the two objective qualitative LCCA models, an objective LCCA model with all the subcategories performs better than an objective LCCA model with only the main categories. The covariates are a better prediction of belonging to the identified clusters, and the model contains more often arguments for and against the particular statement.

Coming back to eventually taking away the explanatory power of socio-demographic characteristics, for all three models, the living situation became for all models (almost) significant. It cannot be directly explained where this lies, but it could be that there is a relation between giving particular arguments and the living situation of a respondent. Apart from this, the significance of the socio-demographics has not changed much.

9

Discussion

This chapter will first discuss the limitations of this study and will give recommendations for further research. These limitations relate to the literature review, QCA, LCCA, and generalisation issues. After that, this study's societal and scientific impact will be discussed.

9.1. Limitations and recommendations for further research

Literature review
Firstly, the literature revealed no standardised way to perform QCA. This applies to both methodology and quality assessment. Because of this, different methods from different studies have been combined. This gave the risk that the researcher had much influence on the QCA method and indirectly on the outcomes of the QCA. Whether a different method would have produced the same results cannot be said. It is for further research recommended to investigate how to standardise QCA, taking into account the different research contexts.

QCA
For the QCA process, the limitations can be categorized into two aspects: creating the codebook and the actual coding process. Firstly, concerning the codebook, for all statements, except statements two, four, and seven, the categories were based on data from the first 500 respondents of the soft-launch. Due to time constraints, waiting for the second soft-launch data was not possible. In order to check the codebook, the codebook was first tested on the data of the second soft-launch. However, the statements between these datasets differed slightly, so it cannot be ruled out that the codebook does not fully match the data. In addition, despite the involvement of the other researcher, QCA is still a subjective process. Both researchers come from the same *'bubble'*, and it could be said that the data is manipulated to achieve the desired results. It is therefore necessary to explore ways to make the coding process as objective as possible, for instance, by involving an independent third party.

Furthermore, during the actual coding process, it turned out that many arguments were not valid and could not be coded. This resulted in the number of coded arguments being almost half the total number of arguments. The respondents that could be coded differed per argument, so not every respondent had nine coded arguments. This missing data may have created biased results. It could be, for example, that the lack of data depends on certain characteristics of respondents. If this is the case, the sample would no longer represent the entire population. Therefore, caution should be used when drawing conclusions, and possible biases due to the missing data should be taken into account when interpreting the findings. For this research, the dataset became too small when excluding these respondents. However, for further research, excluding respondents with missing data is recommended. To ensure a large enough sample, it is recommended either make it mandatory for respondents to provide a motivation for their choice or take a larger sample. Alongside this, since it was only possible for the LCCA model to assign one code to each argument, sometimes a choice had to be made about the main message of the argument. In this way, the researcher influenced the outcomes of the QCA. When estimating an LCCA model, this risk cannot be avoided but can be mitigated by checking these doubtful cases with another researcher.

Finally, the QCA process was very time-consuming because it was done manually. In the case of the NMP, it was worth the extra time because it is a controversial issue, but this may differ for other cases. Time is indirectly money, so policy-makers should make thorough considerations beforehand to avoid unnecessary costs. The seven factors identified to determine whether the extra time investment can be justified should be used for this consideration. In addition, it is recommended to explore the adoption of automated QCA methods to make the process less time-intensive. However, it is essential to acknowledge that the literature highlights risks related to the validity and reliability of automation. It must therefore be investigated how these risks can be mitigated.

LCCA
There are also some limitations regarding the representativeness of the sample and the estimation of the LCCA model.

Firstly, it turned out that the dataset is not fully representative of the Dutch population. Therefore, care should be taken when drawing conclusions and generalising the results. It is therefore recommended to continue this study with a more representative sample. The dataset from the full-launch could be used for this.

Secondly, the same quantitative LCCA has been estimated as the model from Populytics in order to be able to compare the qualitative LCCA with the quantitative LCCA. However, this model had not the optimal model fit. This conclusion can be derived from the Bivariate Residual Values (BVR) that were statistically significant. This indicates significant covariance between the indicators, indicating that local independence is unmet. In order to solve this, direct effect parameters, which have a relation with the high BVR values, can be included in the model to improve the model fit (Vermunt & Magidson, 2005).

In addition, it was found that the distribution of qualitative data across clusters did not fully match the distribution of points across clusters. On the one hand, these inconsistencies may indicate that the respondent could not express his opinion well enough in the choice options and therefore mentioned it in the arguments. On the other hand, it may also indicate that the qualitative method is not fully valid. It is therefore advisable to look for these inconsistencies in other case-studies and decide on the validity of the qualitative method.

Next to this, despite the entropy R-squared of the qualitative model being five times higher than the entropy of the qualitative model, the entropy value was still low. This indicates that the covariates are not very good predictors of class membership. For further research, it would be recommended to investigate how to improve this, for example, by including another covariate selection method or adding more covariates to the model. Another limitation is that it is not clear yet what the best way is to include the general statements in the LCCA model. In this research, it was chosen to have one covariate for the general arguments that occurred across the nine statements rather than having a separate covariate for every statement. However, due to the scope of this study, the best method to include these arguments was not investigated. Therefore, it is recommended to do further research on the best method for including these general arguments.

Furthermore, due to the large number of covariates, it was chosen for the qualitative LCCA model with subcategories (model 1) to execute a more efficient approach in conducting the backward elimination procedure. It was chosen to make the variables with the lowest- and second-lowest significance inactive during one backward elimination step instead of making only variables with the lowest significance inactive. It is not clear whether this influenced the model estimation. It is therefore advisable to look for other software programs in which it is possible to do this automatically and compare these results with the results of this research.

Lastly, regarding the comparison of the two objective LCCA models, model 1 with subcategories performed the best. However, further research is needed for two reasons. Firstly, the researcher defined the comparison criteria, and secondly, in other cases with more subcategories, the use of a model with all subcategories can cause an information overload. It would be interesting to investigate the threshold value for determining the presence or absence of an information overload.

Generalisation
A major limitation of this study is that it was a single-case study. This means that the results are not directly generalisable to other cases. Due to the single-case study, no final conclusions can be drawn about the influence of the arguments on the predictive power of socio-demographics because only one socio-demographic characteristic that was not significant in the quantitative LCCA model became consistently significant in all qualitative LCCA models. Next to this, for the NMP case, it is concluded that there is added value in the qualitative method. However, this does not mean that this applies to all cases. The same applies to the seven factors that may affect the added value of the qualitative method. It is unclear whether and to what extent the factors influence the added value. It is therefore recommended to test the qualitative method on multiple cases, differentiate the cases based on the seven factors, and assess their influence on the added value of the qualitative method. It is important to make these factors measurable by establishing measurement scales to differentiate them across cases. To illustrate, one should quantify political sensitivity by identifying a measurement scale with different levels.

After this, it is recommended to try a case-study design in which the quantitative model estimation is separated from the qualitative model estimation. It is for the separation of the analysis, only when both generic and cluster-specific factors influence the added value, important to keep in mind that the study design is dependent on the decisiveness of the general factors. If it can be concluded from the general factors alone that there is no added value in a qualitative LCCA, there is no need to test the other four factors on the quantitative LCCA model. However, when they are not decisive, examining the other four factors in addition to the general factors is always necessary. In this way, there are two possible scenarios, which are shown in Figure 7.

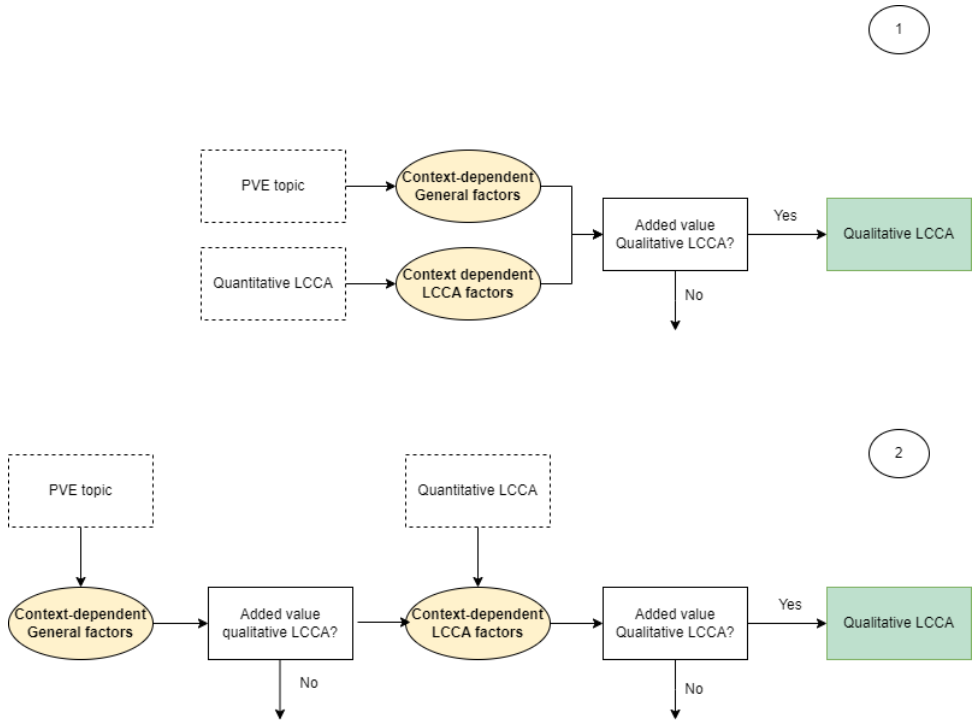

Figure 7: Possible research designs separate qualitative LCCA

All these research results can result in a final framework that allows assessing the added value of adding the qualitative LCCA analysis to the PVE analysis. This helps policy-makers in the consideration surrounding the deployment of a qualitative LCCA model.

9.2. Impact and practical recommendations

Societal impact

This research aimed to investigate whether it would add value to policy-making to understand the qualitative arguments of the clusters rather than just the quantitative data. This research showed that adding qualitative data led to a more in-depth overview of the population's perspectives. The (possible) societal impact of this research is threefold. The first two relate entirely to the outcomes of this research, while the third impact extends to a broader context. Important to mention is that this impact is not a general truth, because this impact was not examined in this study.

