Detection of Hidden Moralities in the Energy Transition

An explorative study for the development of a research method

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D'Oude Jan,
kromgebogen
onder de
zorgen van de mensen
die hij in de
loop der eeuwen
onder zich zag

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Acknowledgements

This study starts in the year 2020, when the contagious enthusiasm of T.S.G.H. Rodhouse opened to me the world of possibilities of Q methodology. In the following years, I have applied this research method to various contexts where an objective view on subjectivity would contribute to better communication and interaction between people. As part of my master's thesis, I wanted to apply Q Methodology in an innovative way. After a substantial search process for a topic, I was eventually introduced to the problem of hidden morality by N. van Uffelen. I would like to thank her for that because it proved to be a good match. I would like to thank my daily supervisor M.L.C. de Bruijne for his sustaining enthusiasm and at times critical reflection on my research endeavors. I would like to thank U. Pesch for his feedback and his inspirational papers. I would like to thank M.J.G. van Eeten for nudging me to use a moral foundation framework combined with statements from Twitter. And lastly, I would like to thank Squarewise Transitions and the municipality of Wijchen for helping me in the collecting of data.

Executive Summary

Participatory procedures have been made mandatory for Dutch municipalities in the transition towards a CO2-neutral energy system. Most of these procedures have been based on discourse ethics, which describe a set of prerequisites for public deliberation. These prerequisites form no barrier for the ideal citizen who is imaged as someone who behaves rationally, possesses adequate information, and is capable of effectively navigating regulations and government procedures. However, those prerequisites serve as barriers to feasible citizens who are imaged as someone who desires to exercise personal autonomy but at times lack sound judgment, decisiveness, and rationality in their actions. (Bohman & Rehg, 2017; Honneth, 1982; Scheltema, 2018).

Moreover, current participatory procedures are designed from a residual realist's point of view which results in pre-defined subjects, objects, and formats of participatory events. However, this conflicts with modern public engagement's complex and diverse nature. When the need claims, values, and desires of citizens are not appropriately addressed, the phenomenon of "overflowing" can occur, resulting in an informal assessment trajectory that impairs decision-making and undermines the legitimacy of the formal participatory procedures (Chilvers & Kearnes, 2020; Pesch et al., 2017).

An alternative view on participation, called relational coproductionist, is proposed which emphasizes the coproduction of the formats, objects, and subjects of participatory procedure by policy-makers and citizens. It aims at removing barriers to the expression of citizens by including moral emotions, since they show insight into ethical considerations of decision-making (Chilvers & Kearnes, 2020; Roeser & Pesch, 2016). See Figure 1 for a visualization of the increasing of the legitimacy of participatory procedures.

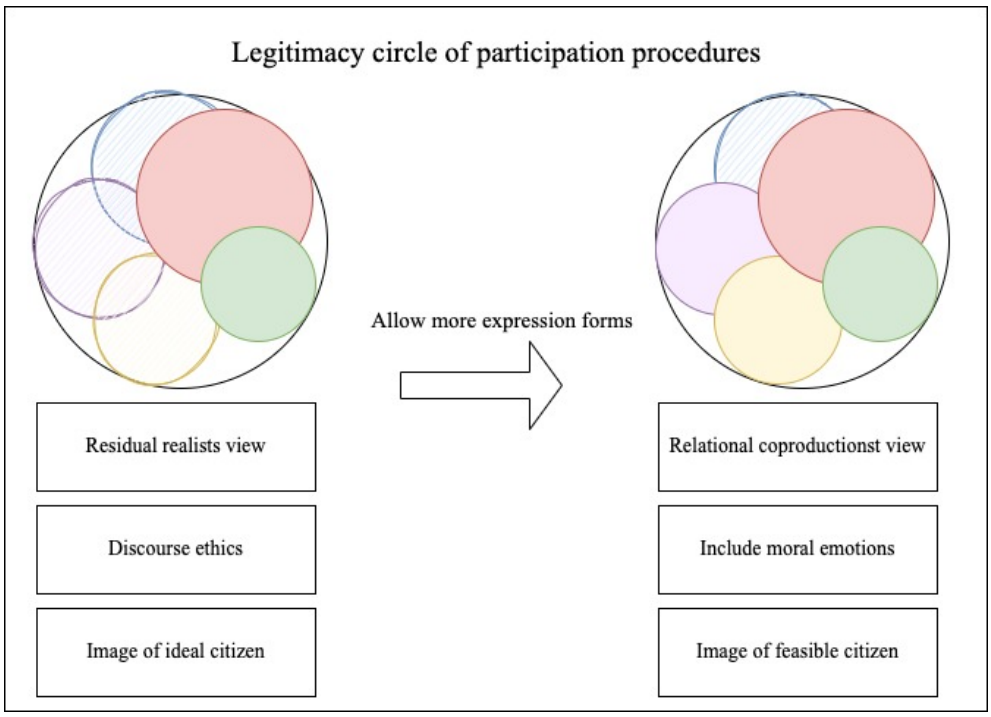

Figure 1: Increasing the Legitimacy of Participatory Procedures

This view is aligned with the theory of the problem of hidden morality which explains why the sentiments of citizens remain hidden in public deliberations. It argues that citizens have uncoordinated complex, negatively formulate, and reactive demands for justice that are expressed in moral emotions. The interpretation and translation of these moral emotions can lead to the formulation of ethically grounded goals. In that form, they can be discussed with the moral concerns of other citizens and can become part of public deliberation as is visualized in Figure 2. In short, the legitimacy of participation procedures can be increased by incorporating moral concerns in form of emotions (Honneth, 1982).

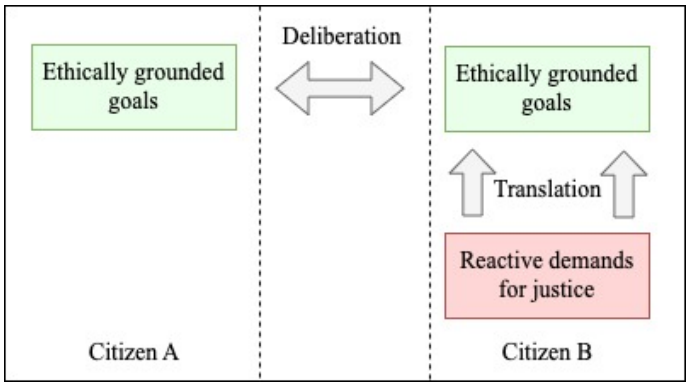

Figure 2: Interpreting Reactive Demands for Justice (Honneth, 1982)

However, there is a lack of transparent and rigorous methods that can contribute to these alternative participatory procedures. This study aims to develop such a method by combining a framework on moral foundations in combination with Q methodology, resulting in a research design that is accessible and at the same time has reliable results. The development of the research design is guided by its application to a participatory procedure in Wijchen where citizens had to communicate their preference for a CO2-neutral technology (Chilvers & Kearnes, 2020; Haidt, 2012).

The methodological aspects of a Q research involve the constructing of the Q set, P set, factor extraction, and factor analysis. The Q study is expected to elicit the needs, values, and desires of citizens in a participatory procedure in Wijchen and translate them into coherent narratives. The study uses statements about moral dilemmas surrounding CO2-neutral technologies. With the availability of limited time and resources, 36 citizens have sorted the Q set, of which 23 have been used for factor extraction. A safe factor extraction approach is employed to allow for general subjective trends in the data. The data is interpreted by innovative analyses based on moral foundations and phrasing (reactionary/ideal) of the statements.

The interpretation of the factors aimed to translate the resonance with reactionary, negatively formulated content into the articulation of ethically grounded goals. This process yielded three distinct perspectives whose rationale is described by means of a narrative. The first perspective, *"We, as reasonable citizens, manage the transition ourselves"*, sees the energy transition as a communal effort with the need for critical reflection on technological alternatives and institutions and thereby protecting the vulnerable. The second perspective, *"Being idealistic means being pragmatic"*, shows enthusiasm for constituting a CO2-neutral energy system and is convinced that citizens together with the government can overcome the drawback of each technological alternative. The third perspective, *"Fairness as proportionality should be put central"*, is skeptical towards the technological alternatives and only wants to transition to an alternative energy system when a proportional distribution of costs and benefits is ensured.

The results of the Q research have been roughly validated by observations during a second participatory event (Bewonersdag). The resonance with reactionary and ideal-formulated statements has been used to identify ways in which participants of the three perspectives would interact in a deliberation. Analysis showed that the ethically grounded goals that underlie the reactionary demands of perspective 3 are at-risk to remain undetected and be overshadowed by the sentiments of perspective 2. This was signaled during a group discussion on the Bewonersdag. This demonstrates that the ethically grounded goals of perspective 3 can be regarded as hidden moralities.

The impact of the detection of hidden moralities on the shaping of the participatory procedure is yet to be fully understood. The output of the Q research could be used for the structuring of a fruitful deliberation, or as a proxy for the values, needs, and desires of citizens. Additionally, the conducting of the research could be seen as an approach to acknowledging moral emotions and therefore building levels of trust with citizens.

It is promising to apply the research design at multiple participatory procedures to reduce the risk of overflowing and thereby iterating the Q research design to increase its sensitivity to detect difficult

expressed moralities. The main point of attention are the integration of a value framework and the consideration of the distrust of participants towards institutions. It would be interesting to conduct the Q research design in combination with a workshop in which citizens gain knowledge on the subject of participatory procedures and where works of art are used as triggers for emotions-moral reflection.

Table of Contents

1 Introduction

In recent years, the legitimacy of the democratic system is questioned by academics and opinion makers by reviewing the working principles of representation. One line of a critic is that the requirements and demands that have been advocated by citizens are translated and distorted in the process of policymaking and implementation to fit existing power structures and policies (Veeneman et al., 2009). This is also the case for energy decision-making as is shown by recent failures in the policy dossiers of the earthquakes in Groningen (Verdoes & Boin, 2021).

To ensure a more direct impact of citizens' values on energy policies, direct democratic practices such as local participatory procedures have been proposed by academics and policymakers (Fiorino, 1989; Mayer et al., 2002; Propper & Steenbeek, 1998; Thomas & Thomas, 1995). In the Netherlands, for example, participatory procedures have been made mandatory for every municipality in the transition toward a CO2-neutral energy system (Ministerie van Economische Zaken en Klimaat, 2019). The mandate leaves room for municipalities to decide on the amount and type of participation, which has resulted in the employment of a broad array of participation processes.

However, there is a fundamental critique of these participatory procedures. Several Dutch institutions have been criticized for their misrecognizing of the need claims of citizens (Schuurmans, 2021; Verdoes & Boin, 2021). Critics argue that the current participation procedures have been created with the ideal citizen in mind who *"acts rationally, has sufficient knowledge to make well-thought choices, and is appropriately manageable to deal with rules and the government"* (Scheltema, 2018, p. 1). However, modern society has become substantially complex in a short amount of time resulting in new, unforeseen situations in which citizens interact with the government. It is not legitimate to expect that citizens can interact according to that the proposed ideal image.

Alternatively, participatory energy decision-making should be designed with a feasible image of a citizen in mind *"who wants to make his own choices, but reacts not always smart, decisive and rational"* (Scheltema, 2018, p. 2). In the new interactions of complex modern society, it is reasonable to expect that citizens make mistakes despite genuine intentions. Citizens may express themselves incoherently and reactionary by continually opposing policy proposals, distrusting institutions, and reasoning with emotional arguments. However, this does not mean that emotions are irrelevant in participatory procedures. Emotions are often moral emotions, such as sympathy, guilt, and indignation, and they are often based on desires, values, and need claims and can provide insight into ethical aspects of decision-making (Honneth, 1982; Roeser & Pesch, 2016). Instead of seeing emotions as a burden in participatory procedures, they can enrich a deliberation.

When participation procedures are designed with the ideal citizen in mind, moral emotions are interpreted as reactionary expressions and consequently, they are excluded from the process. However, this way certain injustices might remain undetected. This problem can be described as "hidden moralities" (Honneth, 1982). The fact that certain moralities remain hidden undermines the legitimacy of participation procedures since they are employed for advocating the values, desires, and need claims of citizens.

The challenge of uncovering hidden morality lies in the detection of hidden desires, requirements, demands, values, and norms to make them part of a participatory procedure. However, methodologies that are transparent and can produce reliable results are often lacking in the identification of vulnerabilities and injustices in the energy transition (Jenkins et al., 2021). This thesis aims to analyze hidden morality in energy participation procedures through a Q methodology research design. Q methodology is often applied in studying the complex, multi-actor environment of participatory processes because of its relevant research characteristics (Cuppen et al., 2010; Curry et al., 2013; Forrester et al., 2015). Where other research methods fall short, Q methodology may be used to research unknown sentiments because of its flexibility and scientific rigor (Brown, 1980; Watts & Stenner, 2012). In short, this methodology can realize the potential of participatory procedures in propelling the constitution of a CO2-neutral energy system.

1.1 Research Outline

This paper is on the development of a method to operationalize normative academic research on participatory procedures in the energy transition. The use of Q methodology aims to detect moralities that would have remained hidden. Therefore, the main research question is posed as:

How can hidden moralities be analyzed in participatory procedures in the Dutch energy transition through a Q methodology research design?

The main research question is composed of three sub-research questions. An answer to the main research question can be formed by answering the sub-research questions consequently.

Sub research question 1: *How do moralities remain hidden in participatory procedures in the Dutch energy transition?*

Sub research question 2: *How can moral emotions be considered in a Q methodological study?*

Sub research question 3: *How can hidden moralities be detected in participatory procedures in the Dutch energy transition through a Q methodology research design?*

Chapter 2 delves into participation literature to answer the first sub-research question after which chapter 3 answers the second sub-research question by reviewing Q methodology literature. The research methodology and the chosen participatory process for the data collection are described in respectively chapters 4 and 5. Chapters 6 and 7 deal with the design and output of the Q research design, thereby answering the third sub-research question. The conclusions, discussion, limitations, and recommendations are discussed in respectively chapters 8, 9, 10, and 11.