Firstly, this research showed that adding qualitative data could allow governmental communication strategies to be tailored to the different clusters identified. However, care must be taken not to focus excessively on extreme opinions. Otherwise, there is a risk of polarisation. First, it is important to not only focus on points where people disagree but also look for starting points to start a conversation. It is therefore advisable to look for this information in the qualitative arguments given in the clusters, as this can provide valuable information to start the dialogue. In addition, it is important to focus the governmental communication strategy not only on people who are decidedly against a certain policy but also on people who feel that the policy does not go far enough. It is therefore recommended to explore further how governmental communication strategies can be adjusted based on the qualitative data, taking into account these two recommendations. In addition, it is also recommended to examine how to reach these subgroups effectively. This includes considering the appropriate communication medium for the purpose. For example, the socio-demographics of the subgroups can play a role in determining the most appropriate communication medium. The socio-demographic characteristics of each subgroup, such as age, gender, education level, and income, can provide insight into their communication preferences. For example, younger subgroups may prefer social media platforms, while older subgroups may prefer more traditional media such as television or print media. To effectively target these subgroups, it is also essential to consider qualitative arguments in an LCCA, as they have been found to influence the significance of socio-demographic variables. In this way, policy-makers are more likely to target the right socio-demographic groups. Secondly, this study revealed that qualitative data usually validate quantitative data. In this way, it can be ensured that the choice tasks are valid; what was intended to be measured is measured. This allows policy decisions to be made based on valid information. In this way, the complexity of citizens' opinions is preserved and communicated to policy-makers. This can lead to better policies that are better tailored to the needs and concerns of citizens.

Finally, citizens can feel more acknowledged and heard when the qualitative data is more extensively analysed. According to Levesque et al. (2017), trust among participants grows when opinions in a participation process are taken seriously. If qualitative data is ignored or not comprehensively analysed, citizens may feel that nothing is being done with their input, which can lead to distrust (Smith, 2001).

Academic impact

Before this study, it has never been tried to include the qualitative data of a PVE in an LCCA. This research has answered the curiosity of PVE researchers to analyse qualitative arguments more thoroughly. From a broader perspective, there was a lack of literature on a method for including qualitative data in an LCCA and an assessment of its added value. This research filled this gap by conducting a literature review on QCA and developing a method to incorporate these coded arguments into an LCCA.

Next to this, it was unknown whether adding qualitative PVE data to an LCCA could serve as an extra validation step of the quantitative LCCA model. This research revealed that comparing the qualitative data with the quantitative data obtained from the choice experiment makes it possible to see whether respondents interpreted the choice tasks as intended. Additionally, by looking at whether the same socio-demographics as in the quantitative LCCA model are still statistically significant, it is possible to draw more valid conclusions about the importance of certain socio-demographics. In this way, the researcher can be more certain of the study's validity. Therefore it is recommended to add the qualitative analysis as an additional validation step. Next to this, the predictive power of the three qualitative LCCA models is approximately five times higher than the quantitative LCCA model. This implies that the qualitative models are more effective in capturing and explaining the underlying patterns in the data. Expanding on the qualitative LCCA model, an objective model with subcategories performs better than an objective model with only main categories.

Furthermore, this study not only demonstrated the added value of including qualitative data to an LCCA, but also defined concrete factors that can be used to assess whether it is worth performing such an analysis. This has never been done before by other researchers. These factors can be a starting point for further research in this domain.

Finally, it appears that the inclusion of qualitative data partially addresses the concerns that participants expressed about the PVE choice tasks being too simplified. The qualitative arguments made it possible to differentiate between various subcategories of a specific choice option in cases where such differentiation is not initially specified within the choice. For example, for the statement about protecting residents' health from pollution and nuisance, some participants gave written feedback that only one of the two aspects was important to them. In this way, the desired level of complexity could be better expressed through written arguments, which (partially) mitigates the weakness of the PVE method.

Importantly for academic justification, the conclusions drawn in this section are conditional, and the method needs to be tested on other cases before definitive conclusions can be drawn. It may be that the added value that emerged is attributable to the chosen case and that the added value will not emerge in other cases. No statements can be made about this now, but it is necessary to investigate whether the added value holds up and, if not, what the reasons are.

Expanded scope research
Both societal- and academic impacts are related to the NMP case in which the NMP PVE is analysed with an LCCA. However, this is only a tiny part of the whole. The new method could possibly be used to analyse PVEs on other topics or even to analyse the qualitative arguments of participation methods with a quantitative component, such as public opinion surveys. In addition to the LCCA, alternative clustering techniques such as Latent Profile Analysis can also be used to cluster the qualitative data. This broader scope is shown in Figure 8.

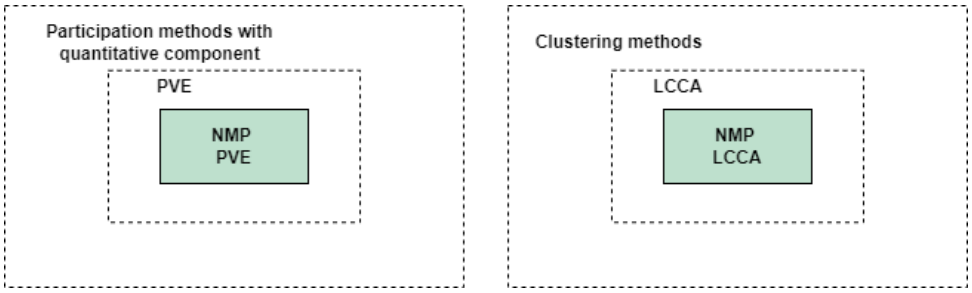

Figure 8: Expanded scope research

Regardless of the participation method and clustering method, this research aims to create social and academic impact by more thoroughly analysing the qualitative data obtained through participation methods. From a societal perspective, the overarching goal of the qualitative analysis is get more in-depth insights of population's perspectives. In this way, the complexity of participants in terms of ideas, concerns, and values is preserved, and the described societal impact can be realized. Alongside, from an academic perspective, the primary objective is to improve the validity of the models and possibly get new insights that would not emerge from the purely quantitative models. In this way, this research can serve as a starting point for further research in this domain. It is necessary to research further whether this is indeed the case with the expanded scope.

References

Abiiro, G. A., Leppert, G., Mbera, G. B., Robyn, P. J., & De Allegri, M. (2014). Developing attributes and attribute-levels for a discrete choice experiment on micro health insurance in rural Malawi. *BMC Health Services Research*, *14*, 235. doi: 10.1186/1472-6963-14-235

Arcadis. (2022). *NRD Nationaal MilieuProgramma Notitie Reikwijdte en Detailniveau Ministerie van Infrastructuur en Waterstaat (No. YTQFEJ4WDKYW-407687668-285:5.0)*. Retrieved from https://www.staten-generaal.nl/9370000/1/j4nvgs5kjg27kof{_}j9vvkfvj6b325az/vluenoro37x7

Arnstein, S. R. (2019). A Ladder of Citizen Participation. *journal of the American Planning Association*, *85*(1), 24–34. doi: 10.1080/01944363.2018.1559388

Assarroudi, A., Heshmati Nabavi, F., Armat, M. R., Ebadi, A., & Vaismoradi, M. (2018). Directed qualitative content analysis: the description and elaboration of its underpinning methods and data analysis process. *Journal of Research in Nursing*, *23*(1), 42–55. doi: 10.1177/1744987117741667

Beierle, T. C. (1999). Using social goals to evaluate public participation in environmental decisions. *Review of Policy Research*, *16*(3-4). doi: 10.1111/j.1541-1338.1999.tb00879.x

CBS. (2021, aug). *Bevolking; geslacht, leeftijd en burgerlijke staat, 1 januari.* Retrieved June 6, 2023, from https://opendata.cbs.nl/statline/#/CBS/nl/dataset/7461BEV/table?fromstatweb

CBS. (2022, jan). *Mannen en vrouwen.* Retrieved June 6, 2023, from https://www.cbs.nl/nl-nl/visualisaties/dashboard-bevolking/mannen-en-vrouwen#:~:text=Op2012januari2020222telde,meerderheid2C20op20hogere20leeftijden20vrouwen.

CBS. (2023, may). *Hoogst behaald onderwijsniveau.* Retrieved June 6, 2023, from https://www.ocwincijfers.nl/sectoren/onderwijs-algemeen/hoogst-behaald-onderwijsniveau

de Graaf, R., & van der Vossen, R. (2013). Bits versus brains in content analysis. Comparing the advantages and disadvantages of manual and automated methods for content analysis. *Communications*, *38*(4). doi: 10.1515/commun-2013-0025

Dekker, T., Koster, P., & Mouter, N. (2019). *The economics of participatory value evaluation*. Tinbergen Institute Discussion Paper 2019-008/VIII.

de Vries, G., Terwel, B., & Ellemers, N. (2014, 06). Spare the details, share the relevance: The dilution effect in communications about carbon dioxide capture and storage. *Journal of Environmental Psychology*, *38*. doi: 10.1016/j.jenvp.2014.01.003

de Vries, M., Spruit, S., Mouter, N., Jenninga, S., & Tuit, C. (2022). *Een participatieve waarde evaluatie over windenergie in vijfheerenlanden.* Populytics. Retrieved from https://populytics.nl/wp-content/uploads/2022/12/20221024-Eindrapport-Windenergie-in-Vijfheerenlanden_PDF_FINAL1.pdf

Elliott, V. (2018). Thinking about the Coding Process in Qualitative Data Analysis. *The Qualitative Report*, *23*(11), 2850–2861. doi: 10.46743/2160-3715/2018.3560

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K., & Kyngäs, H. (2014). Qualitative content analysis: A focus on trustworthiness. *SAGE open*, *4*(1).

Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, *62*(1), 107–115. doi: 10.1111/J.1365-2648.2007.04569.X

Farshchi, S., & Rizk, R. (2020). *Prioritising Safe Trips Over Safe Policy Processes A Pilot Study on the Appropriateness of the Participatory Value Evaluation Method for Encompassing (Feelings of) Safety (and Security) in Public Transport* (Tech. Rep.). KTH ROYAL INSTITUTE OF TECHNOLOGY.