2 Hidden Moralities in Participatory Procedures

This theory section deals with the question of how moralities remain hidden in participatory procedures. Participatory literature is used to depict the dominant and an alternative view on participation. These views are used to discuss how the legitimacy of participatory procedures can be increased.

2.1 Legitimacy of Mainstream Participatory Procedures

This section starts with an elaboration on the main view on participation and discussed the legitimacy of participatory procedures employed from that stance.

In the Netherlands, participatory procedures are employed from a residual realist's point of view on participation and publics. This view sees participatory procedures as a combination of events in which the public as a grouping of self-governing individuals interact with each other. The forms, subjects, and objects are specifically predefined and do not correspond with a deliberative model of participation which can do justice to the complexity and multivalence of modern public engagements (Chilvers & Kearnes, 2020).

These participatory procedures seem to be based on Habermas' discourse ethics. Discourse ethics depicts an ideal form of discourse by describing guidelines on how to reach agreements in a participatory setting. Some of these guidelines are no hierarchy in power concerning communication, common use and interpretation of linguistic terms, and true expressions of participants (Bohman & Rehg, 2017).

Discourse ethics is meant to include all citizens in deliberation, however, in practice, the guidelines have become barriers to expression. The prerequisites for deliberation are impossible to attain in practice and are bound to disregard the moral emotions of people and people unable to articulate their thoughts and arguments (Honneth, 1982).

A change in perception between policymakers and citizens occurs when citizens cannot advocate their values and concerns in a participatory process. Policymakers might think that they have allowed appropriate participation by complying with the laws and procedures. However, an informal assessment trajectory might emerge as a response to a (perceived) lack of attention to concerns or values in the formal trajectory. This process is called 'overflowing', and can cause substantial delays in decision-making when the informal trajectory is seen as irrational and not made part of the formal trajectory (Pesch et al., 2017).

The process of overflowing exposes a dichotomous view of citizens present with policymakers. On the one hand, laws and procedures are based on citizens acting as reasonable moral agents, on the other hand, policymakers tend to consider participants as irrational in participatory processes and therefore are reluctant to take their concerns into account (Rodhouse et al., 2021).

In conclusion, mainstream participatory are employed from a residual realist' point of view, seem to be based on discourse ethics, and take into account an ideal image of the citizen. For these reasons, participatory procedures face the risk of overflowing. This impairs decision-making and undermines the legitimacy of these procedures.

2.2 Alternative View on Participation

This section discusses whether an alternative approach to participatory procedures can increase its legitimacy.

The relational coproductionist view on participation offers an alternative to the mainstream residual realist's view by suggesting that the legal elements of participatory procedures, such as the objects, formats, and subjects are coproduced by citizens and policy-makers. Participation in this view is considered reflexive, diverse, responsive, and experimental. However, this view remains primarily confined to analytically interpreting participatory processes. There is namely a lack of methodologies that align with and can contribute to the employment of participatory procedures based on this view (Chilvers & Kearnes, 2020).

These new methodologies have to be focused on removing barriers to the expression of citizens. The

feasible image of a citizen has to be put central, who want to be independent but may not have sufficient knowledge or decisiveness. The dichotomous approach to reason and emotion present in participatory procedures which assess new, risky technologies serves as a barrier to the expression of citizens. The logic to exclude emotions from assessment practices is that reason has to prevail and correct emotions. This is erroneous since moral emotions such as guilt, sympathy, and indignation can provide an understanding of ethical considerations related to decision-making. Most notably, the levels of trust of citizens decrease when their emotional expressions are dismissed. In short, this coherent view of reason and emotion recognizes more ways of expression and thereby increases the legitimacy of deliberation (Roeser & Pesch, 2016).

The broadening of ways of expression by the inclusion of moral emotions can only work when citizens are willing to join a conversation. This is not a given fact because joining a conversation might compromise the credibility of citizens when they want to remain neutral and be regarded as an outsider. This problem could be solved with proxies that add the values, need claims, and desires of citizens to deliberation. It has to be noted that the use of proxies cannot guarantee the heightening of the legitimacy of participatory procedures and the prevention of overflowing (Pesch et al., 2020).

In short, the relational coproductionist view on participation aims to increase the legitimacy of participatory procedures by considering a feasible image of citizens and allowing more ways of expression among which moral emotions, as described in Figure 3. It has to be noted that this view is dependent on the availability of methodologies and the willingness of citizens to cooperate.

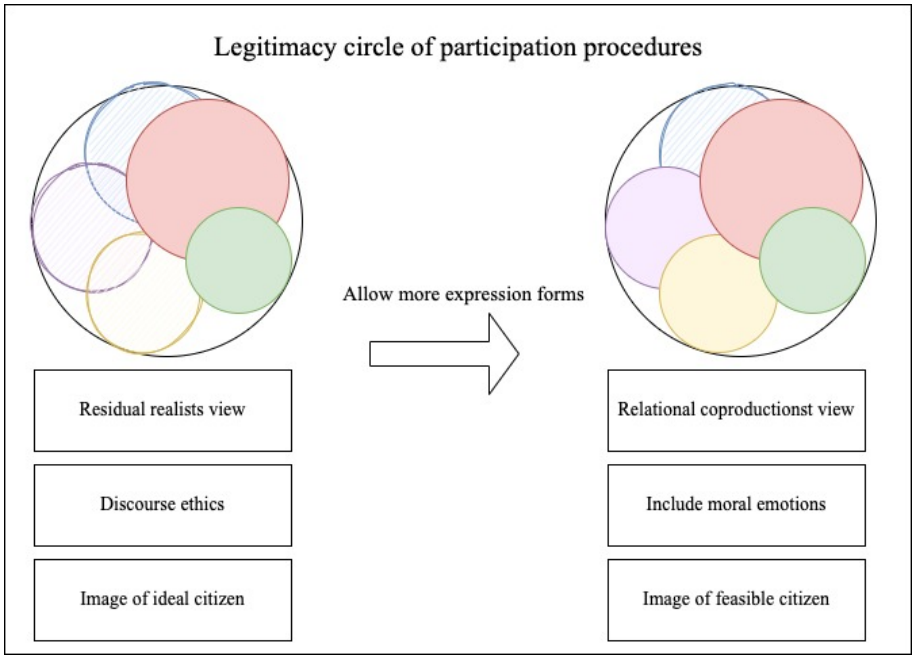

Figure 3: Increasing the Legitimacy of Participation Procedures

2.3 Interpretation of Moral Emotions

To understand how moral emotions can be incorporated into participatory procedures, it is relevant to depict how moral emotions are present in society.

The energy transition occurs in a global, modern society that is characterized by the presence of a multitude of social orders. Whereas in the past, the forming of group identity of citizens was bounded by geographical boundaries, in contemporary society, through the use of social media these boundaries have disappeared. This leads to a multitude of social orders in which the identity and affiliation of citizens are challenged, leading to a mixture of moral emotions and not knowing how to act. This challenges the skill of moral agency with citizens, which has to be developed to enable citizens to participate in public deliberations (Pesch, 2020).

A philosophical theory called “the problem of hidden moralities” shed light on how limited moral agency

in modern society affects public deliberations. It argues that the development of "well-developed and normatively based ideas of justice" is the result of lifelong (academic) learning and participating in deliberations (Honneth, 1982, p.4). Citizens who are not able to articulate their positive set of principles express "uncoordinated complex and reactive demands for justice" in the form of moral emotions (Honneth, 1982, p. 5). The disregarding of moral emotions in public deliberations can cause the ethically grounded goals that underlie these reactive valuations to remain hidden. Only when the need claims, values, and needs of all citizens are brought to the table, a public deliberation deal with what is a stake. To do so, it is needed to translate the reactive demands for justice into ethically grounded goals as schematically visualized in Figure 4.

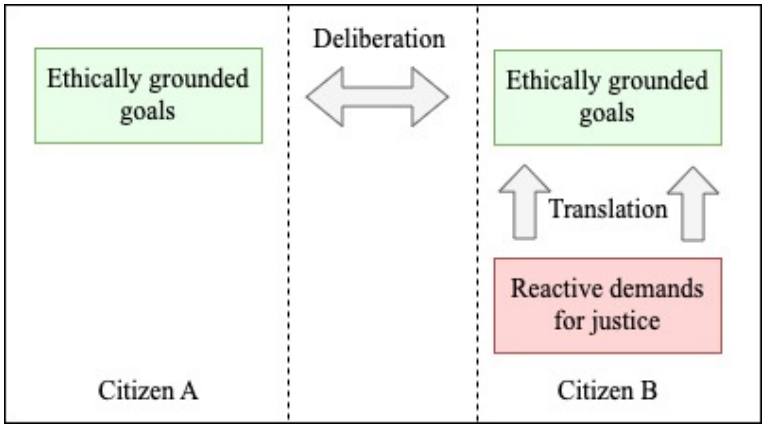

Figure 4: Interpreting Reactive Demands for Justice (Honneth, 1982)

However, interpreting reactive demands is not clear-cut, since reactive demands for justice can be fragmented and dependent on specific situations and are therefore not always valid. Citizens may be affected by cognitive biases when they are forced to take decisions under uncertainty. Cognitive biases are systematic disturbances in judgment because of a deviation from rationality. The presence of cognitive biases at citizens is a sign that they are struggling in addressing their vulnerabilities. Although it does pose a challenge in interpreting their reactive demands for justice (De Vries, 2020).

However, guidelines to consider moral emotions in participatory procedures remain normative and difficult to put into practice. The role of art could be relevant and contribute to the moral consideration of citizens because art does not have to follow certain laws and has therefore the freedom to exaggerate certain issues. Artworks can trigger moral emotions and influence people more directly than a scientific study could. Therefore, works of art have the potential to incorporate moral emotions in public deliberations (Roeser et al., 2018).

In conclusion, modern, complex society poses a strong demand on the moral agency of citizens. As a result, some citizens can articulate and communicate their positive set of principles while others express themselves in reactionary, emotional demands for justice. The challenge for public deliberation is to detect the ethically grounded goals that underlie these reactive valuations. Works of art can initiate the interpretation of moral emotions, while the presence of cognitive biases hampers that process.

2.4 Conclusion

An alternative view on participation is proposed to increase the legitimacy of participatory procedures and thereby limit the risk of overflowing. Central in this view is the allowance of multiple expressions of citizens. The interpretation of moral emotions can lead to the identification of undetected moralities.

3 Detection of Moral Emotions

Interpreting moral emotions can enhance decision-making in the energy transition and increase the legitimacy of participatory procedures. This section discusses how to detect and interpret moral emotions. It does so by discussing a moral foundation framework and the recent development of the research method Q methodology.

3.1 Moral Foundations Framework

A holistic approach to the detection and interpretation of moral emotions is provided by an influential American social scientist called Jonathan Haidt. In his book “The Righteous Mind” he develops a framework of moral foundations which he applies to describe the difference in appeal between the Democratic and the Republic party in the United States of Amerika (Haidt, 2012). He reasons that before reasoning starts, moral intuitions emanate automatically and almost right away moral. In his questionnaires, he makes use of statements that are based on these moral intuitions which are salient and elicit strong moral responses. The framework categorizes moral intuitions by six moral foundations.

3.1.1 Care/Harm

The "Care/Harm" moral foundation is on the relation of the vulnerable to keep them safe, to keep them alive, and to keep them from harm. Triggers for this foundation are signs of suffering, distress, or neediness (Haidt, 2012).

3.1.2 Loyalty/Betrayal

The moral foundation of "Loyalty/Betrayal" focuses on the virtue of loyalty within teams and coalitions but also in two-person relationships. It is related to the challenge of forming and maintaining coalitions that could fend off challenges and attacks from rival groups. The trigger for this foundation is anything that tells you who is a player and who is a traitor (Haidt, 2012).

3.1.3 Fairness as Proportionality

The moral foundation of "Fairness as Proportionality" is about utilizing cooperation while preventing exploitation by people who do not adhere to the rules. The foundation is triggered when bad behavior remains unpunished (Haidt, 2012).

3.1.4 Liberty/Oppression

The "Liberty/Oppression" moral foundation is on the prevention of individuals dominating and constraining others. This foundation is triggered by signs of attempted domination. The reaction is a motivation to unite as equals with other oppressed individuals to resist and restrain this domination (Haidt, 2012).

3.1.5 Authority/Subversion

The moral foundation of "Authority/Subversion" is on creating stability by providing order and justice. Anything related to acts of (dis)respect, (dis)obedience, or submission/rebellion concerning legitimate perceived authorities serves as a trigger. Aspects that provide stability such as tradition, values, or institutions may not be sabotaged (Haidt, 2012).

3.1.6 Sanctity/Degradation

The "Sanctity/Degradation" moral foundation is related to the pillars that are supporting a community. These pillars could be people, places, principles, or objects. When someone in a moral community desecrates one of the sacred pillars, the reaction is sure to be swift, emotional, collective, and punitive. Furthermore, this emotion deals with the balance of neophilia (an attraction to new things) and neophobia (a fear of new things) (Haidt, 2012).

3.1.7 Critics on the Framework

Although the framework has had explanatory power in recent years, it is not without critics. Some argue that Haidt's view on moral foundations is too limited; people are not merely guided by gut feelings and moral arguments whose reasoning reflects are unjustifiably devised. Other scholars from psychology and philosophy have argued that emotions have also cognitive aspects, and therefore can be interpreted as considerations of value (Roeser & Pesch, 2016).