Fiorino, D. J. (1990). Citizen Participation and Environmental Risk: A Survey of Institutional Mechanisms. *Science, Technology & Human Values*, *15*(2), 226–243. doi: 10.1177/016224399001500204

Geijsen, T., de Vries, M., Maas, W., Tuit, C., Fillerup, L., & Mouter, N. (2022). *Coronabeleid op de lange termijn welke doelen en maatregelen vinden nederlanders belangrijk?* Retrieved from https://populytics.nl/blog/coronabeleid-op-de-lange-termijn-welke-doelen-en-maatregelen-vinden-nederlanders-belangrijk/

Gilar-Corbi, R., Sandhu, D., Lorenzo Lledo, G., Schmidt, S., A-k, B., Zlatkin-Troitschanskaia, O., ... Brückner, S. (2020). Undergraduate Students' Critical Online Reasoning-Process Mining Analysis. *Front. Psychol*, *11*, 576273. doi: 10.3389/fpsyg.2020.576273

Graneheim, U., & Lundman, B. (2004, feb). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*, *24*(2), 105–112. doi: 10.1016/j.nedt.2003.10.001

Hase, V. (2023). Automated Content Analysis. In *Standardisierte inhaltsanalyse in der kommunikationswissenschaft – standardized content analysis in communication research* (pp. 23–36). Wiesbaden: Springer Fachmedien Wiesbaden. Retrieved from https://link.springer.com/10.1007/978-3-658-36179-2{_}3 doi: 10.1007/978-3-658-36179-2_3

Heijnen, V. (2022, July 1). kamerbrief over nationaal milieuprogramma [letter of government]. Retrieved from https://open.overheid.nl/documenten/ronlf8fccdcbad1d7774a70ec9f14bed8b47a7afaefa/pdf

Henry, D., Dymnicki, A. B., Mohatt, N., Allen, J., & Kelly, J. G. (2015). Clustering Methods with Qualitative Data: a Mixed-Methods Approach for Prevention Research with Small Samples. *Prevention Science*, *16*, 1007–1016. doi: 10.1007/s11121-015-0561-z

Hsieh, H.-F., & Shannon, S. E. (2005). Three Approaches to Qualitative Content Analysis. *Qualitative Health Research*, *15*(9), 1277–1288. doi: 10.1177/1049732305276687

Itten, A., & Mouter, N. (2022). When digital mass participation meets citizen deliberation: Combining mini- and maxi-publics in climate policy-making. *Sustainability*, *14*(8), 4656. doi: 10.3390/su14084656

Jiang, M. Z., Fu, Q., Xiong, J. Y., Li, X. L., Jia, E. P., Peng, Y. Y., & Shen, X. (2020). Preferences heterogeneity of health care utilization of community residents in China: A stated preference discrete choice experiment. *BMC Health Services Research*, *20*(1). doi: 10.1186/S12913-020-05134-4

Kruger, R. (2014). 4. participants in a focus group. In *Focus groups - a practical guide for applied research* (pp. 63–84). Sage Puglications.

Kuckartz, U. (2019). Qualitative text analysis: A systematic approach. In G. E. Kaiser (Ed.), *Compendium for early career researchers in mathematics education* (p. 181-197). Springer. doi: 10.1007/978-3-030-15636-7_8

Levesque, V. R., Calhoun, A. J. K., Bell, K. P., & Johnson, T. R. (2017). Turning Contention into Collaboration: Engaging Power, Trust, and Learning in Collaborative Networks. *Society & Natural Resources*, *30*, 245–260. doi: 10.1080/08941920.2016.1180726

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Beverly Hills: CA: Sage.

Magee, C., Voyer, M., McIlgorm, A., & Li, O. (2018). Chasing the thrill or just passing the time? Trialing a new mixed methods approach to understanding heterogeneity amongst recreational fishers based on motivations. *Fisheries Research*, *199*, 107–118. doi: 10.1016/j.fishres.2017.11.026

Mayring, P. (2014). *Qualitative content analysis: theoretical foundation, basic procedures and software solution*. Klagenfurt. Retrieved from https://nbn-resolving.org/urn:nbn:de:0168-ssoar-395173

McCool-Myers, M., Grasso, D., Kozlowski, D., Cordes, S., Jean, V., Gold, H., & Goedken, P. (2022). The COVID-19 pandemic's intersectional impact on work life, home life and wellbeing: an exploratory mixed-methods analysis of Georgia women's experiences during the pandemic. *BMC Public Health*, *22*(1).

Ministerie van Binnenlandse Zaken en Koninkrijkrelaties. (2020). *Nationale Omgevingsvisie Duurzaam perspectief voor onze leefomgeving*. Retrieved from https://open.overheid.nl/documenten/ronl-59b3033c-0826-4624-ba7f-41aec10b6d7a/pdf

Ministerie van IenW. (2022). (ontwerp)Participatieplan NMP. Retrieved from https://www.rijksoverheid.nl/documenten/rapporten/2021/02/22/nationaal-milieubeleidskader-definitieve-

Mitchell, G. E., & Schmitz, H. P. (2021). Using Model-Based Clustering to Improve Qualitative Inquiry: Computer-Aided Qualitative Data Analysis, Latent Class Analysis, and Interpretive Transparency. *Voluntas*, 1–8. doi: 10.1007/s11266-021-00409-8

Molin, E., Mokhtarian, P., & Kroesen, M. (2015). Multimodal travel groups and attitudes: A latent class cluster analysis of Dutch travelers. , *83*, 14-29. doi: 10.1016/j.tra.2015.11.001

Mouter, N., Beek, L., de Ruijter, A., Hernandez, J. I., Schouten, S., van Noord, L., & Spruit, S. (2021). *Eindrapport klimaatraadpleging populytics*. Populytics. Retrieved from https://populytics.nl/wp-content/uploads/2022/06/Eindrapport-Klimaatraadpleging-Populytics.pdf

Mouter, N., Hernandez, J. I., & Itten, A. V. (2021). Public participation in crisis policymaking. How 30,000 Dutch citizens advised their government on relaxing COVID-19 lockdown measures. *PLOS ONE*, *16*. doi: 10.1371/journal.pone.0250614

Mouter, N., Jara, K. T., Hernandez, J. I., Kroesen, M., de Vries, M., Geijsen, T., ... de Bruin, M. (2022). Stepping into the shoes of the policy maker: Results of a Participatory Value Evaluation for the Dutch long term COVID-19 strategy. *Social Science & Medicine*, *314*, 115430. doi: 10.1016/J.SOCSCIMED.2022.115430

Mouter, N., Koster, P., & Dekker, T. (2019). *An introduction to participatory value evaluation*. Tinbergen Institute Discussion Paper 2019-024/V.

Mouter, N., Koster, P., & Dekker, T. (2021). Participatory value evaluation for the evaluation of flood protection schemes. *Water Resources and Economics*, *36*, 100188. doi: 10.1016/j.wre.2021.100188

Mouter, N., Shortall, R., Spruit, S. L., & Itten, A. V. (2021). Including young people, cutting time and producing useful outcomes: Participatory value evaluation as a new practice of public participation in the Dutch energy transition. *Energy Research and Social Science*, *75*, 101965. doi: 10.1016/j.erss.2021.101965

Nelson, L. K., Burk, D., Knudsen, M., & McCall, L. (2021). The Future of Coding: A Comparison of Hand-Coding and Three Types of Computer-Assisted Text Analysis Methods. *Sociological Methods and Research*, *50*, 202–237. doi: 10.1177/0049124118769114/ASSET/IMAGES/LARGE/10.1177_0049124118769114-FIG7.JPEG

Niederkrotenthaler, T., Voracek, M., Herberth, A., Till, B., Strauss, M., Etzersdorfer, E., ... Sonneck, G. (2010). Role of media reports in completed and prevented suicide: Werther v. Papageno effects. *British Journal of Psychiatry*, *197*, 234–243. doi: 10.1192/BJP.BP.109.074633

Patel, S. R., Galfavy, H., Kimeldorf, M. B., Dixon, L. B., & Simpson, H. B. (2017). Patient preferences and acceptability of evidence-based and novel treatments for obsessive-compulsive disorder. *Psychiatric Services*, *68*(3), 250–257. doi: 10.1176/APPI.PS.201600092

Populytics. (2023a). *Nationaal MilieuProgramma (Open) - Wevaluate.* Retrieved 2023-07-01, from https://nmp.raadpleging.net/

Populytics. (2023b). *Report results NMP PWE* . Advance online publication.

Ramaswamy, M. (2006). On the phenomenon of information dilution. *Issues in Information Systems*, *7*(2).

Rohm, A., Kaltcheva, V. D., & Milne, G. R. (2013). A mixed-method approach to examining brand-consumer interactions driven by social media. *Journal of Research in Interactive Marketing*, *7*(4), 295–311. doi: 10.1108/JRIM-01-2013-0009

Rowe, G., & Frewer, L. J. (2000). Public participation methods: A framework for evaluation. *Science Technology and Human Values*, *25*(1), 3-29. doi: 10.1177/016224390002500101

Rowe, G., Horlick-Jones, T., Walls, J., Poortinga, W., & Pidgeon, N. F. (2008). Analysis of a normative framework for evaluating public engagement exercises: Reliability, validity and limitations. *Public Understanding of Science*, *17*(4). doi: 10.1177/0963662506075351

Royo, S., & Yetano, A. (2015). "Crowdsourcing" as a tool for e-participation: two experiences regarding CO2 emissions at municipal level. *Electronic Commerce Research*, *15*(3), 323–348. doi: 10.1007/s10660-015-9183-6

Ryan, K. E., Gandha, T., Culbertson, M. J., & Carlson, C. (2014). Focus Group Evidence. *American Journal of Evaluation*, *35*(3), 328–345. doi: 10.1177/1098214013508300

Saleh, J., & Marais, K. (2006). Highlights from the early (and pre-) history of reliability engineering. *Reliability Engineering & System Safety*, *91*(2), 249–256. doi: 10.1016/j.ress.2005.01.003

Shaw, S., & Crisp, V. (2011). Tracing the evolution of validity in educational measurement: past issues and contemporary challenges. *Research Matters: A Cambridge Assessment publication*, *11*, 14–17.

Sikora, A. (2021). European Green Deal – legal and financial challenges of the climate change. *ERA Forum*, *21*(4), 681–697. doi: 10.1007/s12027-020-00637-3

Smith, M. H. M., P.D. (2001). Beyond Public Participation: Fairness in Natural Resource Decision Making. *Society & Natural Resources*, *14*(3), 239–249. doi: 10.1080/08941920120140

Ton, D., Zomer, L.-B., Schneider, F., Hoogendoorn-Lanser, S., Duives, D., Cats, O., & Hoogendoorn, S. (2020). Latent classes of daily mobility patterns: the relationship with attitudes towards modes. *Transportation*, *47*, 1843–1866. doi: 10.1007/s11116-019-09975-9

United Nations. (2021, arpil 27). *SDGs will address 'three planetary crises' harming life on Earth.* Retrieved April 28, 2023, from `https://sdgs.un.org/news/sdgs-will-address-three-planetary-crises-harming-life-earth-33088`

van 't Veer, R., Annema, J. A., Araghi, Y., Homem de Almeida Correia, G., & van Wee, B. (2023). Mobility-as-a-Service (MaaS): A latent class cluster analysis to identify Dutch vehicle owners' use intention. *Transportation Research Part A: Policy and Practice*, *169*, 103608. doi: 10.1016/J.TRA.2023.103608

van Veldhoven-van der Meer, S. (2020, September 24). kamerbrief milieubeleid [letter of government]. Retrieved from `https://zoek.officielebekendmakingen.nl/kst-28663-75.pdf`

Vermunt, J. K., & Magidson, J. (2002). *LATENT CLASS CLUSTER ANALYSIS*. Statistical Innovations Inc. Retrieved from `https://jeroenvermunt.nl/hagenaars2002b.pdf`

Vermunt, J. K., & Magidson, J. (2005). Technical guide for latent gold choice 4.0: Basic and advanced. *Belmont Massachusetts: Statistical Innovations Inc.*.

Vermunt, J. K., & Magidson, J. (2016). *Technical guide for latent gold 5.1: Basic, advanced, and syntax* (Tech. Rep.). Belmont, MA: Statistical Innovations Inc.

Visser, V., van Popering-Verkerk, J., & van Buuren, A. (2019). *Onderbouwd ontwerpen aan participatieprocessen. kennisbasis participatie in de fysieke leefomgeving.* Retrieved from `https://www.kennisknooppuntparticipatie.nl/downloads/HandlerDownloadFiles.ashx?idnv=1564826&forcedow`

Volberda, L. J. (2020). *Analyzing citizens' views on new spatialinfrastructure projects: From the average view towards various clusters within the Participatory Value Evaluation Method* (Tech. Rep.). TU Delft.

Winter, S. C., Dreibelbis, R., Dzombo, M. N., & Barchi, F. (2019). A mixed-methods study of women's sanitation utilization in informal settlements in Kenya. *PLoS ONE*, *14*(3). doi: 10.1371/JOURNAL.PONE.0214114

Yin, R. K. (2018). *Case study research and applictions- Design and Methods* (6th ed.). SAGE Publications.

Zarkadis, N., Papageorgiou, G., & Stamovlasis, D. (2017). Studying the consistency between and within the student mental models for atomic structure. *Chemistry Education Research and Practice*, *18*(4), 893–902. doi: 10.1039/C7RP00135E

Zhang, Y., & Wildemuth, B. M. (2009). Qualitative Analysis of Content. In *Applications of social research methods to questions in information and library science* (p. 318-330). Libraries Unlimited. Retrieved from https://www.ischool.utexas.edu/~yanz/Content_analysis.pdf

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A

Literature review knowledge gap

The literature review will systemically analyse literature about methods to include qualitative data in the LCCA. Next to this, limitations described in the articles that are relevant to this study will be mentioned. This literature review has the goal to identify the knowledge gap.

Methods

Search strategy
Firstly, in the database ScienceDirect was searched for the following key terms:
'LCA' AND 'PVE' AND 'Participatory Value Evaluation'
This search resulted in only three articles.

After that, in the Education Repository of the TU Delft was searched for the following key terms:
'Participatory Value Evaluation' AND 'PVE' AND 'Latent Class Cluster Analysis'
This search resulted in only one article.

Because the first two searches did not lead to a sufficient amount of articles, the scope was broadened to using qualitative data in the LCCA. In the database Scopus was searched for the following key terms:
'Qualitative Latent Class Analysis' AND 'LCA'
This search resulted in 43 search results.

Selection process
Firstly, specific document types were excluded from the study. Only research articles, review articles, and book chapters were included in the study to ensure the scientific value of the literature. The following inclusion criteria were used to select articles: a. English language, and b. The time frame between 2000 and 2022 c. Presence of the LCCA analysis D. Analysis of qualitative data.

Applying the inclusion and exclusion criteria
The search about the use of the LCCA in a PVE which resulted in three articles, included one article that matched the defined inclusion criteria (Mouter et al., 2022). The article by Volberda (2020) that was the result of the second search matched the defined criteria. Regarding the search with the broadened scope, after applying the inclusion and exclusion criteria, ten articles were included in the study. An overview of the selection process is visualized in Figure A.1

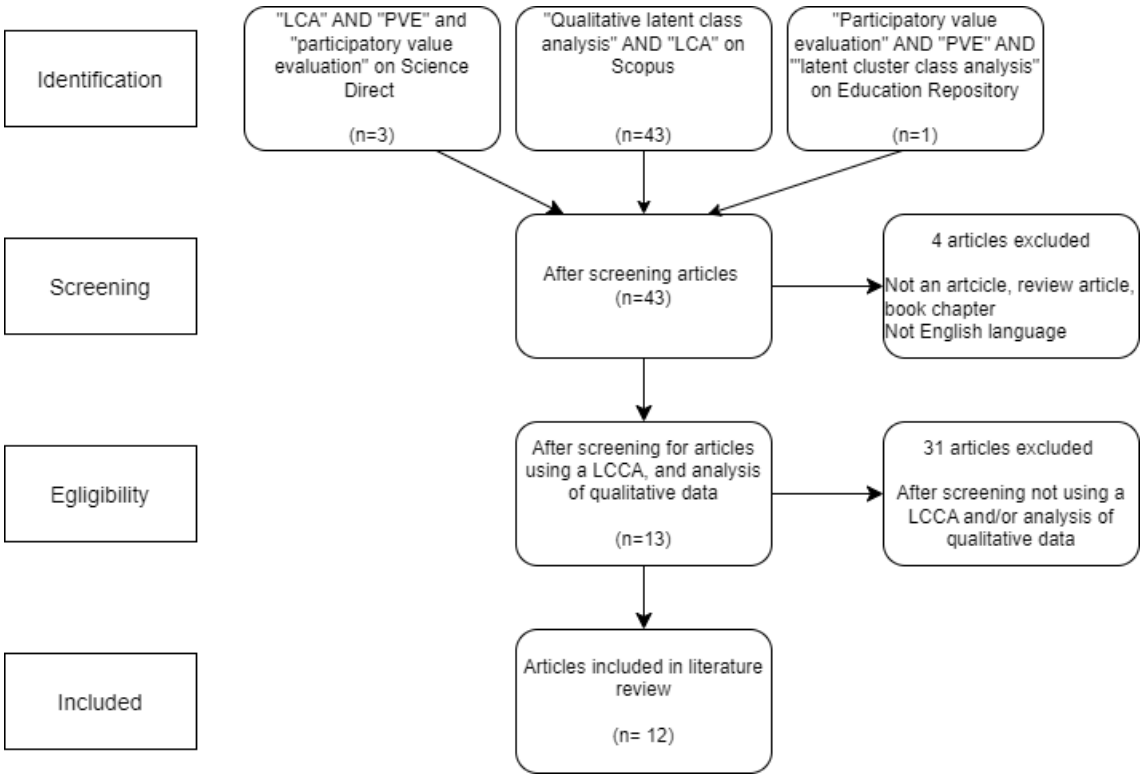

Figure A.1: Selection process literature review

Table A.1: Results literature review

Reference	Qualitative LCCA	Method	Limitation
PVE literature			
(Mouter et al., 2022)	-	-	-
(Volberda, 2020)	-	Qualitative interviews about clusters	
Coded qualitative data literature			
(Mitchell & Schmitz, 2021)	Yes	Computer-aided qualitative data analysis (CAQDAS) for coding	-
(Niederkrotenthaler et al., 2010)	Yes	Qualitative data in LCCA with coding scheme (indicators)	-
(Rohm et al., 2013)	Yes	Qualitative data in LCCA with coding scheme (indactor+covariates)	-
(McCool-Myers et al., 2022)	Yes	Iterative themes codebook, not included as covariate	-
(Winter et al., 2019)	Yes	Codebook, not included as covariate	-
Interviews with class members literature			
(Magee et al., 2018)	-	Qualitative focus groups with class members	More qualitative research is needed
Separate qualitative analysis			
(Patel et al., 2017)	-	Coding the qualitative data separately from LCCA	-
(Zarkadis et al., 2017)	-	Coding the qualitative data separately from LCCA	-
Important limitations			
(Gilar-Corbi et al., 2020)	-	-	Qualitative research about profiles is needed
(Jiang et al., 2020)	-	-	LCA can identify the preference heterogeneity, but are unable to discover the underlying behavior reason in-depth, and can be better explained through qualitative interviews.

Results
The results of the literature review are shown in Table A.1. A distinction can be made between five types of literature. The first type is the result of the search about the LCCA in a PVE and the other four types are about analysing qualitative data in the LCCA.

In the article by Mouter, Koster, & Dekker (2021) only quantitative data is used in the LCCA. The qualitative data, which consists of written arguments for choices made in the choice task, are analysed separately from the quantitative data through content analysis. This means that the types of arguments were firstly defined by the coders, subsequently a larger dataset of arguments was analysed and coded to see which arguments were mentioned a lot by respondents (Geijsen et al., 2022). Next to this, the article by Volberda (2020) carried out the LCCA analysis with the PVE data. Qualitative data was not included in the LCCA, but interviews with experts were conducted to discuss the findings of the cluster analysis.

The second type is literature about the use of coded qualitative data in the LCCA. The article by Mitchell & Schmitz (2021) used Computer-Aided Qualitative Data Analysis to code the qualitative data. Computer-Aided Qualitative Data Analysis helps to code and analyse qualitative documents. After this, the coded data were analysed in the LCCA. They also provided a clear overview of the process of including coded qualitative data in an LCCA. The articles by Niederkrotenthaler et al. (2010) and Rohm et al. (2013) used a coding scheme to use the qualitative data in the LCCA. Both coding schemes were developed based on the qualitative data obtained during the research. The qualitative data entailed media reports and written social media diaries respectively. The article by Niederkrotenthaler et al. (2010) used the qualitative data as covariates and indicators in the LCCA model, while the article by Rohm et al. (2013) used the qualitative data only as indicators only. The articles by McCool-Myers et al. (2022) and Winter et al. (2019) also coded the qualitative data, which was gained from the open-ended questions, but did not include this as an input variable in the LCCA. Both articles extracted inductive from the responses. Inductive means that the different categories are determined by reading through the responses (Elo & Kyngäs, 2008). After execution of the LCCA with the quantitative data, they used the inductive themes to get more insight into the further details on the characteristics of and rationale behind each profile.