The framework could be enhanced by making a distinction concerning the subject about which the emotion is felt. Emotions could be directed at well-being, people, or self. Furthermore, the framework lacks a connection between emotions and values. Values can be defined as ideals or life goals that abstractly define what is considered important to people (Perlaviciute & Steg, 2015). People experience emotions because they have values or concerns which are impacted. Values are based on emotional reactions in addition to knowledge (Bozeman, 2007), and therefore have the potential for more explanatory power in an observation.

3.1.8 Conclusion on the Use of the Moral Foundation Framework

The moral foundation framework of Haidt provides a holistic approach to the detecting of moral emotions and provides starting points for the development of a methodology. Although the framework is criticized for a too limited view of cognitive decision-making and a lack of connection with values, it has had substantial explanatory power.

3.2 Detection of Moral Emotions with Q Methodology

It is promising to use the framework of moral foundations in combination with Q methodology to detect moral emotions in the energy transition. In recent years, Q methodology is often applied in the field of participatory procedures and specifically in the energy transition using stakeholder analyses. The method can identify shared ways of thinking between multiple actor groups (Curry et al., 2013) and can help with 'participatory mapping' by representing the connection between people's actions and their attitudes (Forrester et al., 2015). Q methodology stands out from other methods because it combines the in-depth qualities of interviews with the regularity of a survey, thereby compensating for the limitations of each research strand (Donner, 2001). The following section discusses the working principles and recent developments in Q methodology.

3.2.1 Introduction to Q Methodology

Q methodology emerged in 1930 and has been a marginal method in the academic community until recent years when it has been applied to an increasing amount of disciplines. On the one hand, this development shows that there may be even more disciplines and topics on which Q methodology could be used. On the other hand, this shows that Q methodology to be improved to apply the research method in these new applications.

Fundamental to Q methodology are the terms 'Q set' and 'P set'. A Q set is a set of stimuli of subjective content that comprises a certain object or project/problem. This subjective content could be composed of statements, objects, descriptions of behavior, etc. A P set is a set of participants to which the Q set is presented. The participants are chosen such that they represent the wide range of opinions that are present in a certain context and does not have to be a representation in the quantity of the relevant group (Watts & Stenner, 2005). The participants receive instruction to sort the Q set to a criterion, for example, what they think is most important. Their sorting is guided by a presupposed distribution pattern, a rigid scale, which makes the participants prioritize the set of stimuli and forces them to give each stimulus another amount of importance. See Figure 5 for an example of a distribution pattern.

Figure 5: Example of a Q Methodology Distribution Grid

A Q sort is a distribution grid filled in with statements and is a representation of the way of thinking of the participant on the subject. The unique Q sorts of the participants are analyzed together so that pieces of common sorting patterns can be identified. These are called factors and are presented as a new Q sort. For each participant, it is shown to what extent they correlate with these factors. The communal way of thinking about these extracted factors is written down in a narrative. This narrative is constructed by a process of abduction, where hypotheses are formed and rejected about the reasons behind the distribution of statements. In short, Q methodology allows participants to express themselves to construct narratives that describe the subjectivity of the object under scrutiny (Watts & Stenner, 2005).

3.2.2 Methodological Adaptations

Q methodology has a standard way of executing all the steps in generating and analyzing the data. However, it leaves plenty of room for diversification and adjusting the Q study to a certain context (Watts & Stenner, 2005). This section depicts which adjustments can be made to the method to include various forms of expressions of citizens.

3.2.3 Use of Visual Stimuli

The main presentation of a set of stimuli is using statements, although other kinds of stimuli are permitted. One example is the use of visual stimuli, which is used in a minority of Q studies. Still, over the years visual stimuli are widely applied in different contexts and are particularly used with Q studies related to environmental issues. The effect of images can be more sophisticated and powerful than verbal statements. Furthermore, images can arouse emotions making it easier to detect them (Beckham Hooff et al., 2017; Lu et al., 2018; O'neill & Nicholson-Cole, 2009; Zhu et al., 2021).

3.2.4 Use of Art Works

Some Q methodological papers allow the reflection of participants on works of art. These papers are in the minority but still, walk an untrodden path where other methodologies fall short. One Q methodology study analyses the responses to a performance art piece that visualized experiences of domestic aggression through visual stimuli, another paper detects responses to a movie (Davis Michelle, 2011; Maxwell, 1999). The investigation of experiences of traumas in a particular context in which Q studies in combination with artworks is used because they lack verbal logic and are concealed through images (Maxwell, 1999). This research object has some relevance to the studying of hidden moralities when citizens have difficulties in advocating their need claims concerning experienced injustices.

3.2.5 Q Methodology and Accessibility

Some Q studies that have been particularly focused on its accessibility are those employed in the field of social work. Q methodology is related to that field because it focuses on user participation by making them part as co-researchers, is perceived as a non-threatening research method, and with a small number of participants can offer rigorous analyses. The accessibility of the method can be increased by limiting the number of stimuli in a Q study, which considers the patience and cognitive abilities of the participants (Ellingsen et al., 2010; Størksen & Thorsen, 2011).

3.2.6 Q methodology and Validity

The accessibility of a Q methodology research and the rigor of the results can be seen as communicating vessels. Methodological measures have to be undertaken to maintain the validity of the output when the accessibility is substantially increased to include more expression of citizens. A possible solution to strengthen the results of a Q methodology study is to make it part of a mixed-method research strategy with the use of an additional framework or theory. In such a research design the framework can guide the interpretation of the data without limiting the expression of participants. Special attention needs to be paid to the study of Grosswiler who test a philosophical theory through a Q methodology with visual and audio stimuli (Babinčák & Jenčopal'ová, 2022; Callahan et al., 2006; Coke & Brown, 1976; Donahue, 2004; Grosswiler, 1990).

3.2.7 Conclusion on Recent Developments and Applications of Q Methodology

Q Methodology has been applied often in participatory procedures in the energy transition and has seen an increase in its use in recent years. The ability of the research method to capture emotional sentiments can be increased by the use of visual stimuli and in combination with works of art. The research method can be employed in combination to make sure that the results have rigor despite efforts to make the study accessible.

3.3 Conclusion on Using Moral Foundations with a Q Methodology Study

The framework of Haidt could be used in combination with Q methodology to design a research method that is both accessible by generating salient statements for the Q set and has reliable results by providing moral foundations as guidance with the interpretation of the factors.

4 Research Methodology

This section elaborates on the research methodology that has been used to answer the research questions. The used mixed method research strategy, design methodology, data collection, and notions on the abduction process of Q Methodology are discussed.

4.1 Mixed Method Research Strategy

The mixed method approach for this research is an exploratory sequential design (ESD), because of the need for adjusting a quantitative instrument to a specific situation where other instruments are not available (Creswell & Clark, 2017). This study can be notated as *Qual -> [QUAN + QUAL] = development of new methodology*. The results of the first qualitative research phase are ideally informed with a theory, in this case, the theory of the problem of hidden moralities. The second research phase, which is the focus of this research combines the development of a Q methodological instrument with data gathering. A schematic representation of an exploratory sequential design can be found in Figure 6.

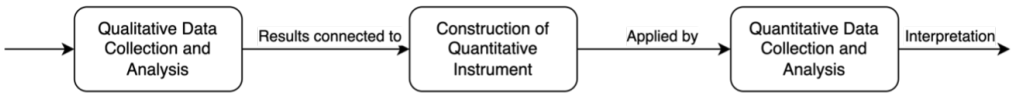

Figure 6: Exploratory Sequential Research Strategy (Creswell & Clark, 2017)

4.2 Design Methodology

The construction of a research instrument is ideally guided by a design methodology. At first, the research steps of the design science research methodology (DSRM) have been of guidance, but that methodology has proven to be too far-fetched and too theoretical to combine with the ESD (Peffers et al., 2012). Instead, the Vision in Design principles are used to sketch a potential future in which the research instrument will operate. The theory of the problem of hidden morality has provided starting points to delineate a future situation in which the Q Methodology can be employed.

4.3 Data Collection

The second phase of the mixed-method research strategy includes two participatory procedures for the gathering of data (Harrison et al., 2017). These procedures are chosen to learn how the constructed instrument performs rather than to prove something (Flyvbjerg, 2006). At the same time, this study searches for frequently occurring subjective patterns that might also occur within other contexts (Brown, 1980). The confrontation with the field serves as a demanding and coercive force to develop the research instrument (Flyvbjerg, 2006).

4.4 Q Methodology and Abduction

Abduction plays a central role in Q methodology and involves generating and exploring a combination of hypotheses (Brown, 1980). The process of abduction can be criticized as sensitive to bias by a lack of theories upon which the hypotheses are formed, but also lauded as a process that does not impose theories a priori and restricts the interpretation of the data (Watts & Stenner, 2012). The process of abduction is especially relevant when you want to get inside someone's head to determine its moralities when he can not articulate itself (Brown, 1980). In an unexplored area, the process of abduction can contribute to quickly getting an understanding of the problem at hand.

4.5 Conclusion

A mixed-method research strategy with practices from design literature is chosen to develop a research instrument in distinct participatory procedures. The abduction working principle of Q methodology aligns with the endeavor to detect hidden moralities.

5 Participatory Procedures in the Netherlands

Every municipality in the Netherlands is required to organize some sort of participation in getting rid of the use of gas in the heating of homes (Ministerie van Economische Zaken en Klimaat, 2019). In theory, every participation procedure would be relevant for the detection of hidden moralities. Eventually, two participatory procedures studies are chosen which were studied from July until October 2022. This section describes and typifies those participatory procedures and discussed how a Q methodology study could be of value with the present challenges.

5.1 Bospolder-Tussendijken 'Huis van de Toekomst'

5.1.1 Procedure Description

Bospolder-Tussendijken is a cross-cultural working-class district in Rotterdam. Several artists have created the project Huis van de Toekomst (Huis van de Toekomst, 2023), which can be typified as a participatory procedure. One of the artists has developed a climate-neutral human-powered future scenario for Bospolder-Tussendijk (Smets, 2020). This future scenario is the starting point for the participation of the citizens. Weekly events are organized to practice or discuss this future scenario, which is on repairing clothes, baking and sharing food, or creating a theater piece. A few times per year an Energy Agora is organized where inhabitants present their findings of the weekly events and discuss them with members of the municipality.

5.1.2 Procedure Typification

This participation procedure can be seen from a relational co-productional view, with a focus on reflexivity and responsivity. The organizers of the procedure are aware of dominant socio-technical imaginaries and developed a niche socio-technical imaginary. The procedure is not seen as separate events, but as a long-term continuous procedure that is influenced by politics on national, regional, and municipal levels. The citizens are encouraged to express themselves, to co-create, and communicate their ideas to the municipality.

5.1.3 Procecure Challenges

This participatory procedure offers multiple benefits, including the development of a social network among citizens, an increase in trust among network members, and an opportunity for citizens to express their ideas. However, the procedure is fragile, and it is challenging to concretize and communicate its value to policy-makers. Most citizens do not participate in events where members of the municipality are present. The organizers serve as proxies for the citizens, communicating their message, but this is not a long-term solution. The organizers would like to act as facilitators rather than translators. Additionally, the procedure falls short of enhancing democratic engagement (Hess & Sovacool, 2020).

5.1.4 Design Aim of Q Methodology Study

A Q methodology study could be used to study the reaction of citizens to the developed climate-neutral socio-technical imaginary. The study would be a rich representation of all the discussions that are held and could therefore strengthen the value that is created and help to communicate this to policymakers.

5.1.5 No Go of Q Methodology Study

In the end, several barriers made it not possible to conduct a Q methodology study at the Huis van de Toekomst. First of all, the researcher was linked to a research institution and its relevant power and influence. The researcher was not perceived as objective, there is a low level of trust present toward institutions. This is the challenge of becoming an "actor in social conflicts" when studying them (Cuppen & Pesch, 2021). Next to this, the participants had limited time, and they were asked too often to participate. And lastly, there was no direct visible value for the citizens as a reward for their participation in this study. The only thing that could be promised was a potential long-term system change in the way participatory procedures are organized, which would only affect them indirectly. In other words, the benefits a researcher could bring to the procedure were discounted and the risks were exaggerated.

5.2 Wijchen

5.2.1 Procedure Description

Wijchen is a rural city of origin near Nijmegen. Policymakers of the municipality have developed a 'Warmtetransitievisie' together with stakeholders, which is a vision of how to get rid of natural gas as a heating resource. This vision is criticized by the city council for not facilitating enough participation from citizens. As a consequence, a consultancy firm is hired to facilitate that participation. Two participatory events were organized where policymakers and citizens were joined together to discuss the outcome of the 'Warmtetransitievisie'. These events were called 'Bewonersdag'. Citizens were invited to the events randomly by their postal code. Around the same time, a negotiation round with only members of the city council and a negotiation round with the energy councilor and relevant stakeholders such as infrastructure parties took place.

The aim of the 'Bewonersdagen' was to let citizens decide on an alternative technology instead of natural gas. The municipality has selected technological alternatives and presented them with additional information on a website specially launched for the procedure (Warmtetransitiewijchen, 2023). The technological alternatives are 'a heating network", "renewable gas", "biomass", "hybrid" and "all-electric". They are extensively described in Appendix A.

5.2.2 Procedure Typification

This participation procedure is shaped from a residual realist's point of view. The type of procedure, the subject, and the participants were predefined. Furthermore, citizens' needs and preferences had to be combined into a univocal decision for a certain technology. There was time pressure on making the decision and the participatory procedure tended to be viewed as a combination of discrete events.

5.2.3 Procedure Challenges

The municipality of Wijchen designed the participatory procedures from a residual realist's point of view, but the consulting firm that facilitated the Bewonersdagen wanted to include the reflexive, responsive, and experimental qualities of a relational coproductionist view. As a result of the pre-defined format of the Bewonersdag, there is limited time and resources to elicit the needs, values, and desires of citizens.

5.2.4 Design Aim of Q Methodology Study

A Q methodology study designed from a relational co-productionist point of view could be inserted into this participatory procedure. The study results could be shared with policymakers together with the univocal decision for a technology. The results could serve as a proxy for the needs and wants of citizens at the roll-out of the chosen technology when no other participatory events are organized. The study needed to be accessible and be integrated with a 'Bewonersdag'. At the same time, the results needed to be in-depth, convincing, and written in the language of policymakers.

5.3 Conclusion

The participatory procedures of Bospolder-Tussendijken and Wijchen have complementary characteristics and can be seen from a, respectively, relational co-productional and a residual realist point of view. The procedure of Bospolder-Tussendijk would benefit from a Q methodological study to concretize the created value and communicate with policymakers. However, it was not viable to generate data for this study because of citizens' low levels of trust toward institutions. In the procedure of Wijchen, a Q methodological study would help the procedure by communicating the values and needs of citizens to policymakers in a rather short time and with limited resources.

6 Q Methodology Design

A Q methodology study design has to be tailored to fit in the participation procedure in Wijchen to collect data at the 'Bewonersdag'. The academic insights from participation and Q methodology literature are combined to create a research design that is accessible as well can produce reliable results. The construction of the Q set and the P and the factor extraction have been iterative processes. This process is represented in this section together with an argumentation on the final outcome.

6.1 Design of the Q set

The section of "Design of the Q set" discusses the design aspects of the construction of the Q set.

6.1.1 Statements as Stimuli

The Q set has to be a balanced and holistic representation of the problem under scrutiny. Typically, a wide range of subjective stimuli is generated after which they are selected using some criteria. A stimulus has to be unambiguous and balanced on positive and negative phrasing. Furthermore, the stimulus has to be salient and evoke a reaction. Lastly, the stimuli have to be balanced in content; the wide range of subjectivity has to be represented (Watts & Stenner, 2012). A verbal set of stimuli in the form of written statements is chosen for practical reasons such as time limits and no presence of visual content.

6.1.2 Sorting Grid

For the selection of a definitive set of statements, a sorting grid is used, which is a table with boxes that are defined by categories on the X and Y axis. The categories have to be meticulously chosen to represent the problem. The grid structures the set of statements by defining to which box each statement belongs. A statement is never fully defined by a box; a statement may overlap two or more boxes. Nevertheless, it is aimed to make each statement fit one box to prevent ambiguous content. Furthermore, a sorting grid has a filtering function by comparing statements that belong to the same box on their salience and complementary to the statements of other boxes. Still, it has to be noted that the sorting grid is not set in stone for the selection of statements and other balancing aspects such as the salience of statements may prevail.

6.1.3 Backwards Engineering from Desired Narrative

The outcome of a Q study is several narratives about the problem under scrutiny. The categories of the sorting grid determine the content of the narratives to a great extent and need further attention. In a complex system the borders of a problem are not clearly demarcated and setting these boundaries will affect the coverage of the narrative (Van Dam et al., 2012). The most important aspects of the participatory procedure are determined and chosen as starting point for the construction of the Q set.

The municipality in Wijchen wants their citizens to decide on a C02-neutral technology, and the Q study could generate additional information on that decision which is helpful for the roll-out of the technology. Therefore, the technological alternatives are chosen as categories for the sorting grid. The institutional and process aspects are closely related to the technological alternatives and can add subjective content to construct a narrative that provides richness to a univocal decision that citizens have to make on the technology.

The institutional and process aspects are represented by two categories. The first category is named "Other technical aspects" and focuses on technical issues in general, outside the earlier named categories, and their intertwining with institutional aspects. The second category is named "Responsibility" and deals with subjective content related to the question of who is responsible for the heating transition. It focuses on institutional and process aspects on local and national scales and does not name specific technologies. These categories embed the technological categories and make a coherent narrative possible.

These technological, institutional, and process categories constitute the X-axis of the sorting grid. On the Y axis categories are chosen that are related to the moral foundation framework of Haidt). Therefore, these categories are named "Care/Harm", "Loyalty/Betrayal", "Fairness as proportionality", "Liberty/Oppression", "Authority/Subversion" and "Sanctity/Degradation", see Table 1 (Haidt, 2012). These

moral emotions categories will ensure that the Q set is inciting and that the framework provides a coherent view of the type of reactions. As a result, the rather abstract categories on the X axis are made personal by the moral foundation categories on the Y axis.

	Heating network	**Renewable gas**	**Biomass**	**Hybrid**	**All electric**	**Other technical related**	**Responsibility**
Care/Harm							
Loyalty/ Betrayal							
Fairness as Proportionality							
Liberty/ Oppression							
Authority/ Subversion							
Sanctity/ Degradation							

Table 1: Sorting Grid Categories

6.1.4 Balancing Acts

Fitting the set of statements to the boxes defined by the categories of the sorting grid is not the only balancing act that needs to be performed. The earlier mentioned balancing of positive and negative phrasing is especially relevant since it can be related to the theory of hidden morality. Preferably, positive and negative expressions are not only balanced in the whole set of statements but also in each category alone. This is paramount to ensure that reactive demands for justice and ethically grounded goals are adequately represented.

Next to this, a balancing act needs to be performed on statements that come forward from experts and laymen. Both focus on different aspects of the problem and put forward different reasonings and dilemmas (Roeser & Pesch, 2016). The study aims to make the questionnaire accessible and to translate the results into the language of policymakers. To do so, statements from experts as well as from laymen have to be included and balanced.

6.1.5 Statement Generation

The criteria on which the Q set is balanced have been used to identify areas with related subjective content. The process of generation statements is considered complete when no substantial other subjective content on the categories of the sorting grid is found.

One of the main resources for the generation of statements has been Twitter since this is a prime medium where moral emotions are publicly expressed. The website is searched for relevant content by hashtags and popular accounts. A few examples of hashtags are #warmtemaffia, #stopbiomass, #aardgasvrij, #warmtenet. The public debate on the biomass plant in Ede as well as the heat network in Bodegraven were especially relevant (Biomassa Ede, 2022; Keijzer, 2022).

The facts upon which the subjective content of the tweets are based are sometimes publicly contested. When contested tweets are included in the Q set, some participants would regard those statements as factual untrue whereas other participants might be unaware of this. This would make those statements unambiguous, which is not desirable in a Q set, and therefore these tweets are not selected.

Other areas that have been searched for subjective content are documents in which experts discuss relevant aspects of the energy transition. These documents were found at branch organizations such as AEDES and VNG (Aedes, 2023; VNG, 2023). Furthermore, policy advisors and consultants active in the energy transition have been asked to identify moral dilemmas in the energy transition present with

citizens and experts. Also, some scientific papers have been searched for moral emotional content in the energy transition (Rodhouse et al., 2021).

Most suited for the generation of statements would be a platform where experts and laymen come together to discuss the energy transition. This platform is found at Programma Aardgasvrije wijken, where best practices are discussed in neighborhoods that have been acting as trial runs to get rid of natural gas (PAW, 2023). The experiences of these trial runs have been written down in accessible language and thereby generated relevant content for the Q set.

6.1.6 Constraints on Time and Statement Selection

The sorting grid has 7 categories on the X axis and 6 categories on the Y axis which results in 42 boxes. The Q set will contain 42 statements if each box contains one statement. This would result in a substantial sorting time, for which participants need to be strongly motivated to end the sorting successfully. To make the sorting accessible it is chosen to limit the number of statements to 25. The maximum score a statement could be given is +4 and the minimum score is -4.

The balancing of the statements on the content has become challenging when it is not clear which box needs a statement. Therefore, the other balancing acts have been mainly of guidance. Furthermore, the categories "Other technical aspects" and "Responsibility" has been favored in the selection of statements, since these categories provide essential background subjective content for the construction of a narrative. Lastly, with each technological alternative, it was defined which moral foundations were most present in public debate to select appropriate statements.

6.1.7 Presentation of Statements

Table 2 presents the resulting 25-statement Q-set. Appendix B explains to which category each statement belongs. Appendix C presents the statements written in Dutch as they were presented to the citizens in Wijchen.

Number	Statement
1	It is crazy that biomass is considered sustainable with the disappearing of all the forests!
2	I think it is a bad thing that the rich get richer and the poor get poorer when we get rid of gas.
3	Let's make it cheaper to isolate your home, in that way we can help people who cannot pay their energy bills.
4	I don't believe heating costs stay the same if we switch to a heating network.
5	I don't trust hydrogen to be safe.
6	I don't want a biomass plant pumping smoke into my home.
7	If we work together in our neighborhood, we could generate enough electricity to heat our homes.
8	The government can be trusted when it comes to getting rid of gas.
9	The crazy thing about a heating network is that you have to pay even when you are barely using heat.
10	It's not fair that Nijmegen gets to use all the biomass in the area.
11	I refuse to pay for thicker electricity cables just because the neighbors want a Tesla.
12	I think it is a bad thing that the heat pump subsidy goes to the first people who signed up.
13	I want the people who pollute the most to pay for it.
14	I find it burdensome that you have to stick with one supplier with a heating network.
15	The good thing about a hybrid solution is that you get to choose when to get rid of gas.
16	It's amazing not having to rely on energy from outside when you have solar panels and a heat pump.
17	We need to protest against those ridiculous climate plans.
18	A heating network provides much needed stability during uncertain times.
19	I trust gas pipelines in the ground because gas transportation went all right.
20	The government has no say in my housekeeping, I decide if I use a central heating kettle or not.
21	Demonstrating to get rid of gas quicker is disrespectful.
22	Using biomass for heating is wonderful because it's the most ancient form of heating.
23	I am happy to keep my trusty central heating kettle in this time of change.
24	It's really annoying to have a big, noisy heat pump in your home.
25	I don't want to cook electric, cooking with gas is much better.

Table 2: Final Set of Statements

In Appendix D, the statements are analyzed on a category basis. For each category, the extent to which they are effectively balanced in terms of positive and negative phrasing and content is evaluated. The technology categories "heating network" and "all electric," as well as all the moral foundation categories, were represented by well-defined statements that encompassed the full spectrum of subjectivity. However, it was challenging to convey the debate surrounding the technologies "renewable gas," "biomass," and "hybrid" in a limited number of statements. Figure 7 illustrates the presentation of statements within a category.

	Heating network	Ideal/reactionary	Moral foundation
Nm	Statement		
	Positive contribution technology		
18	A heating network provides much needed stability during uncertain times.	+	auth
	Negative contribution technology		
4	I don't believe heating costs stay the same if we switch to a heating network.	-	loy
9	The crazy thing about a heating network is that you have to pay even when you are barely using heat.	-	fair
14	I find it burdensome that you have to stick with one supplier with a heating network.	-	lib

Figure 7: Heating Network Statements

6.2 P Set Design

The "P Set Design" section delves into the process of generating data for the Q Study.

6.2.1 Course of the Event

The "Bewonersdag" took place on a Saturday in the municipality building in Wijchen from 10 am until 2 pm. In total 80 citizens were present together with 4 people from the mediating consultancy firm, two people from the municipality, and one researcher. There was a short general introduction after which the citizens were grouped and went to separate rooms to discuss their needs and worries about the energy transition in Wijchen. After this first round, the highlights from each group were communicated after which lunch was held. After lunch, there was another session where participants could come up with questions that they had in mind about the question of getting rid of gas. This session was concluded with another general round after which the day was closed.

6.2.2 Q-Methodological Design and Instructions

The citizens had the option to sort the statement of the Q set during the Bewonersdag. Ten laptops with the Q set and instructions to sort them were present. The citizens could sort the statements in between the activities of the day. They had to sort the statements independently while the researcher was nearby to ask questions.

The instructions were as such that the participants had to sort the statement initially by the criteria “agree”, “disagree” and “neutral”, after which they had to sort the statements again with the instruction on which statements they find most important. After the sorting, the participants could comment on the statements they had given the highest and the lowest score, and, lastly, they could give some demographic information about gender, age, and education level. The data is collected using the “EQ” software (Banasick, 2021/2022). In total 36 citizens have sorted the Q set.

6.2.3 Approximation of Emotion

The core aspect of the questionnaire is the sorting instruction to make participants indicate how much they agree with the statements ranging from “-4”- to “+4”. It is reasoned that the amount of resonation with the statement is an indication of the amount the participants could feel the moral foundation that has inspired the statement. The higher the positive score, the higher the positive resonance. The same applies to a negative score.

6.2.4 Type of Respondents

The citizens differed in their eagerness to fill in the questionnaire, it is not clear what causes this difference. Some citizens needed to be encouraged to fill in the questionnaire, while others simply refused to. A smaller group of citizens did not understand the digital device and could not sort the statements. Furthermore, most of the participants during the day were aged 50+, so it was difficult to gather respondents below that age. It has to be noted that citizens that were not present at the Bewonersdag could not fill in the questionnaire.

6.3 Extraction of Factors

After the Q sorts have been collected, the section of "Extraction of Factors" elaborates on how similar sorting patterns could be extracted in the form of factors.

6.3.1 Safe Factor Extraction Approach

Extensive discussions have been had in the Q methodology community of researchers about when to extract a factor and when not, to properly analyze the subtleties of the present subjectivity. In this study, the focus has been to shape a Q methodology study to an unfamiliar, unsuited area. To do so, the limits of Q methodology procedures are challenged. This is done by collecting data unsupervised and allowing little time for sorting. As a result, the most added value is not found in the subtleties of the data, but moreover in testing the results of the Q set and P set. Therefore, in this study, a tested approach for the extraction of factors is chosen. This means that a Principal Component Analysis has been conducted for selecting sorting patterns, that the difference in the knee slope has been mainly for

guidance in deciding which factors are considered, and that factor rotation varimax has been applied to optimize the variance of the chosen factors (Watts & Stenner, 2012).