Next to this, one articles did not include the qualitative data in the LCCA, but interviewed the class members to understand the motivations behind choices (Magee et al., 2018). Next to this, literature by Patel et al. (2017) and Zarkadis et al. (2017) did a separate qualitative analysis next to the quantitative LCCA. Lastly, the articles by Jiang et al. (2020) and Gilar-Corbi et al. (2020) did not use qualitative data in the LCCA and did not describe a method to analyse the qualitative data, but they gave important recommendations concerning analysing qualitative data in the LCCA.

As mentioned in the beginning of this paragraph, the quantitative data of the PVE has been analysed in the LCCA, but the qualitative arguments have not yet been analysed in the LCCA or another statistical analysis method. Besides this, only a few articles on other research topics than the PVE included qualitative data in the LCCA, while multiple articles stress the importance of analysing qualitative data in order to discover underlying motivations. Important to mention is that the articles that included qualitative data, did not include the data in a quantitative method, such as a DCE.

B

Literature review QCA

B.1. Literature inductive Qualitative Content Coding

Table B.1 below shows the comparison of the inductive coding methods by Mayring (2014), Zhang & Wildemuth (2009), Elo & Kyngäs (2008) and Hsieh & Shannon (2005). The QCA process is divided into three phases; Preparation, Organisation and Reporting. The articles by Elo & Kyngäs (2008) and Hsieh & Shannon (2005) have been presented and discussed together for the inductive approach, because the same inductive approach is used.

Table B.1: Comparison inductive coding methods

QCA Phase	**Reference**		
	Mayring (2014)	**Zhang & Wildemuth (2009)**	**Elo & Kyngäs (2008) and Hsieh & Shannon (2005)**
Preparation phase	Defining research question and theoretical background	Prepare data	
	Define the unit of analysis	Define the unit of analysis	Define the unit of analysis
	Define selection criterion: 1. Category definition 2. Level of abstraction		Select sampling strategy
Organisation phase	Open coding: (Constant comparative)	Open coding: (Constant comparative)	Open coding
	Stop after no new categories are found (10% - 50%)	Test coding scheme on sample.	
	Adapt categories and rules (if needed)	Adapt categories and rules (if needed)	
	Coding whole text	Coding whole text	
	Defining main categories		Grouping list of categories
	Checking on inter-coder reliability	Determine coding consistency	
Reporting phase		Draw conclusions	Abstraction
	Reporting final results	Reporting results and method	Reporting analysis process and results

B.2. Literature deductive Qualitative Content Coding

Table B.2 below shows the comparison of the deductive coding methods by Mayring (2014), Zhang & Wildemuth (2009), Elo & Kyngäs (2008) and Hsieh & Shannon (2005). The QCA process is divided into three phases; Preparation, Organisation and Reporting.

Table B.2: Comparison deductive coding methods

QCA Phase	**Reference**			
	Mayring (2014)	**Zhang & Wildemuth (2009)**	**Elo & Kyngäs (2008)**	**Hsieh & Shannon (2005)**
Preparation phase	Defining research question and theoretical background	Prepare data		
		Define the unit of analysis	Define the unit of analysis	Select sampling strategy
Organisation phase	Derive categories from theory	Derive categories from theory	1. Establish unconstrained analysis matrice 2. Establish structured analysis matrice	Develop categories
	Define coding guidelines	Test coding schema on sample	1. Code data with (new) categories 2. Code data with categories	1. Highlight all important aspects
	Coding with themes	Adapt categories and rules (if needed)	1. Grouping list of categories 2. Test hypothesizes	
	Stop after no new categories are found (10% - 50%)		1. Defining main categories	
	Adapt categories and rules (if needed)			
	Coding whole text	Coding whole text		1. Code all the highlighted text 2. Code all the text
	Checking on intercoder reliability	Determine coding consistency		1+2 identify subcategories
Reporting phase		Draw conclusions	1. Abstraction	
	Report final results	Report results and method	1+2 Report analysis process and results	1+2 Report analysis process and results

C

Policy programs overview

A detailed overview of policy programs related to the National Environmental Program, both on a global scale and within the Dutch context is presented. On a global level, the UN defined three planetary crises; climate change, environmental pollution, and biodiversity loss (Arcadis, 2022). Within the SDG's planetary issues are addressed (United Nations, 2021). The NMP focuses on the crisis of environmental pollution and corresponding SDGs.

On a national level, the Dutch government released the *'National Environmental Strategy'* (NOVI) and the *'National Environmental Policy Framework'* (NMK) in conjunction with each other (Arcadis, 2022). The NOVI provides a long-term vision for the development of the living environment in the Netherlands (Ministerie van Binnenlandse Zaken en Koninkrijkrelaties, 2020). The NMK focuses on the protection of human-, animal-, and plant- health, strengthening of ecosystems, and respecting the boundaries of the earth system (Arcadis, 2022). The NOVI provides the government's strategic policy framework for the NMP, while the NMK describes starting points and building blocks needed to further shape and develop environmental ambitions (van Veldhoven-van der Meer, 2020).

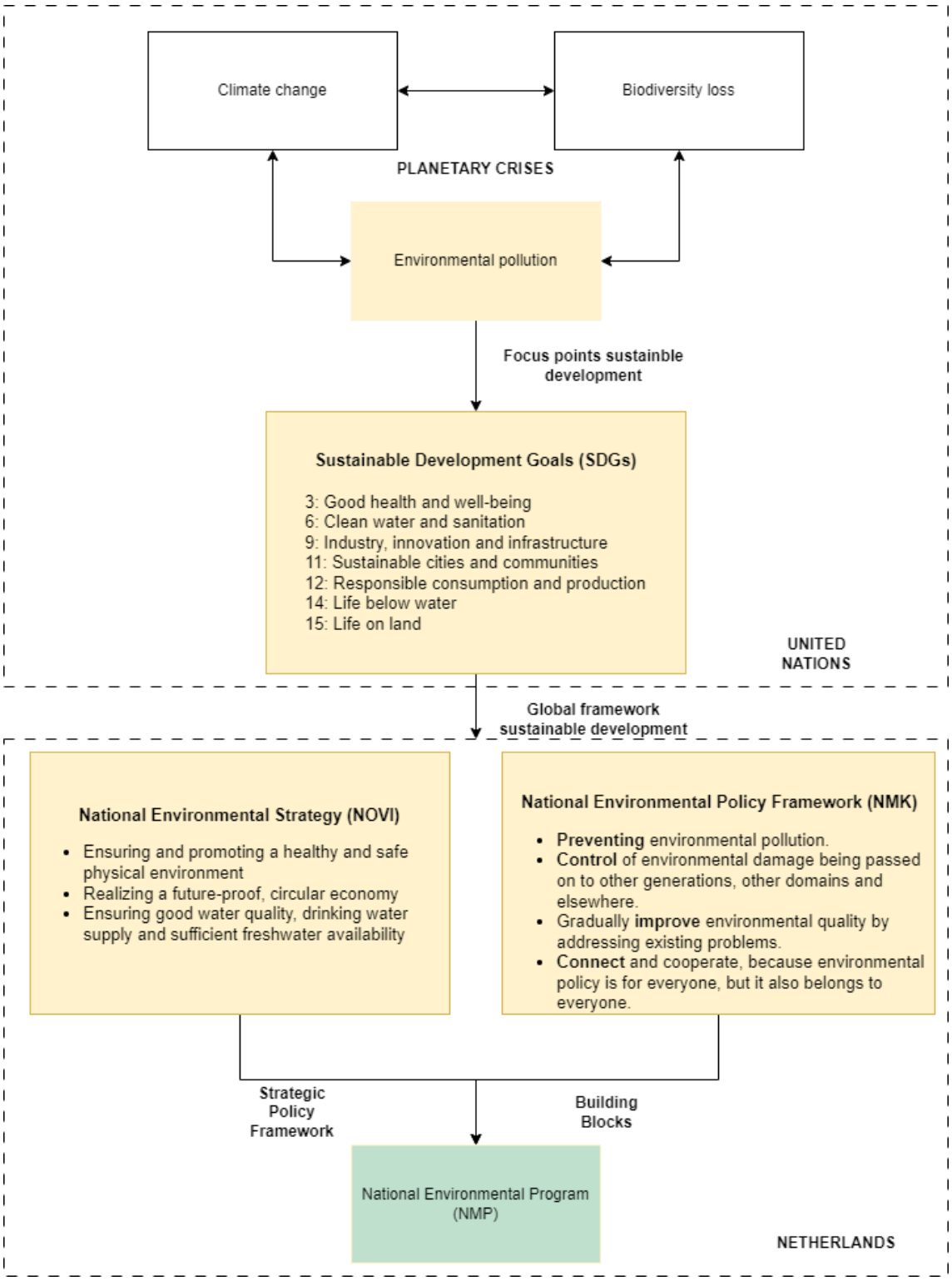

Figure C.1: Policy programs detailed
Source: (Arcadis, 2022)

D

Choice task 1

The first choice task of the Participatory Value Evaluation is a strategic choice task, which has the goal to analyse what values citizens drive when they would be able to make environmental policy. It is asked what the participant considers important when making environmental policy. There are 9 statements displayed, over which they can divide fifty points. After that, they can argue why they divided the points in this way (Populytics, 2023a).

Figure D.1: Choice task 1
Source: (Populytics, 2023a)

E

Codebook

Witin the codebook, there are nine tables with statement-specific categories and one Table with general categories. The changes after the first codebook from the full launch are presented with colors.