6.3.2 Warning Flags for Q Sorts

What has been most relevant for the factor extraction is to determine which Q sorts can be taken into account. Most of the participants sorted the statements without supervision, and it is difficult to determine whether they understood the instructions. Any sign which would tell that the participant did not understand the instruction creates a warning flag for this Q sort. Next to this, the question of time is relevant for the participants. Some participants were bothered by the activities of the day and had to finish the questionnaire too quickly to go to another round. Therefore, the time used for each round in the questionnaire indicates how well the questionnaire is filled in. In the end, only 23 of the 36 Q sorts have been used for the final factor extraction.

6.3.3 Singular Unique Factor Loadings

One of the strengths of Q methodology is its ability to extract a factor based on only one Q sort. This is especially relevant for the detection of hidden moralities. However, with this study, it is difficult to determine whether the participants have understood the sorting instructions. A unique sorting pattern might be the result of a unique way of thinking but might also have been the result of not sorting correctly. Therefore, extracted factors with limited correlated Q sorts had to be researched meticulously.

6.4 Q Analysis

The "Q Analysis" section considers the analysis methods that are used for the interpretation of the factors.

6.4.1 Deviation from Standard Interpretation Methods

Generally, the extracted factors are interpreted by some standard ways of presenting the data. Each factor is presented as a Q sort with statements and their relevant score, furthermore the factors are compared to each other by signifying the differences and similarities, and lastly, the factors are reviewed by showing statistical data about how much variance is covered (Watts & Stenner, 2012). The data of the interpretation methods are studied holistically to construct hypotheses about the rationale behind each factor, and determine what aspects make the factor stand out from each other.

Most notably, this study focuses to a great extent on the categories of the sorting grid to guide the interpretation, next to using the general interpretation methods. Each statement and each category have been designed to contribute to a certain aspect of a to-be-emerged narrative. This is the result of a balancing act on multiple dimensions. Therefore, the categories could direct the abduction process of interpretation. Still, it has to be borne in mind that these categories can only be studied in relation to the whole set of data. The unconventional interpretation methods will be presented in this section.

6.4.2 Presenting Categories

For each category, the statements and their relevant score for each factor are presented. The scores of each factor are summed up in multiple ways. First of all, the scores of the statements are summed up concerning their sentiment about the category; the statements could positively or negatively contribute to the category. Next to this, the scores of each factor are summed up on basis of their absolute score on the statements, thereby conveying how inciting the category has been. And lastly, scores on the positively formulated and reactionary statements are summed up separately from each other, this is depicted for the category of Authority/Subversion in Figure 8.

Nm	Authority/Subversion Statement		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
	Positive contribution moral emotion						
18	A heating network provides much needed stability during uncertain times.		0	1	-2	+	He. network
19	I trust gas pipelines in the ground because gas transportation went all right.		-1	2	2	+	Ren. gas
21	Demonstrating to get rid of gas quicker is disrespectful.		-2	-1	-1	-	Other (Respons)
	Negative contribution moral emotion						
17	We need to protest against those ridiculous climate plans.		-4	-1	2	-	Respons
20	The government has no say in my housekeeping, I decide if I use a central heating kettle or not.		-2	-3	0		Hybrid
		Authority	3	6	-3		
		Absolute	9	8	7		
		Ideal	-1	3	0		
		Reactionary	-6	-2	1		

Figure 8: Scores on Authority/Subversion Statements

6.4.3 Presenting Factors

The statements and their relevant score for each factor alone have been presented with the help of the moral foundation categories, the technological categories, and the positive or reactionary formulation. Each aspect has been presented in a visual, intuitive way. Therefore, the subjective content of the factor could be seen at a glance, as well as being studied profoundly. See Figure 9 for an example of factor 7 and Appendix E for the data for factors 2 and 3.

Statement	Care	Loy	Fair	Lib	Auth	Sanc	Q Sort Value	Heat. net.	Ren. gas	Biomass	Hybrid	All electric	Other.	Respons.	Ideal/reactionary	Ideal score	Reactionary score
6		x					4			x					-		4
3	x						3						x		+	3	
2	x						3							x	-		3
16				x			2					x			+	2	
13			x				2							x	+	2	
14				x			2	x							-		2
7		x					1					x			+	1	
24						x	1					x			-		1
15				x			1				x				+	1	
4		x					1	x							-		1
1	x						0			x					-		0
12			x				0					x	x		-		0
9			x				0	x							-		0
18					x		0	x							+	0	
10		x	x				0			x					-		0
19					x		-1		x						+	-1	
11		x	x				-1					x			-		-1
5	x	x					-1		x						-		-1
23					x	x	-1				x				+	-1	
21					x		-2						x	x	-		-2
20				x	x		-2				x						
8		x			x		-2							x	+	-2	
25						x	-3					x	x		-		-3
22						x	-3			x					+	-3	
17					x		-4							x	-		-4
															Sum	2	0

Figure 9: Data of factor 1

6.4.4 Ranking on Consensus and Disagreement

A conventional Q methodological interpretation method is the comparison of the factors on differences and similarities by calculating the consensus and amount of disagreement. In this study, these calculations have been extended with the naming of relevant categories for each statement, allowing for again a visual intuitive as well as a profound analysis.

Standard, the ranking for the amount of consensus and disagreement is determined by the so-called 'Z-score variance'. A 'Z-score' is the distance between the score on a statement and the average score of the statement (Watts & Stenner, 2012). The higher the 'Z-score variance', the higher the amount of disagreement. However, for the calculation of the amount of consensus, a different calculation is used. The scores of each factor on a certain statement are added together after which this score is made absolute. In this way, statements that elicited a similar moderate score from each factor were not ranked as high on consensus as would have been the case with using a low Z-score variance. The reason for this is to not focus on the subtleties of the data but rather on subjective trends and the big picture. See Figures 10 and 11 for the ranking of consensus and disagreement respectively.

Statement	Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation	Technology	Z-score variance	Absolute	
3	3	4	2	+	care	Other	0,815	9	
5	-1	-4	-4	-	loy (care)	Ren. gas	0,459	9	
25	-3	-3	-2	-	sanc	Other (electric)	0,103	8	
14	2	1	3	-	lib	He. network	0,107	6	Consensus
22	-3	0	-3	+	sanc	Biomass	0,591	6	
2	3	2	0	-	care	Respons	0,187	5	
13	2	2	1	+	fair	Respons	0,088	5	
16	2	3	0	+	lib	Electric	0,245	5	
20	-2	-3	0		auth (lib)	Hybrid	0,582	5	
8	-2	1	-3	+	loy (auth)	Verant	0,972	4	
9	0	0	4	-	fair	He. network	0,649	4	
21	-2	-1	-1	-	auth	Other (verant)	0,073	4	
23	-1	-2	-1	+	sanc (auth)	Hybrid	0,118	4	
6	4	-2	1	-	loy (sanc)	Biomass	1,224	3	
7	1	3	-1	+	loy	Electric	0,958	3	
17	-4	-1	2	-	auth	Respons	1,006	3	
19	-1	2	2	+	auth	Ren. gas	0,405	3	
10	0	-1	-1	-	fair (loy)	Biomass	0,572	2	
12	0	1	1	-	fair	Other (electric)	0,064	2	
1	0	-2	3	-	care	Biomass	0,496	1	
4	1	0	-2	-	loy	He. network	1,014	1	
15	1	0	0	+	lib	Hybrid	0,089	1	
18	0	1	-2	+	auth	He. network	1,036	1	
11	-1	0	1	-	fair (loy)	Electric	0,414	0	
24	1	-1	0	-	sanc	Electric	0,151	0	

Figure 10: Rank of Consensus

Statement	Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation	Technology	Z-score variance	Absolute	
6	4	-2	1	-	loy (sanc)	Biomass	1,224	3	
18	0	1	-2	+	auth	He. network	1,036	1	
4	1	0	-2	-	loy	He. network	1,014	1	Disagreement
17	-4	-1	2	-	auth	Respons	1,006	3	
8	-2	1	-3	+	loy (auth)	Respons	0,972	4	
7	1	3	-1	+	loy	Electric	0,958	3	
3	3	4	2	+	care	Other	0,815	9	
9	0	0	4	-	fair	He. network	0,649	4	
22	-3	0	-3	+	sanc	Biomass	0,591	6	
20	-2	-3	0		auth (lib)	Hybrid	0,582	5	
10	0	-1	-1	-	fair (loy)	Biomass	0,572	2	
1	0	-2	3	-	care	Biomass	0,496	1	
5	-1	-4	-4	-	loy (care)	Ren. gas	0,459	9	
11	-1	0	1	-	fair (loy)	Electric	0,414	0	
19	-1	2	2	+	auth	Ren. gas	0,405	3	
16	2	3	0	+	lib	Electric	0,245	5	
2	3	2	0	-	care	Respons	0,187	5	
24	1	-1	0	-	sanc	Electric	0,151	0	
23	-1	-2	-1	+	sanc (auth)	Hybrid	0,118	4	
14	2	1	3	-	lib	He. network	0,107	6	
25	-3	-3	-2	-	sanc	Other (electric)	0,103	8	
15	1	0	0	+	lib	Hybrid	0,089	1	
13	2	2	1	+	fair	Respons	0,088	5	
21	-2	-1	-1	-	auth	Other (respons)	0,073	4	
12	0	1	1	-	fair	Other (electric)	0,064	2	

Figure 11: Rank of Disagreement

6.4.5 Presenting Qualitative Information

After sorting the statements, each participant had the opportunity to comment on two statements which they had given the highest and the lowest scores. These comments offer more in-depth qualitative information on the given numeral scores. It can be seen which statements are crucial for which factors and for what reason by presenting all this qualitative information together. See Appendix F.

6.4.6 Interpretation of Moral Foundations

During the interpretation of the moral foundation categories, it has been noted that the positive and negative extremes of the foundations do not link to each other in the same way. For example, the moral foundation of Loyalty has its opposite in Betrayal. When you feel betrayed by an actor, you do not want to be loyal to him. However, when you look at the moral foundation of Liberty whose opposite is Oppression, the relation is different. When you feel oppressed you do want to have more liberty. This has to be born in mind when the moral foundation categories are studied.

6.5 Conclusion

The methodological aspects of Q research are discussed which involve the construction of the Q set, P set, factor extraction, and factor analysis. The Q set is constructed reasoned backward from a narrative in mind that can elicit the needs, values, and desires of citizens in a participatory procedure in Wijchen. Statements about the technological categories have been made personal by the moral foundation categories. Although there were limited time and resources, on the participatory event (Bewonersdag) 36 citizens sorted the Q set. A safe factor extraction approach yielded three distinct factors. These factors have been interpreted by innovative analysis methods based on the categories of the sorting grid and the (reactionary/ideal) phrasing of the statements.

7 Q Methodology Output

This section presents the outcomes of the interpretation of the factors and elaborates on the question of whether the research design has detected hidden moralities.

7.1 Presentation of Narratives

The way of thinking behind a factor is represented using a narrative. A narrative combines the set of hypotheses that emerged through analyses on the level of statements, categories, and factors as a whole. The narratives are presented with references to the statement's numbers and qualitative data upon which they are based.

7.1.1 Perspective 1 We, as reasonable citizens, manage the transition ourselves

It is important to quickly get rid of the use of gas for heating. But you have to bear in mind that this transition is extremely difficult. Not only because there is no technological quick fix, but also because we are at the moment in a political crisis. *"The government has proven not being able in the past thirty years to hold on to a vision and respond adequately to long-term problems"* (8). Citizens should oppose this (21). However, we have to be aware of the risk of polarization in the debate. It is of no use to oppose everything and "to hide your head in the sand" (17).

Let's keep on responding rationally and talking with each other when important decisions have to be made. It is nonsense if you do not want to cook electric because you have been used to cooking with gas (25), or, that you choose biomass. After all, that is a 'natural' way of heating your house (22). At the same time, considerable changes are never comfortable, and we should listen to each other, for example when the heat pump makes too much noise at home (24).

We should care for each other, so the vulnerable among us could also participate in the transition (2). A suitable way to "tackle poverty" is making isolating your home accessible, which *"makes a huge difference in heating costs"* (3). Getting rid of gas is important, but as a consequence, you do not want to increase the difference between rich and poor (1).

It is important that we are free as citizens and are not being dominated by a monopolist, government, or another party, no matter which technology we choose (14, 15, 16).

The energy transition is a communal challenge and we only succeed if we do it together. It would be fantastic if we as citizens take the lead in it (7). The most suitable option would be an electrical solution for heating the neighborhood whereby we generate the energy ourselves (7, 11, 16). We mustn't want a heating solution with the use of biomass because then we would be strongly dependent on the government and other market parties (6, 10, 22). The same applies to a heating network (4, 14). It would be fair that the polluter pays, together with the people who do not take responsibility (13).

7.1.2 Perspective 2 Being idealistic means being pragmatic

How wonderful it would be to live in a world with renewable energies! And how wonderful it would be as citizens to be self-supporting in our energy needs (16). One way or the other we have to get rid of the use of gas, (17, 21). The government is doing what it can to propel the energy transition by making subsidies available, changing legislation etc (8). The main challenge, for now, is that everybody participates because the transition is not working when some people are lacking behind (2).

In a short period, it will not be possible anymore to heat your house with a central heating kettle on gas, there have to be alternatives (20, 23). Every CO2-neutral technology has its (dis)advantages, but the only deciding factor of every option would be that no coal and gas are being used.