Green = changed after testing on the sample
Purple = changed during coding of the 1484 respondents
Orange = changed by Populytics

Statement 1: The government should always strictly control laws and regulations on the environment			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
Too much control is not good AA	There is too much control from the government, which could be less. Too many laws and regulations	Government should not be too strict (Exaggerating is also included here)	AA1
		There are too many laws and regulations	AA2
		Trust is more important than control	AA3
		Citizens/businesses must take responsibility	AA4
Control is no task of the government AB	These arguments relate to the argument against control from a political point of view.	Control is not the government's job	AB1
		Government abuses its power	AB2
Control costs too much money AC	Arguments that relate to the extra costs incurred for control, or that the government only controls because there is money to 'make' for the government.	Control again costs (too much) extra money	AC1
		The government only controls because there is money to be collected (which ends up in their own pockets). *'Just collecting, that's what they are good at. ridiculous'*	AC2
There is no more time for control AD	There is no time left for control, there is already too long a wait for action on the environment.		AD
Strict control is not feasible AE	Not feasible to strictly control laws and regulations. No capacity for this. *'they don't have the manpower for that'*		AE
Enforcement capacity should be used for things other than the environment. AF	Enforcement capacity should be used for other things; drugs, and crime.		AF

All laws and regulations must be controlled, not just the environment AG	There should not only be environmental controls, this applies to everything, the government should strictly control everything. It should be done automatically already. *'Should be on everything when making laws and regulations. Not just especially on the environment'*		AG
Arguments for			
More control is needed for the sake of the environment. AH	More control is needed: Concerns all aspects related to the environment; control to improve environment and health, nature etc. Differentiate between people who describe that enforcement is essential; more monitoring for compliance and those who think there should be more punishment; imposition of sanctions. People also indicate that preventing tampering/abuse/violation is important. This also includes people going their way otherwise. People also indicate that laws and rules otherwise make no sense, logical to control, they are there for a reason. Otherwise, nothing is going to change/improve.	Compliance enforcement is needed.	AH1
		There should be consequences for actions.	AH2
		Prevent tampering/abuse/violation.	AH3
		Otherwise, laws and rules make no sense	AH4
Control is good, but the rules and laws being controlled should be checked first. AI	Laws are there to be obeyed so they should be correct, laws should not be copied blindly.		AI

Control is good, but the government does not control in the right way AJ	Control is good, but it needs to be different. This concerns the way in which is being controlled *'If that's true, and when I see them driving the cars, they cover many kilometres without paying attention to where they should be looking during the execution.'*		AJ
Emphasis should be on controlling big polluters. AK	This concerns where the focus of control lies, with big polluters (undefined), companies, rich citizens.	Emphasis should be on checking big polluters (not defined who).	AK1
		Emphasis should be on controlling companies.	AK2
		Emphasis should be on checking rich citizens. *'The strict rules are almost always imposed on the citizens. Start with the rich and then move on to the ordinary citizens. That's why I haven't given any points here.'*	AK3
Fairness/Justice AL	The main argument is that everyone must abide by the law and regulations, and that the same rules should be applied to everyone. The control and enforcement of these rules should be fair and legal. *'It is important that everyone adheres to the law and regulations.'* *'Everyone should be subject to the same rules.'*		AL
Control is a core task of the government AM	That's where a government comes in; it has the core responsibility to ensure compliance with the rules.		AM
This is already happening AN			AN
Statement is important AO			AO
Statement is not important AP			AP

Statement 2: The government must do as much as it can to improve the environment			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
There is no need to do more, the government is already doing enough to improve the environment. BA	They are already doing enough, is already being done. '*The environment is already receiving too much attention, causing the Netherlands to almost collapse.'*		BA
Don't do more, the citizen has to pay the cost. BB	Disagree, the citizen has to pay costs anyway *'Because all those idiotic environmental plans take money out of people's pockets again'* (if it appears that the respondent thinks the environment should be improved, but that the costs should not end up with the citizen; code BI)		BB
Protecting the environment is not (only) a government task BC	Big polluters, companies and citizens have to take responsibility themselves, everyone has to do something. We have to do this together.	There is (also) responsibility on big polluters (not defined who)	BC1
		There is also a responsibility for citizens. '*We don't need a government for that; let people do it themselves'*	BC2
		There is (also) responsibility on companies. *'That only helps if companies cooperate'*	BC3
Arguments for			
Protection of the environment is the core task of the government BD	Responsibility of the government, the government must take measures, government must set a good example, only the government can motivate citizens, and only the government can implement specific measures; individual responsibility does not work		BD

Improving the environment is important for future generations BE	Importance for future generations, sustainable living environment. Future as a keyword.		BE
Improving the environment is necessary/urgent BF	It's going badly, combating climate change is crucial. Action is needed now. Improving yields benefits, is better for everyone, and provides advantages for humans. Positive framing. Yields results. Better for all living beings. Because we need the environment. The environment is a top priority, extremely important, environment above everything. Without nature, we have nothing, the existence of humans ceases to exist. (Is the environment important? --> BJ, no urgency)	It's going badly with the environment	BF1
		Improving the environment is an opportunity	BF2
		The environment is the most important	BF3
Improving the environment is important for health BG	The environment has an impact on health, can prevent diseases. The importance of a healthy living environment falls under this as well.		BG
<u>With condition</u>			
The environment must be improved, but not at any cost BH	The environment is important, but not at any cost. *'They should take action... but it's currently at the expense of everything. People should also be able to live and afford their expenses, such as bills, etc.'*		BH
The environment is important, but (not all) costs may fall on citizens. BI	Costs should not burden the citizens. It should remain affordable. *'The environment is important, but it usually comes at the expense of the citizens who have to pay extra.'*		BI

	(If it becomes evident that the respondent believes the environment should not be improved because the costs ultimately fall on the citizens; code as BB)		
Statement is important BJ			BJ
Statement is not important BK	(Only if it is not mentioned that the environment is not important; otherwise code as JB)		BK

Statement 3: The government must ensure that improving the environment costs as little as possible			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
Environmental improvement does not have to be expensive CA	Improvements need not be expensive, look for alternative measures; other energy sources, adjusting citizens' behaviour. *'Taking the economy into account, use as little money as possible to address the environment. A good consultation can also include thrift, e.g., recycle, use less plastic, use more cloth bags.'* *'Sometimes solutions are simple and cheap'*		CA
Improving the environment does not have to cost as little as possible CB	Money can be spent on the environment; it is important. Cheap is often expensive in the long run. Investing now yields financial benefits in the long term; this perspective is purely focused on costs. It is impossible to spend little money; sometimes it simply costs money. Improvement requires financial resources.	Environment is important; it may cost something.	CB1
		'Cheap is often expensive in the long run' *'Taking measures against certain forms of pollution is always better than cleaning up afterwards. Prevention is better than cure, I would say.'* *'But we shouldn't go for the cheapest option if it's ineffective.'*	CB2
		Investing in sustainable options ultimately yields long-term financial benefits (solely focused on costs) *'Investing money in sustainable options is ultimately the best way to generate future returns.'*	CB3
		Improving the environment always costs money	CB4
Arguments for			
Cost savings are important for the economy	Life is expensive, inflation, struggling to make ends meet.	Life is expensive	CC1
		Government budget deficit/expenditures.	CC2

CC	Government budget deficit/expenditures. Economy in general	*'Yes, that would be really nice, we already have a significant deficit in the spring budget.'*	
		Economy	CC3
The environment has already cost enough CD	It already costs too much, environment has cost enough		CD
This leaves more money for more important/other things than the environment CE	Money is left for other things like education and care and teaching. (This includes all arguments stating that money is better spent on other things and that it is good to save money).		CE
Passing on costs to citizens CF	Ultimately, the citizens end up paying for this., the less it costs, the less the population has to pay, making it affordable. *'If the government wants to make it more expensive, then it is the taxpayers, homeowners, and households who will pay for this.'* Costs for the environment should not be placed on the citizens.	The less it costs, the less society has to pay	CF1
		Costs for the environment should not be placed on the citizens.	CF2
Cost reduction is good for creating support for environmental policies CI	Ensures better public support, if it costs too many people will revolt. *'The willingness of the Dutch to help will become less and less if everything becomes even more expensive'.*		CI
Environmental policy can cost something, but not too much CJ	It may cost something, but not too much. Spending must be kept under control.		CJ

Money must be spent efficiently CK	Achieve the most for the least amount of money, invest smartly. No unnecessary expenses. *'Think carefully about what money should be spent on and do it as efficiently as possible: the most result for the least money.'*		CK
Statement is important CG			CG
Statement is not important CH			CH

Statement 4: The government must protect residents' health from pollution and nuisance to best of its ability			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
Government should not do more to protect the health of citizens DA	So much is already happening and too much is being done; enough measures have already been taken. The government is already doing enough to protect health.		DA
Pollution and nuisance are part of life. DB	Sometimes, nuisance/pollution is unavoidable; accepting a certain level of nuisance and/or pollution is a necessary evil. Pollution is a part of life; it's simply there. *'Pollution has always been present; it's just a part of life.'*		DB
Arguments for			
The health of people is most important DC	Health is the number one priority, health comes before everything else, everyone should be able to live a healthy life.		DC
Healthy people are important for the economy DD	Important for the economy, so people can keep working, there is already a staff shortage, less absenteeism.		DD
Citizens have no control over pollution and nuisance, so the government's job DE	On which people have no influence (emissions by Tata Steel, e.g.), the government must intervene. *'Residents cannot monitor air and water quality themselves'*		DE
Protecting health is a core government task DF	Basic task for government, core government task, covid has shown that government is responsible for protection of health		DF

Air pollution in residential areas must be addressed DG	Residents near Schiphol Airport, wood burning, fireworks, and polluting vehicles.		DG
Protecting health is important from a cost perspective DH	Distinction between: Healthier people, lower healthcare costs, a win-win situation. Prevention is better than cure is also part of this if the cost perspective is associated with it. ' And Care costs will otherwise go up even more, care costs are too high, care must remain affordable.	Protecting health can save costs	DH1
		Otherwise, healthcare costs will go up (even more)	DH2
Prevention is better than cure DI	Prevention (of diseases) is better than cure, focused on prevention. Awareness-raising also falls under this.		DI
<u>With condition</u>			
Addressing pollution is good, but nuisance is subjective DJ	This includes that nuisance is subjective, everyone experiences nuisance differently. The government should take action against pollution. *'everyone experiences nuisance differently'*		DJ
Protection of health is not a government task, and is joint responsibility DK	Collaborating to protect the health, the government has responsibility, as well as the citizens. Own responsibility: Government has no influence on health, citizens themselves are responsible for a healthy lifestyle. This includes people deciding for themselves where to live (e.g., Schiphol Airport)	Health is citizens' own responsibility	DK1
Statement is important			DL

DL			
Stelling is not important DM			DM

Statement 5: The government must ensure that companies important to the Dutch economy stay here			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
Environment always comes before economy (regardless of the type of companies) EA	The environment always takes priority, the economy is secondary to it. *'It would be nice, but if it's not technically feasible for the environment, then it can't be done'* *'I don't find it important in relation to the environment.'*		EA
Businesses do not need government support EB	The government already supports companies too much, companies can take care of themselves, the economy will regulate itself. *'Let it go, the Netherlands is already a tax haven.'*		EB
Economy is not a priority, there are plenty of jobs EC	No need to make an effort to retain businesses, there are plenty of jobs anyway		EC
Government has no influence on this; they will leave anyway ED	The government has no control over this, you can't stop them, they do what they want anyway. *'If companies want to leave they will eventually do so anyway'*		ED
World is one whole, Netherlands is a too narrow scope EE	Arguments indicating that this is too narrow in scope; we should see the world as a whole. Companies can also contribute in other countries, not necessarily in the Netherlands. Or The problem is shifted to other countries.	Companies can also contribute in other countries	EE1
		Shifting of the problem	EE2
Arguments for			