The use of biomass for heating is a realistic option when the trees that are cut will be planted again (1). Furthermore, we will be able to manage the nuisance of the smoke of burning biomass (6). There is indeed only a limited amount of biomass available. If that means that another municipality can use biomass while we cannot, it is fine. The Netherlands as a whole has to transition after all (1).

An electrical solution as a heating solution would be most suitable. The challenge is to transition together with the whole neighborhood (7). Clear arrangements have to be made about who pays what and uses which electricity (11). In the meantime, the technology is so advanced that you for example are not bothered anymore by the noise of a heat pump (24). The main advantage of an electrical solution is that we are self-sufficient in our energy needs (16).

We should also consider the option of renewable gas. After all, the pipelines which are used for the transport of natural gas are still in the ground and *"do not affect the landscape"* as opposed to for example windmills (19). It might be doable to transport hydrogen in those pipelines. Let's consider this option more before we oppose it (5).

A heating network would be an interesting option because the technology offers a communal heating solution and thereby offers the needed stability in a transition. This can help the vulnerable people that are lacking behind (18). The main challenge is not to be dependent on one heat supplier and not to pay too much. A solution would be to pay for how much you are using and not for the fact that you are connected to the network (14).

Whatever technology we choose, let's face each other honestly, collaborate, trust each other, and create a working solution.

7.1.3 Perspective 3 Fairness as proportionality should be put central

I do understand the urgency to get rid of natural gas (21). I do not want to keep using a central heating kettle on natural gas (23, and do not have to keep on cooking with gas (25). The only thing is that if we create a CO2-neutral energy system then it has to be fair with the costs and benefits shared proportionally. The people that pollute and use energy the most should pay for it (13). I do not see that proportionality being represented in the climate policy (17). Therefore, I do not trust the government will ensure the proportionality of a new energy system (8).

I want to pay for the energy that I use myself (9). That was something that was properly managed with the infrastructure for gas pipelines (19). The problem with a heating network is that you have to pay maintenance costs even when you are not using any heat from it (9). It would be helpful if the municipality takes the lead in the development of a possible heating network. Then no monopolist would emerge and a *"neutral partner with no profit-making objectives"* would be present (14).

A fully electrical solution for the heating of houses seems to be a suitable solution, only with a few hooks and eyes. If any subsidy would be made available, then *"it should not be on a first-come, first-served basis"* (12). I refuse to pay for the energy usage of my neighbors (11). It is expensive to expand the electricity infrastructure and I do not want to pay for the costs of it if the capacity is used for large consumers in the vicinity.

It is being suggested that the use of biomass for heat is a sustainable energy resource, but I doubt that strongly (22). The ratio between the time of combustion and the growth of biomass resources is not considered correctly in sustainability calculations, furthermore, the consequence of the cutting of trees on the nitrogen absorption capacity of forests is neglected. Lastly, I do not want to have smoke from a biomass heating plant in my home (6).

I argue that we should consider the option of hydrogen. It is probably a safe technology if it is further developed (5). The main advantage of hydrogen is that we could reuse natural gas pipelines for the transportation of hydrogen (19). From experience, we know that infrastructure created a fair system with proportionally shared costs and benefits (19).

7.2 Arguments for Narratives

The theory of the problem of hidden moralities presupposes that beneath reactionary demands for justice lies an unformulated positive set of principles. Therefore, in the interpreting of the factors it is aimed to translate resonance with reactionary formulated statements towards ethically grounded goals. Appendix G, gives an argumentation on the formulation of the narratives along with each category, to support the translation effort.

7.3 Detection of Hidden Moralities

The next step is to determine which aspects of the emerged narratives have remained hidden in the participatory procedure in Wijchen. This is done by estimating the kind of debate that would result by letting participants from each perspective interact. These types of participants can be used to globally typify the role of each narrative in a deliberation. This can direct group discussion observations on a subsequent participatory event in Wijchen.

7.3.1 Types of Participants in a deliberation

Four types of participants can be typified based on their reactions to positive and reactionary formulated statements, see Table 3.

	Positive score on ideal formulated statements	**Negative score on ideal formulated statements**
Positive score on reactionary statements	Participant A. Fruitful debate	Participant C. Sound objections
Negative score on reactionary statements	Participant B. Blindness of the ideal	Participant D. Unaddressed sentiments

Table 3: Types of Participants in Deliberation

The impact of each participant on deliberation is discussed. Participant A is perhaps the most constructive participant in a discussion. The participant has a balanced opinion and can communicate about it. Participant B is a bit more difficult to deal with in a discussion. It is useful that this participant has been able to formulate an ideal, but it is challenging that this participant might not have considered the alternatives. It can be fruitful to determine why this participant does not recognize the objections. Participant C can be part of a fruitful discussion. It does not resonate with the proposed ideal but brings relevant information to the table on why not. It does require some interpretation and translation work. Participant D is the most challenging to add to a discussion. The formulated ideal as well as the arguments against it do not resonate with the participant, which says that there is some aspect of the discussion that is hidden and not addressed.

Participants C and D are particularly relevant in detecting underlying moral codes, as they do not align with the proposed ideals and therefore their needs and desires are not positively expressed. These hidden moralities can be incorporated into the deliberation by considering the objections raised by participant C. This may prove challenging for participant B, who fails to acknowledge these objections. On the other hand, participant A can serve as a mediator by aligning with both the ideals and objections. To include the needs and desires of participant D, the scope of the deliberation must be broadened.

7.3.2 Identification of Participants in Wijchen

The four types of participants can serve as a way to identify the impact of each narrative on a hypothetical deliberation. Each narrative is represented by a type of participant to simulate a deliberation. This representation is done by looking at the summed-up scores for each factor at reactionary and ideal formulated statements as Figure 12 demonstrates.

Ideal	Factor 1	Factor 2	Factor 3	
Care/Harm	3	4	2	9
Loyalty/Betrayal	-1	4	-4	-1
Fairness as proportionality	2	2	1	5
Liberty/Oppression	3	3	0	6
Authority/Subversion	-1	3	0	2
Sanctity/Degradation	-4	-2	-4	-10
Total	2	**14**	**-5**	

Reactionary	Factor 1	Factor 2	Factor 3	
Care/Harm	3	0	3	6
Loyalty/Betrayal	4	-6	-5	-7
Fairness as proportionality	-1	0	5	4
Liberty/Oppression	2	1	3	6
Authority/Subversion	-6	-2	1	-7
Sanctity/Degradation	-2	-4	-2	-8
Total	0	**-11**	**5**	

Figure 12: Summed Scores on Ideal and Reactionary Formulated Statements

The first perspective is represented by Participant A because it shows resonance with ideal formulated statements, but it can also relate to the posed objections. The second perspective is represented by Participant B, as it highly resonates with the ideal formulated statements but does not relate to the

objections. The third perspective is represented by participant C, since it does not relate to the ideal formulated statements but instead show strong resonance with the reactionary formulated statements.

Based on these typifications, participants of the second perspective may be blinded by their enthusiasm to propel the energy transition and therefore neglect objections that might be paramount to others. This is alarming since participants of the third perspective tend to express their objections in reactionary demands. Only when the underlying ethically grounded goals of these reactionary demands are identified, a construction deliberation could take place.

7.3.3 Hidden Moralities in Wijchen

On the first Bewonersdag, the citizens have been able to forward questions about the energy transition in Wijchen. The municipality has answered those questions, and a second Bewonersdag is organized to discuss the technological alternatives in-depth. During this event, observations are made on group discussion to detect elements of the emerged narratives.

During one group discussion, a citizen put forward the need for a rapid energy transition. She was even irritated by persons who did not want to change for some reason, although she mentioned that she would understand that the noise of the heat pump of neighbors might be particularly frustrating. This expression was not taken into account in the group discussion, probably because it was layered and difficult to react upon. The strength of the Q methodology study is that this sentiment is captured and expressed in perspective 1. In the narrative, this sentiment is connected to other aspects of the participatory process and therefore the thought of this citizen is coherently elaborated.

In another group, two persons were leading a discussion about which technology alternatives might be suitable in Wijchen. One of the two people was a physicist, who was keen to explain all the advantages and challenges of each technology and took the technological problem very seriously. This person might have found resonance with perspective 2 “Being idealistic means being pragmatic”. The other person was listening with his arms crossed and every once in a while he commented on the fact that energy companies would make too much profit, or that the municipality should investigate the technology of hydrogen. This person showed signs of narrative 3, however, expressed in a rather reactionary way. The discussion went on for about 20 minutes without reaching forward. The ethically grounded goals of narrative 3 have never reached the surface which argues that the energy transition is indeed needed but that a new energy system is only wanted when a proportional distribution of costs and benefits is ensured.

7.4 Conclusion

The interpretation of the emerged factors has led to the formulation of three narratives. The first perspective, *"We, as reasonable citizens, manage the transition ourselves"*, sees the energy transition as a communal effort with the need for critical reflection on technological alternatives and institutions. The second perspective, *"Being idealistic means being pragmatic"*, shows enthusiasm for constituting a CO2-neutral energy system and is convinced that citizens together with the government can overcome the drawback of each technological alternative. The third perspective, *"Fairness as proportionality should be put central"*, is skeptical towards the technological alternatives and only wants to transition to an alternative energy system when a proportional distribution of costs and benefits is ensured. Based on a simulation of deliberation, it was seen that the ethically grounded goals of perspective 3 have the risk the remain unacknowledged. This is reflected in an observation of a group discussion during a second "Bewonersdag". The research Q design shows that it can acknowledge moral emotions and interpret complex expressions towards a coherent narrative, whereas this acknowledgment was absent in the participatory event.

8 Conclusion

In this section the main research question *"How can hidden moralities be analyzed in participatory procedures in the Dutch energy transition through a Q methodology research design?"* is addressed after subsequently answering the sub-research questions.

8.1 Answer to Sub Research Question 1

SQ 1: *How do moralities remain hidden in participatory procedures in the Dutch energy transition?*

Mainstream participatory procedures face the risk of overflowing, which is the emergence of an informal assessment trajectory. It occurs when the moralities of citizens such as need claims, values, and desires are not sufficiently addressed in the formal procedures. Moralities remain hidden because prerequisites for public deliberation such as common interpretation of linguistic terms and true speech prevent the expression of moral concerns. These prerequisites are based on an ideal form of citizen, someone who has sufficient knowledge and can articulate their needs coherently and consistently. Furthermore, there is no room for adjustment of the subjects, objects, and formats of the participatory procedure, thereby restricting the unanticipated expression of citizens.

An alternative view on participation aims to include hidden moralities by making participation procedures responsive, reflexive, and experimental. The constitutional elements are therefore co-produced by citizens and policy-makers. The legitimacy of these procedures can be increased by allowing more forms of expression and therefore letting more citizens participate. Crucial is the incorporation of moral emotions in the procedures, by not viewing them as expressions that need to be corrected by reason. Moral emotions can show insight into the ethical considerations of decision-making. Whereas some citizens can articulate their positive set of principles directly others express themselves in reactive, emotional demands for justice. However, these participatory procedures fail to incorporate moral emotions by a lacking of transparent and rigorous methodologies. As a consequence, procedures of the alternative view on participation are difficult to employ.

So, moralities remain hidden in the Dutch energy transition, because barriers to the expression of moral concerns are present in mainstream participatory procedures and because alternative participatory procedures do not succeed in incorporating moral emotions by a lack of methodologies.

8.2 Answer to Sub Research Question 2

SQ 2: *How can moral emotions be considered in a Q methodological study?*

The moral foundation framework, as developed by Jonathan Haidt, has had explanatory power in various contexts regarding the decision-making of citizens although it has been criticized for its limited view of cognitive abilities and a lack of connection with values The framework can guide the development of methodologies to detect moral emotions using six moral foundations: Care/Harm, Loyalty/Betrayal, Fairness as Proportionality, Liberty/Oppression, Authority/Subversion, and Sanctity/Degradation.

Q Methodology has been often applied with participatory procedures in the energy transition by providing narratives on multiple groups of actors. The research method has been used in a non-threatening way to study the marginalized who may lack articulation on their viewpoints. The use of visual stimuli and works of art can increase the ability of Q Methodology to capture emotional sentiments. A research design where Q methodology is combined with the framework on moral foundations can help to generate inciting statements and act as a guide in interpreting emotional resonance.

A research design that combines Q methodology with a moral foundation framework is accessible and can produce reliable results and therefore can consider moral emotions.

8.3 Answer to Sub Research Question 3

SQ 3: *How can a Q methodology research design detect hidden moralities in participatory procedures in the Dutch energy transition?*

Two participatory procedures have been selected for the development of a research instrument to detect hidden moralities. The first participatory process of Bospolder-Tussendijken can be seen from a relational coproducitonist view and developed reflexive and experimental practices to let citizens express themselves. A Q methodology study could help in translating those expressions since they are not directly shared with policymakers. In the end, this study could not proceed because of a lack of trust from citizens toward institutions. The second participatory process of Wijchen can be seen from a residual realist's view, in which citizens had to express their preferences for a CO2-neutral technology in a discrete participatory event (Bewonersdag). Only during the Bewonersdag could the Q methodology research be employed despite the availability of limited time and resources to collect data.

A Q methodological research is designed to contribute to the participatory process, by providing background information on the needs, desires, and ways of thinking in addition to the preference for a certain technology. A sorting grid is used as guidance to structure the generation and selection of statements of the Q set, to ensure that a Q methodology study captures the broad range of subjectivity in a participatory process. The categories of the X axis of the sorting grid consists of the technological, institutional, and process aspect of the CO2-neutral technologies that are considered in the participatory process in Wijchen. The categories of the Y axis consist of moral foundations as defined by a framework developed by Haidt. The statements are formulated in ideal and reactionary forms to align with the theory of the problem of hidden morality. The statements have been generated through the use of Twitter, documents of branch organizations, and reports of trial runs of CO2-neutral neighborhoods. The final Q set consists of 25 statements and had to be balanced on the sorting grid, (ideal or reactionary) phrasing, source of dilemmas (laymen or experts), and salience.

Citizens of Wijchen were able to sort the statements in between activities of a Bewonersdag, and filled in the questionnaire unsupervised. They had to sort the statement on the amount they find the statement important, which serves as an approximation of how much they resonate with the moral emotions that inspired the statements. In total 36 citizens sorted the statements, of which 23 were used in the final factor analysis. The factor analysis chose a safe approach since the limited amount of qualitative data could only allow the studying of general subjective trends thereby neglecting subtleties in the data. Three factors were extracted, which were interpreted into perspectives using innovative, unconventional analyses. The categories of the sorting grid served as a basis to find similarities and differences between the factors and to construct hypotheses. The interpretation yielded three narratives in which resonance with reactionary statements was aimed to be translated into a positive system of principles with ethically grounded goals.

The first perspective, *"We, as reasonable citizens, manage the transition ourselves"*, sees the energy transition as a communal effort with the need for critical reflection on technological alternatives and institutions and protecting the vulnerable. The second perspective, *"Being idealistic means being pragmatic"*, shows enthusiasm for constituting a CO2-neutral energy system and is convinced that citizens together with the government can overcome the drawback of each technological alternative. The third perspective, *"Fairness as proportionality should be put central"*, is skeptical towards the technological alternatives except for hydrogen and only wants to transition to an alternative energy system when a proportional distribution of costs and benefits is ensured.

A simulation of deliberation based on these narratives is delineated to determine whether the formulated moralities of the emerged perspectives would have remained hidden during a participatory procedure. Using the scores on reactionary and ideal formulated statements, it is determined which kind of participants would be present in deliberation and to what extent these types align with the perspectives. The first perspective is seen as a participant that could contribute to a fruitful debate by considering the (dis)advantages of technological alternatives. The second perspective has an ideal way of thinking and is at risk of not considering the objections of technologies fully. The third perspective does not take initiative in discussion using a positive stance but puts forward sound objections.

During a 'Bewonersdag' after completing the study, observations on group discussions were conducted to identify aspects of the emerged narratives. It could be seen that a layered expression of a citizen was not acknowledged during the event, although the Q research design has been able to formulate that sentiment coherently in the narrative of perspective 1. Next to this, a heated debate took place between two citizens who resemble perspectives 2 and 3. The citizen that embodied perspective 2 was able to propose its pos-

itive system of principles while the other citizen kept on responding in reactionary, negatively formulated demands. After a considerable amount of time, the discussion ended without addressing the ethically grounded goals that lay beneath the reactionary expressions of the citizen that aligned with perspective 3. These examples show that the emerged narratives of the Q methodology study contain moralities that have remained hidden in the participatory process of Wijchen.

A Q Methodology research design can detect hidden moralities in participatory procedures by using categories on moral foundations and C02-neutral technologies and thereby constructing coherent narratives that translate negatively expressed reactive demands for justice into ethically grounded goals.

8.4 Answer to the Main Research Question

The main research question can be answered by combining the answers to the three sub-research questions. The main research question is posed as follows:

How can hidden moralities be analyzed in participatory procedures in the Dutch energy transition through a Q methodology research design?

Current energy participatory procedures in the Netherlands often disregard the presence of hidden moralities, because there exist barriers for citizens to express themselves. A citizen who can formulate their desires and values in a positive set of principles are recognized easier than citizens who express their selves in emotionally reactive demands for justice. It is most likely that this can cause participatory procedures to overflow by the emergence of a nonformal participatory trajectory.

A Q methodology has demonstrated its ability to reveal moralities in mainstream participatory procedures by detecting and translating moral emotions into ethically grounded goals. It, therefore, operationalizes the reflexive, responsive, and experimental qualities of an alternative view on participation. A research design that uses Q methodology in combination with a framework on moral emotions is accessible while having validity with the results.

When the detected hidden moralities are included in a participatory procedure, the decision-making can be improved and thereby increasing the legitimacy of participatory procedures. As these participatory procedures are mandated to be employed by every municipality in the Netherlands, this research design has the potential to improve decision-making at a broad scale.

9 Discussion

This section embeds the drawn conclusion within an academic discussion. This is done by discussing how the detection of hidden moralities can contribute to the shaping of participatory procedures, by identifying barriers that obstructed the detection of more hidden moralities, and by reviewing the research design to validate the results of the Q research design.

9.1 Shaping Participatory Procedures

This study presents initial steps in the detection of hidden moralities by identifying moral emotions and translating them into ethically grounded goals. The impact of the detection of hidden moralities on participation procedures is still undecided. This section proposes some applications.

The narratives generated from the Q methodology study could serve as a basis for deliberation regarding CO2-neutral technologies by indicating areas of consensus or disagreement. Moreover, when moral emotions are neglected in a procedure, the narratives could guide the exploration of underlying ethically grounded goals.

Additionally, the emerged narratives can serve as a proxy for the desires, needs, and wants of citizens in the absence of participation events. However, it is important to note that these narratives cannot replace representation procedures and should not hinder the implementation of additional participatory procedures.

It is important to note that the results of the Q study can not specify the most favored moral foundation, technology, or perspective among all participants. Additionally, no claims can be made about the relationship between a certain moral foundation and a specific technology. The only purpose of the Q study is to uncover coherent images regarding the connection between technological alternatives and moral foundations.

Lastly, in addition to the potential impact of the Q research design on the shaping of participatory procedures, the process of conducting the study itself can be seen as a participatory practice. The design of the Q methodology, the collection of data through citizens, and the sharing of results can demonstrate empathy, recognize moral emotions, and therefore build trust with citizens.

In conclusion, the Q methodology design holds promise in facilitating productive deliberation, serving as a proxy for policy-makers, and recognizing moral emotions while building trust with citizens.

9.2 Identifying Barriers for the Detection of Hidden Moralities

While this study claims to have detected a hidden morality, a discussion is in place to determine what barriers were present to detect other hidden moralities. The accessibility of the Q research design is discussed using a use case that involves citizens who express their selves in negatively formulated, reactive demands for justice, have limited moral agency, and have negative experiences with institutions.

To be a participant in the Q study, this citizen would have needed to respond to the invitation of the municipality and would have to go to the Bewonersdag. Practically this means that the citizen has to set aside time and thereby prioritize this event. The citizen has to go to a place with negative associations in their leisure time. During this Bewonersdag, a researcher from an unknown research institute would have asked to fill in a questionnaire. There is no prior level of trust between the researcher and the citizen and the citizen might not know the value of entrusting personal information. The researcher could not make any promises about the effect of the questionnaire on the citizen. The citizen would probably have not come to the Bewonersdag, and, if so, haven't filled in the questionnaire.

This storyline depicts an example of possible barriers, but there might be more. For example, filling in the questionnaire in full sight of other people or the use of certain public facts. It might have been useful to allow citizens who are not present at the Bewonersdag to fill in the questionnaire. The questionnaire could have been distributed online, or citizens could be asked in other public areas such as a café.

In conclusion, it can be noted that this study can be developed further by including citizens who are distrustful of institutions.

9.3 Validation of the Q methodology Design

The limits of Q Methodology are pushed in the effort to study moral emotions in a participatory procedure with limited time and resources. This section aims to determine the validity of the claim that a hidden morality has been detected in Wijchen by reviewing the methodology.

9.3.1 Research in a Complex System

Q methodology dictates that the stimulus used in the Q set should be unambiguous and convey a clear message. However, this may not be feasible in a complex system where all elements are interrelated. It is not possible to generate statements solely on the technological aspect of the system without considering the institutional and process aspects.

Furthermore, the division made in this study between technology-focused categories and more institutional/ process-focused categories is debatable. The process aspect of the problem is so substantial that it can be argued whether a representation in a few statements is valuable at all. The same applies to the institutional aspect. These categories may not be able to represent the institutional and process complexity, resulting in the construction of incomplete narratives.

It is also uncertain whether the entire complexity of the system can be represented in only 25 statements. The output of the study may be too limited due to the desire to make the research method accessible, causing participants to feel restricted in their expression. This leaves too much room for interpretation by the researcher, which could result in the study becoming more a part of the researcher's imagination than that participants act as co-researchers. This could be resolved by creating space for participants to reflect on their sorting and therefore generating qualitative information. More supervision of the researcher on sorting is needed to acquire this. This need is reflected in the high lost ratio between Q sorts that have been generated and those that have been used in the factor analysis. The supervision and generating of qualitative data could increase that ratio and therefore capture more sentiments.

In light of these limitations, it is paramount that the used statements and emerged perspectives are verified by citizens. It could have been tested to what extent citizens recognize the moral foundation that inspired the statements by presenting the statements and asking what they think the statement is about. The emerged narratives could have been presented to the citizens to let them assign which aspect of the narratives they recognize. This is especially important since there has been a translation effort from reactionary statements toward formulated ideals.

Studying subjectivity in a complex system is a capricious effort. Verifying different steps in the Q methodology study and more supervision of the researcher in the sorting could help in assuring that the study would generate appropriate results.

9.3.2 Iterative Development of the Q Set

Another aspect of methodology improvement is the balancing of the Q set. It is important to further develop the Q set to be able to allow for the emergence of other undetected moralities. In Appendix H the balancing act of this study is reviewed, ambiguous statements are identified and it is discussed to what extent the categories represent the subjectivity satisfactorily. In this section, the overarching points to these methodological points for the development of the Q set are named.

The sorting of the Q set by participants in Wijchen has generated information to better balance the set of statements in a follow-up study. Some ideal or reactionary formulated statements did not find resonance with participants at all, and, next to this, other reactionary statements have been translated into ideally formulated sentiments. Furthermore, this study has shown that the moral foundation categories such as Care/Harm and Liberty/Oppression are adequately addressed, while the categories Authority/Subversion, Sanctity/Degradation need to be better represented. Concerning the technical categories, it is proposed to add more statements to the categories of Heating Network and All-Electric

and to combine the other technological alternatives into the categories Other Technical Related. In this way, the main two technological categories could be studied more in-depth.

9.3.3 Reflections on Time and Emotions

This study has explicitly been designed to study emotions in a participatory procedure with limited time. This section reflects on those two aspects and how they interfere with each other.

The sorting grid dictates that a statement has to be related to a moral foundation and a certain technology. This creates ambiguity on which of the two aspects the participant would react. The term 'affect heuristic' is used for the rapid feelings that might arise with a certain stimulus (Slovic et al., 2007). When there is limited time for reflection, the same statement might be perceived differently by citizens as a result of affect heuristics. This points towards the need for verification of how the statements are received by participants.

There was no maximum time for the sorting, but the sorting was limited because citizens had to follow the activities of the 'Bewonersdag'. Some citizens took more time for the sorting than others. It might be that some participants respond solely at an emotional level, whereas other participants take time to reflect and use more ration. A design choice could have been made about a maximum and minimum time for the sorting so that the sorts of participants can be better compared. Seen differently, when citizens participate in a discussion they will always differ on whether to respond at a more rational or emotional level. Perhaps, the Q study represents this reality by having some participants who sorted quickly and others who took more time.

The sorting distribution of the statements might be a too shallow representation of the emotions that the participants experienced during the sorting. It is difficult to determine whether the participant experiences the moral emotions that have inspired the statements by looking at a numerical score. Even more, when the content of the statements has not only been inspired by moral foundations but also by technologies. If you want to make any conclusions about experienced moral emotions, a more sophisticated detection method is needed that asks participants explicitly how they feel. Another possibility would be to use a methodology that is based on a framework of values (Perlaviciute & Steg, 2015).

The limited time of the study and the chosen method to study emotions has indicated that the Q research design has limited sensitivity. , and the suggested improvements can help in detecting hidden sentiments.

It can be concluded that the Q methodological study is questioned by a rather high number of objections. This is not surprising, since the study is designed to study subjectivities in an area where other methodologies fall short. The consequence of these objections is that the study focuses on broader trends of subjectivities and is not able to focus on subtilities in the data. Using this study, numerous potential areas for methodological development are revealed.

10 Limitations

The limitations of the study are mentioned in this section to explain the outcome of the chosen methodology and to discuss which aspects are useful for a future study. The limitations are discussed in the literature study, the finding of a participatory process to generate data, the development of the Q set, and the generating of the Q sorts.

10.1 Literature Study

This study encompasses a wide range of disciplines such as policy-making, participatory studies, energy systems studies, Q methodology, psychology, and philosophy. The time spend on the literature study had to be distributed among these sections. Further research on the connection between moral emotions and values would have been beneficial. This became later in the process evident, however, due to time constraints it was not possible to research this.

10.2 Search for a Participatory Procedure

Although participatory procedures are organized in each municipality in the Netherlands, it has been challenging to find a participatory procedure with substantial space for a Q methodological study. Several reasons contribute to this. First of all, the researcher has not had any experience with participatory procedures, next to this, the research method Q methodology has been relatively unknown, and lastly, the nature of the study is explorative making it uncertain what the results of the study would be.

10.3 Developing the Q Set

As the discussion section points out, the interpretation of the sorting of the statements would have been improved substantially if the statements and the emerged narratives have been tested on citizens. The need for verification of the statements and narratives was identified during the research, however, this was not possible because of time constraints and the unavailability of participants.

Next to this, the broadening of the range of expressions of citizens would have been better succeeded if visual stimuli in the Q set had been used and if reflection on a work of art has preceded the sorting. These methodological choices have not been possible because of time constraints.