Companies ensure independence from other countries EF	Independence from other countries, self-sufficiency, there is too much reliance on imports from other countries, buy local products. Win-win situation: less distance = less pollution.		EF
Businesses are important for socio-economic development EG	Important for the economy, prosperity and employment	Important for employment	EG1
		Important for welfare	EG2
		Important for the economy	EG3
		Environmental policies can be funded through tax revenues generated by businesses	EG4
Companies should stay in the Netherlands EH	Arguments indicating that it is of great importance for the government to ensure that businesses do not leave	Companies are being driven away. *'And that we don't scare away large companies by implementing stricter environmental policies.'*	EH1
		Own country first *"Putting our own people first, I find that an important principle under all circumstances."*	EH2
<u>With condition</u>			
Economy is important, but not at the expense of everything else EI	Ensuring a balance between the economy and the environment, not at the expense of keeping all businesses here. *'We need to maintain a balance. Without companies, there would be no jobs and income.'* *'This remains important for employment but should not come at any cost.'*		EI
Polluting companies should go away, environmentally conscious companies should stay	Let polluting companies go; if they don't want to become more sustainable, they can leave. They can stay if they meet Dutch environmental requirements. Sustainable companies can stay.		EJ

EJ	*'Keeping companies that are important but also striving for sustainability here.'* *'Tighten the regulations or close down polluting companies.'*		
Statement is important EK			EK
Statement is not important EL			EL

Statement 6: The government must protect lower-income households as much as possible			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
The government should (not) only focus on low incomes FA	Do not always need to be held by the hand, need to start working, spend less.	Low-income people are already helped enough by the government	FA1
		These households must take their own action (start working, spend less)	FA2
		Low incomes already get enough, focus on middle incomes	FA3
Working people should end up paying for this FB	Workers must foot the bill for this; it must not come at the expense of working people.		FB
More money should go to residents of the Netherlands instead of migrants FC	Too much money is going to foreign countries and/or migrants.		FC
Not possible FQ	Doesn't work, not feasible		FQ
Everyone should be protected (regardless of income) FD (Equality)	Every household should be protected, income independent, no discrimination, people earning modal have it hard too *'Every household deserves the same protection regardless of income.'*		FD
People with low incomes should contribute proportionally to the environment	Everyone should participate according to their capacity, lend a small helping hand, pay for the environment in proportion, and contribute their fair share.		FE

FE			
Arguments for			
Reduce the difference between rich and poor FF	Less division, too big difference between rich and poor, strongest shoulders heaviest burden, rich must pay.		FF
It is fair to help these people FG	This is fair, fair to help low incomes more		FG
It is social to help these people FH	We live in a social democratic country, this is social and solidarity		FH
Government's job to protect low-income people FI	Duty to protect this group, there must be a safety net for these people, protection of the vulnerable, weak people		FI
Low-income people have a hard enough time as it is FJ	Low incomes are already struggling to make ends meet, everything is expensive, living in poverty. Low incomes are always hit the hardest, fall by the wayside, always suffer. Low income cannot participate in environmental measures, leads to too many (extra) costs. Must remain affordable for everyone. Low incomes are also entitled to a normal life, must be able to make ends meet. Everyone must have the same opportunities. Right to basic needs.	Low incomes are already struggling to make ends meet	FJ1
		Low incomes are always hit the hardest	FJ2
		Environmental measures should not result in additional financial burdens	FJ3
		Also have a right to a normal life	FJ4

Low-income people have no/less opportunity to contribute to environmental policies FK	Have less space and/or opportunities to live cleaner, healthier and more sustainable. Applies also to buying sustainable food. You can't ask more of them.		FK
Addressing the cause rather than treating symptoms FL	People need to be guided more in society, need to be encouraged to earn more and/or get jobs.		FL
People with low incomes also pollute less FM	Emit less, fly less, recycle more.		FM
<u>With condition</u>			
Low incomes should be protected; pay according to ratio FN	Should be taxed, but proportionally, dividing costs by income		FN
Statement is important FO			FO
Statement is not important FP			FP

Statement 7: The government must ensure that residents and businesses that pollute the most do the most			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
Companies will leave if they have to do more GA	Companies will leave, companies will move to other countries, are important for the Netherlands; labour		GA
Enough is already being done by businesses and residents GB	Residents are already incentivized enough to be sustainable, already have to pay a lot. Companies are already working on sustainability		GB
Not feasible to tackle biggest polluters the most GC	Not realistic, not feasible, how are you going to differentiate, no capacity to control this, will be by passed anyway.	Not to determine who the big polluters are *'How do you determine who the big polluters are?'*	GC1
		Uncontrollable	GC2
Not the responsibility of residents and businesses to do anything, but of the government GD	Government has the responsibility, not citizens and businesses. Let the government do something too. *'I think the main responsibility should not be with the residents, but with the government.'*		GD
No finger pointing, it is a collective responsibility GE	We are all responsible, pointing fingers won't get you there either.		GE
Arguments for			
It is fair/just to let big polluters do more GF	This is fair, just. Charging based on pollution; by ratio: this is fair 'Most' is key word Polluter pays? GH Everyone has to do something. Everyone is responsible for their own emissions.	This is fair, just	GF1
		If you pollute more, you also have to pay/do more (indirectly: if you pollute less you have to do less)	GF2
		Everyone has to do something	GF3

	Are responsible for their own actions	Polluters are responsible for their own actions	GF4
Polluting businesses and residents are the main target group to address GG	Main target group to address, should be addressed first.	Should be encouraged to become more sustainable *'Those who pollute the most should stop doing this or find alternative methods.'*	GG1
		Awareness needs to be created; more prevention oriented *'Because they then get the idea that they are the biggest polluter'*	GG2
		Large polluters can make the most impact (scale size) *'These can take the biggest steps.'*	GG3
		It is logical/evident to address this group *'It's obvious, isn't it?'*	GG4
		Big polluters have the most resources to do something	GG5
The polluter should pay GH	Polluter must pay, they should bear the burden		GH
<u>With condition</u>			
A distinction must be made between companies GI	Big polluters are not one group. A distinction must be made between companies		GI

Companies must be addressed, residents not GJ	Businesses should be targeted, residents not *'Not residents, they are already used enough, go after the companies instead.'*	Residents pollute relatively little, businesses a lot *'Residents pollute relatively little, especially relative to large factories, for example.'*	GJ1
		An individual can make little impact, companies can (scale size) *'The small man can do little on his own'*	GJ2
		Residents are already taxed enough, businesses can be addressed *'Not residents, they are already used enough, but go after companies instead'*	GJ3
		Residents have fewer resources than businesses	GJ4
Residents should be targeted, residents not GK	Especially residents, businesses are already doing a lot		GK
Statement is important GL			GL
Statement is not important GM			GM

Statement 8: Environmental policy should interfere with building houses as little as possible			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
No point in building more houses, Holland is just too full HA	There are too many people in the Netherlands, full is full, population must be brought down	Migration *'Asylum seekers out and you have plenty of room for Dutch people'*	HA1
		Population must be brought down. *'I would just start to bring the population down, then there won't be so many homes needed.'* *'Full is full. People should think of other solutions. Fewer children, for example.'*	HA2
Environment goes before housing HB	Environment should not come at the expense of housing, environment comes first, priority is environment. *'It is actually good that environmental policy hinders building houses, as it creates even more urgency to solve the environmental problem.'*		HB
There are enough houses HC	There are enough houses, building more is not needed		HC
Arguments for			
Housing shortage is more urgent than environmental issues HD	Housing is important, there are too few houses, housing is needed, we urgently need new houses, housing shortage is more important than environment	Not enough housing for starters/young people	HD1
		Not enough affordable housing (This includes more social housing)	HD2
		Too few houses in general	HD3
		Too few houses for Dutch people	HD4

Housing is a primary right HE	Everyone has the right to a roof over their head, housing is a fundamental right, everyone has the right to housing, housing is essential		HE
There are too many rules regarding building houses HF	Rules restrict building homes, too strict policies, nitrogen policies get in the way of housing development	Nitrogen policies get in the way of housing development *'Building homes must continue. Nitrogen fuss should not hinder the construction of houses and also the farmers.'*	HF1
Housing is important for the economy HG	Building homes is important for the economy, important that construction companies continue to exist		HG
Building houses is important, population increase through migration HK			HK
<u>With condition</u>			
A balance must be struck between housing and the environment HH	Environment and housing are important, must be done side by side, looking for a balance. Together look at how this can be solved. More housing is needed, but should not be at the expense of the environment *'Efforts should be made to ensure that responsible climate policy and building houses do not contradict each other.'* Environmentally conscious, smart use of space, or looking for other forms of housing	Looking for environmentally conscious housing construction. (This includes using sustainable materials, sustainable means of construction) '*A lot needs to be done for environmental policy, and it is also desirable to build many houses, which can be achieved, for example, using wood instead of concrete.'*	HH1
		Making smart use of space (Physical location of housing, but also the conversion of existing buildings and the utilization of vacant properties) *'Build as much as possible at the borders of villages and cities, and as far away as possible from nature reserves.'* *'We all want to live, build on buildings, convert office buildings.'*	HH2

		Looking for other housing options	HH3
Statement is important HI			HI
Statement is not important HJ			HJ

Statement 9: Environmental policy should interfere with traffic and transport as little as possible			
Main category	**Description**	**Subcategory**	**Code**
Arguments against			
Environment is more important than transportation IA	Environment is more important: Then just a bit longer on the road, people need to adapt, less comfort is okay, traffic is not important		IA
Transportation may be less, there is too much congestion on the road IB	The roads are already so crowded, there are enough roads, there is too much congestion *'Traffic and transportation and congestion is already a problem, and should not get worse'* *'Fewer cars would also be better'* Or Traffic and transport are the biggest polluters, cause a lot of emissions.	Roads are too crowded, there is too much traffic, there are too many roads	IB1
		Transportation creates a lot of emissions/pollution	IB2
Transport must change; more sustainable IC	Transportation must be more environmentally friendly, several measures are mentioned for this purpose: - Taks and excise on fuel, encourage sustainable transportation - Less flying - Reduce speed limits - Restrictive rules also fall under this *'We must continue to be able to travel, but in an environmentally friendly way.'* Public transport is an important measure mentioned; therefore subcategory.	Government should stimulate the use of public transport, make it attractive	IC1

This is not feasible ID	This is not possible, not feasible, not enforceable, people will do it anyway		ID
<u>Arguments for</u>			
Transportation is necessary for accessibility IE	Important for accessibility, mostly commuting And People should be able to go somewhere, freedom of people (This includes also transportation of disabled groups)	Transportation is important for commuting.	IE1
		People should be able to go somewhere *'We must remain mobile and pay more attention to people who have reduced mobility, in addition to the attention given to disabled individuals'*	IE2
Transportation is important for the economy IF	Traffic and transportation are the heart of the economy; otherwise, the entire economy comes to a standstill. (Transportation of van products/export is also part of this)		IF
Otherwise, transport will become even more expensive IG	People should not be taxed extra, transportation is already so expensive. This also includes the indirect influence on the costs of products		IG
Environmental policies backfire: more traffic jams lead to more emissions IH	Environmental policies lead to more traffic congestion, resulting in increased emissions, while smoother traffic flow leads to lower emissions.		IH
<u>With condition</u>			
A balance must be struck between traffic and the environment II			II

Statement is important IJ			IJ
Statement is not important IK			IK

General categories			
Main category	**Description**	**Subcategory**	**Code**
Doubt: discuss JA	Discuss together		JA
Environment is not so important JB	Nature will take care of itself, don't exaggerate with environmental protection, let nature take its course Other things are more important than the environment, no priority The environment is excellent, fine	Environment will manage *'Nature goes its own way. The government can't do anything about it either'*	JB1
		Other things are more important than environment/has no priority	JB2
		The environment is fine *'Our environment is excellent and needs no improvement!'*	JB3
Negative attitude towards government JC	Government does far too little to improve environment, less thinking more doing Or Negative attitude; government cannot be trusted, not acting in the public interest, it's not going to work out anyway, failing government, they won't succeed, they won't keep their promises	Government takes too little action on environment	JC1
		No trust in the government	JC2
There is no climate change JD	There is no nitrogen crisis, no climate crisis. Only the government has created this crisis.		JD
Improving the environment makes no sense if other countries do not participate JE	Netherlands is too small to make an impact; first, the rest of the world, which pollutes the most, should take action. It's nonsense if the most polluting countries don't participate; global support is required. (Addressing pollution is included in this) *'Global support will be necessary because here in the Netherlands, we won't solve the world's major problems.'*		JE

Arguments regarding big polluters			
Cost should be placed on big polluters JF	This is about who should pay the costs of pollution Distinguish between big polluters (not defined who), companies, and wealthy citizens. Regarding rich citizens, it is essential that the objective is not to reduce the gap between the rich and the poor, but, for example, because they are the biggest polluters or have the most capacity to make a difference. *'I agree that the rich should be the first ones to pay for the environment and sustainability.'*	Costs should be placed on big polluters (not defined who)	JF1
		Costs should be placed on companies	JF2
		Costs should be put on rich citizens (not to reduce gap between rich and poor; see FF)	JF3
Big polluters should be tackled first JG	This is about who should be addressed for pollution. Big polluters need to be addressed. For example, large companies like TATA Steel, Shell.	Emphasis should be on tackling big polluters (not defined who)	JG1
		Emphasis should be on tackling (polluting) companies	JG2
		Emphasis should be on tackling rich citizen	JG3

F

Quantitative LCCA Base-case

An overview of the cluster profiles from the quantitative LCCA base-case model is shown. This includes the cluster size and indicator and covariate distributions.

Table F.1: Full overview cluster profiles base-case

	Cluster1	Cluster2	Cluster3	Cluster4
Cluster Size	60.9	19.0 %	12.8 %	7.3%
Indicators				
Statement 1: The government should always strictly control laws and regulations on the environment	5.6	8.1	0.9	3.9
Statement 2: The government must do as much as it can to improve the environment	5.8	11.4	0.6	2.0
Statement 3: The government must ensure that improving the environment costs as little as possible	5.0	1.3	8.0	4.0
Statement 4: The government must protect residents' health from pollution and nuisance to the best of its ability	6.5	8.7	4.8	5.9
Statement 5: The government must ensure that companies important to the Dutch economy stay here	5.4	2.1	7.2	5.0
Statement 6: The government must protect lower-income households as much as possible	5.2	5.1	6.1	21.1
Statement 7: The government must ensure that residents and businesses that pollute the most do the most	6.5	11.6	5.5	3.8
Statement 8: Environmental policy should interfere with building houses as little as possible	5.8	1.3	8.9	2.3
Statement 9: Environmental policy should interfere with traffic and transport as little as possible	4.2	0.3	7.9	1.8
Covariates				
Age				
<25	12.6%	10.1%	10.6%	7.0%
25-44	32.9%	35.1%	31.0%	39.7%
45-64	30.2%	34.9%	36.2%	32.6%
>65	24.3%	19.9%	22.1%	20.8%
Education				
Low	29.2%	16.7%	30.5%	40.1%
Average	40.0%	38.1%	41.5%	38.0%
High	30.2%	44.8%	25.9%	22.0%
Polluted environment				
1	12.3%	9.3%	27.2%	19.7%
2	40.4%	38.7%	41.0%	35.1%
3	13.0%	15.3%	11.5%	9.5%

4	30.4%	29.4%	19.2%	31.9%
5	3.9%	7.3%	1.2%	3.8%
Nuisance environment				
1	18.7%	16.9%	30.7%	28.7%
2	38.5%	37.9%	41.1%	32.0%
3	8.9%	9.8%	7.5%	10.0%
4	27.4%	28.7%	17.5%	24.4%
5	6.5%	6.7%	3.3%	4.9%
Gender				
Men	49.0%	49.8%	53.0%	40.8%
Women	50.2%	49.5%	45.8%	59.3%
Health				
Poor	4.9%	3.2%	5.6%	8.4%
Moderate	20.5%	21.6%	20.9%	25.6%
Good	48.0%	48.4%	50.7%	48.5%
Very good	19.7%	21.5%	15.1%	10.1%
Excellent	4.9%	4.5%	7.0%	5.6%

G

Summary Focus group

June 21, 2023
11:00-12:00
Ministry of Infrastructure and Water Management, The Hague

The focus group consisted of two parts. First there was a presentation on the research methodology and results. Then, there was room for discussion. The discussion was first about the added value of a qualitative LCCA model in general, and then the discussion was about the comparison of the two qualitative LCCA models. This summary presents the main outcomes of the focus group.

Comments following the presentation
During the presentation, it emerged that in the two models presented, the shown profile percentages were confusing. The percentages add up to 100% for each argument in the column and thus indicate how likely it is that people in that cluster do not give that argument (0), and how likely it is that people do give that argument (1). The percentages for HB and HD were given as an example. For argument HB, the percentage for cluster 2 is 16%, while for argument HD3, the percentage for cluster 2 is 14%. However, the 16% for HB is very high compared to the percentages in the other clusters, and the 14% for HD3 is very low compared to the percentages in the other clusters. So, according to them, the disclaimer should be given that the percentages per argument are relative, and cannot be compared.

Added value qualitative models in general
The initial focus of the discussion centred around the number of people per cluster. People in clusters 2 and 3 are often the most likely or the least likely to give a particular argument, but together they make up 33 per cent of the sample, while the more neutral clusters, 1 and 4, together make up 67 per cent of the sample. The question is how to deal with the opinions of people in clusters 2 and 3 compared to the other 67 per cent. It quickly became clear during the discussion that multiple policy-makers agreed on the fact that policies can't be changed for these groups; opinions are usually too extreme to adjust the policies to. This could be different if there are more people in the most outspoken clusters. In this case, there is more need to adjust policies (partially) for this, because the opinions are more representative of the overall population and require greater consideration. However, you can make sure that these groups do feel heard. Because the qualitative analysis ensures that you have a clear overview of the counterarguments, this enables you to effectively respond to this with your communication strategy. One policy-maker mentioned that you normally would think, we will never get this group on board, we will ignore them, but when you get more insights by means of the qualitative data, you can see why people think something and you can adjust your strategy accordingly.

Despite these benefits, one policy-maker mentioned that you have to be careful not to look too much at the extreme opinions, otherwise, you come to the game of polarisation. First, according to another policy-maker, it is important to not only focus on points where people disagree but rather to look for starting points to start a conversation. These starting points can also emerge from the qualitative analysis. In addition to this, it is important in your communication strategy to not only focus on people who think that the environment is not important but also on people who think policies are not complex enough;

you can adjust your communication to both audiences.

Lastly, it was mentioned that the insights gained from the qualitative data are often confirmatory for the results from the quantitative LCCA model. It is therefore questionable whether it is worth the investment in the future.

Costs versus benefits
This automatically led to the next discussion point, do the cost outweigh the benefits? The interest in separating the qualitative LCCA analysis from the quantitative LCCA analysis was mentioned by multiple policy-makers. The added value of the qualitative analysis is context-dependent. For the NMP PVE, clear clusters emerged from the quantitative LCCA, but this might not be the case for other PVE'S. In that case, there would be a need for an additional qualitative LCCA. The qualitative LCCA model could then be estimated later. Another reason for an additional analysis could be that the clusters from the quantitative LCCA give a reason to acquire more information. For example, it may emerge that you need people in a particular cluster, or that the topic is politically sensitive.

Finally, there was a debate regarding whether the costs outweigh the benefits. It was concluded by all the policy-makers that the small group ends up making a lot of noise and that it is valuable to be able to adjust your communication strategy accordingly. When you make something controversial like the NMP, you want to have a clear overview of all the perspectives. Then it is worth the extra costs and time. So in the case of the NMP, the qualitative analysis is worth it, but it would be even more meaningful on even more controversial issues, for example, corona policies. Besides this, the added value also depends on which stage of the policy process you are in. It depends mainly on whether you can still do something with the input or not.

Comparing the two models
The last discussion point was about comparing the objective and subjective models. It was concluded by all policy-makers that it is always good to start with an objective model, and then it could be further examined whether this gives rise to a subjective model. You cannot decide in advance which variables you would want to have in the subjective model. It was also said that 36 variables are a manageable amount of variables for the objective model. It is therefore not needed to have a model with fewer variables.

Further comments
According to one policy-maker creating the codebook and coding by one organisation is a risk. These people are all in the same bubble. It could be said that the data has been manipulated to achieve the desired results. It would therefore be necessary to look at how the codebook and coding could be done as objectively as possible. It was given to involve an independent person in the study.