10.4 Generating Q Sorts

The design of a Q methodology study would benefit from knowing in advance what the resources are for the conducting of the research. However, a participatory procedure is a plaything in a complex political discussion. Decisions regarding the design of the Q study had to be altered in a short amount of time because the planning of the Bewonersdag in Wijchen was capricious. In the end, it was possible to generate Q sorts but only with limited resources, making it impossible to personally supervise the citizens in the sorting.

It can be concluded that the availability of time was the primary factor in limiting the conducting of the research in different research steps.

11 Recommendations

The discussion and the limitations lead to recommendations for policy as well as further research.

11.1 Policy Recommendations

The participatory procedure in Wijchen has succeeded in attracting a substantial amount of citizens to the 'Bewonersdagen' but was not able to interpret the sentiments holistically. This study has detected a hidden morality that was not acknowledged during the events. In the roll-out of the CO2-neutral technology, the municipality should take into account the narratives of the Q study and show particular interest in the need for proportionality in the distribution of costs and narratives. In future engagements with citizens, the narratives could serve as a way to guide the communication of the municipality.

On a national scale, the Q study should be applied to other participatory procedures. It can detect moralities that would normally remain hidden and can act as a way for municipalities to incorporate moral emotions in the process, show empathy and therefore build levels of trust with citizens. In this way, the risk of overflowing participatory procedures is reduced.

11.2 Research Recommendations

This study has shed light on the capturing of hidden moralities by translating negatively formulated sentiments towards positively formulated ideals. Research in the future could strengthen this methodology by focusing on the argumentation line to make claims based on the output of the study. To enhance the validation of the research, further research should focus on the replicability of the research and verification in several research steps. This study needs iterative improvement to increase its sensitivity to detect moral emotions in a complex system by integrating a framework on values, considering the distrust of citizens towards institutions on allowing more supervision of researchers despite limited resources.

The following research setup is proposed if there would be more resources available. Citizens would participate in a workshop before the sorting of the statements in which they gain knowledge on the topic and are allowed space to express themselves. Works of art are used as triggers for emotional-moral reflection to widen the perspective of the citizens. The narratives that emerge from the sorting of the statements, could be used as starting points for deliberation among the participants. As a result of such a process, institutions develop their capacity to listen to citizens, and citizens develop their capacity to express their selves and understand their moral senses.

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13 Appendix A Description of Technology Alternatives

In the participatory procedures in Wijchen several technology alternatives are proposed to the use of natural gas for heating the homes. These alternatives are described on a website dedicated to inform citizens (Warmtetransitiewijchen, 2023). The alternatives are described in Dutch as follows.

Warmtenet (collectief)
Een warmtenet is een collectieve oplossing: hier worden meerdere gebouwen op aangesloten, zoals een hele buurt of dorp. In Wijchen is op dit moment geen warmtenet, in Nijmegen bijvoorbeeld wel. Het systeem van een warmtenet bestaat uit buizen met warm water, die onder de grond op de gebouwen zijn aangesloten. Een warmtenet heeft een duurzame warmtebron nodig. Dit kan geothermie zijn (aardwarmte uit de diepe ondergrond), restwarmte van een fabriek of water uit een rivier (zoals de Waal). Dit laatste noemen we ook wel aquathermie. Bronnen voor een warmtenet hebben verschillende temperaturen, van laag tot hoog. Bij laagtemperatuur warmtenetten is het nodig om extra te isoleren, tot minimaal energielabel B.

Hernieuwbaar gas (collectief en individueel)
Met hernieuwbaar gas worden gebouwen nog steeds verwarmd met een cv-ketel die is aangesloten op een gasnet. Het verschil met nu is dat er dan geen aardgas meer door het gasnet gaat, maar een hernieuwbaar gas. Hernieuwbare gassen zijn groen gas en waterstof. Groen gas ontstaat door planten te vergisten en waterstof wordt gemaakt met hulp van elektriciteit. Er moet wel genoeg groen gas of waterstof beschikbaar zijn, wat nu nog niet zo is. Verwacht wordt dat er ook in 2030 nog niet genoeg hernieuwbaar gas is voor veel woningen. Voor de duidelijkheid: in 2018 is er 100 miljoen m3 groen gas gemaakt. Dit is 0,9% van het totale gasverbruik van de gebouwde omgeving. Het Expertisecentrum Warmte heeft uitgerekend dat Nederland maximaal 10 miljard m3 groen gas kan maken. Dit is ongeveer de helft van het gasverbruik van bedrijven op dit moment.

Biomassa (collectief en individueel)
Voor verwarming met hulp van biomassa (ook wel bio-energie genoemd) wordt vaste of gasvormige biomassa verbrand. De biomassa bestaat meestal uit: houtsnippers, houtpellets (samengeperste houtkorrels), (schoon) afvalhout en/of biogas uit gft-afval of mestvergisting. Biomassa kan een collectieve en een individuele oplossing zijn. Collectief als bron voor een warmtenet. Individueel met een pelletkachel in de woning of door mestvergisting bij een boerderij. Bij het vervoeren en verbranden van biomassa komt CO2 vrij. Dit is maar weinig als je het vergelijkt met aardgas. De Europese Unie ziet biomassa zelfs als CO2-neutrale warmteoplossing. Bij gebruik van biomassa moet ook worden gelet op emissienormen en luchtkwaliteit.

Hybride (individueel)
Een hybride oplossing gebruikt voor de verwarming van een gebouw elektriciteit (met een warmtepomp) en gas (met de CV-ketel). Wanneer het gasnet nog aardgas gebruikt is dit nog niet helemaal duurzaam. Wel wordt er dan al veel minder CO2 uitgestoten dan met een gewone cv-ketel. In de toekomst kan dit aardgas dan vervangen worden door hernieuwbaar gas. Bij een hybride oplossing is het wel verstandig om extra te isoleren. Maar dit hoeft niet zo uitgebreid als bij gebouwen die alleen nog elektriciteit gebruiken (all electric).

All electric (individueel)
All-electric verwarmde gebouwen gebruiken alleen elektriciteit voor verwarming en warm water. Dit gebeurt meestal met hulp van een warmtepomp. Met een elektrische warmtepomp wordt warmte uit de bodem, buitenlucht of water gehaald om het gebouw mee te verwarmen. All-electric heeft zeer goede isolatie nodig, minimaal energielabel B. Een energielabel geeft aan hoe goed een gebouw geïsoleerd is. Maatregelen voor het opwekken van duurzame energie tellen hierin niet mee (bijvoorbeeld via zonnepanelen). Voor all-electric geldt wel dat de elektriciteit die wordt gebruikt voor de warmtepomp, groen moet zijn (dus bijvoorbeeld met zonne-energie of windenergie). In Nederland is de meeste elektriciteit nu nog afkomstig van gascentrales. Bij dat proces komt CO2 vrij.

14 Appendix B Description of Final Q Set

The statements of the final Q set are described in Table 4. For each statement, the related categories of the sorting grid as well as their positive or reactionary formulations are mentioned.

Nm	**Statement**	**Moral foundation**	**Technology**	**Positive (+)/ Reactionary (-)**	**Description**
1	It's crazy that people think biomass is sustainable, with all the trees getting chopped down.	Care	Biomass	-	The caring aspect is related to the vulnerability of the nature.
2	I think it is a bad thing that the rich get richer and the poor get poorer when we switch from gas.	Care	Respons.	-	The caring aspect is related to the vulnerability of the poor and helping them on an abstract level.
3	Let's make it cheaper to insulate your home, so we can help people who can't pay their energy bills.	Care	Other	+	The caring aspect is related to the vulnerability of the poor and helping them on a practical level.
4	I don't believe heating costs will stay the same if we switch to a heating network.	Loy	He. network	-	The question of trust is related to collaborating with an actor that builds the infrastructure for a heating network
5	I don't trust hydrogen to be safe.	Loy (care)	Ren. gas	-	The caring aspect by protecting others against dangerous technologies as well as the resistance against not trustworthy scientists are present in this statement.
6	I don't want a biomass plant pumping smoke into my home.	Loy (sanc)	Biomass	-	Both the moral emotions of loyalty and sanctity are present. Sign of attempted domination of an all-powerful plant and the safe space of home are intertwined.
7	If we work together in our neighborhood, we could generate enough electricity to heat our homes.	Loy	Electric	+	Loyalty is related to collaborating in a neighborhood to generate energy.
8	The government can be trusted when it comes to getting rid of gas.	Loy (auth)	Respons.	+	In this statement it is questioned whether the government is a party with whom you can collaborate.
9	The nasty thing about a heating network is that you have to pay even when you're barely using heat.	Fair	He. network	-	The proportionality of "you pay what you use" is related to a heating network.

Nm	Statement	Moral foundation	Technology	Positive (+)/ Reactionary (-)	Description
10	It's not fair that Nijmegen gets to use all the biomass in the area.	Fair (loy)	Biomass	-	This statement is in favor of biomass, but that might be unclear to participants because of the negative formulation.
11	I refuse to pay for thicker electricity cables just because the neighbors want a Tesla.	Fair (loy)	Electric	-	The proportionality of "you pay what you use" is related to an electric infrastructure. Furthermore, the aspect of collaborating with your neighbors is included.
12	I think it is a bad thing that the heat pump subsidy goes to the first people who sign up.	Fair	Other (electric)	-	The statement deals with the institutional aspect of subsidy, related to a heat pomp which is often used with the all-electric alternative.
13	I want the people who pollute the most to pay for it.	Fair	Respons.	+	The proportionality aspect is put forward as; you pay what you pollute.
14	I find it burdensome that you have to stick with one supplier with a heating network.	Lib	He. network	-	The aspect of limiting your heating suppliers with a heating network is put central in this statement.
15	The good thing about a hybrid solution is that you get to choose when to switch from gas.	Lib	Hybrid	+	The freedom to choose your own heating technology is put central in this statement.
16	It's amazing not having to rely on outside energy when you have solar panels and a heat pump.	Lib	Electric	+	The self-generating aspect of renewable technologies is related to being independent.
17	We need to protest against those ridiculous climate plans.	Auth	Respons.	-	Protesting and thereby disrupting a decision-making process is related to the question of stability.
18	A heating network provides stability during uncertain times.	Auth	He. network	+	The communal aspect of a heating network is related to providing stability to many people.
19	I trust pipelines in the ground because gas transportation went all right.	Auth	Ren. gas	+	The pipelines in the ground and the whole institutional system represents stability.
20	The government has no say in how I run my house, I decide if I use a central heating kettle or not.	Auth (lib)	Hybrid	Both	The statement is about creating stability by giving the government a mandate and at the same time of preventing the government to intrude.
21	Demonstrating to get rid of gas faster is disrespectful.	Auth	Other (respons.)	-	The question of stability in fast changing energy transition is put forward.
22	Using biomass for heating is wonderful because it's the oldest form of heating.	Sanc	Biomass	+	This statement deals with the link between tradition and sanctity.

Nm	Statement	Moral foundation	Technology	Positive (+)/ Reactionary (-)	Description
23	I'm happy to keep my trusty central heating kettle in this time of change.	Sanc (auth)	Hybrid	+	This statement is as well dealing with creating stability (authority) as well as protecting objects that are part of a moral community.
24	It's really annoying to have a big, noisy heat pump in your home.	Sanc	Electric	-	The sanctity of a home is intruded by an unwilling noise.
25	I don't want to cook with electricity, cooking with gas is much better.	Sanc	Other (electric)	-	The cooking process is regarded as a daily routine to which people are accustomed.

Table 4: Description of the Q Set Statements

15 Appendix C Dutch Formulation of Statements

Table 5 presents the statements that have been presented to the citizens of Wijchen, which were written in Dutch.

Number	Statement
1	Het is onzin dat biomassa duurzaam is; door het kappen raken alle bossen op!
2	Ik vind het niet goed als het verschil tussen arm en rijk groter wordt als we van het gas afgaan.
3	Laten we isoleren goedkoper maken, zo helpen we mensen die hun energie-rekening niet kunnen betalen.
4	Ik geloof er niets van dat de stookkosten hetzelfde blijven als we overstappen op een warmtenet.
5	Ik vertrouw er niet op dat waterstof veilig zal zijn.
6	Ik wil geen rook van een biomassa-centrale in mijn huis.
7	Als we samenwerken, kunnen we met onze buurt zelf genoeg energie opwekken om de huizen te verwarmen.
8	De overheid is een betrouwbare partij als we van het gas af gaan.
9	Het nare aan een warmtenet is dat je ook moet betalen wanneer je bijna geen warmte gebruikt.
10	Het is oneerlijk als Nijmegen alle biomassa uit de omgeving gebruikt, waardoor wij dat niet meer kunnen doen.
11	Ik weiger mee te betalen aan dikkere elektriciteitskabels omdat de buren een Tesla willen.
12	Ik vind het niet goed als subsidie voor een warmtepomp gaat naar mensen die zich als eerste aanmelden.
13	Ik vind dat de mensen die de meeste uitstoot veroorzaken, het meeste moeten betalen als we van het gas afgaan.
14	Het benauwt me dat je bij een warmtenet vast zit aan één aanbieder.
15	Het mooie aan een hybride oplossing is dat je zelf kunt kiezen wanneer je van het gas af gaat.
16	Het is prachtig dat je geen energie van buitenaf nodig hebt, als je zonnepanelen en een warmtepomp hebt.
17	We moeten protesteren tegen de belachelijke klimaatplannen!
18	In een onzekere tijd creëert een warmtenet de stabiliteit die hard nodig is.
19	Ik heb vertrouwen in het gebruiken van de pijpleidingen in de grond, want het vervoeren van gas is altijd goed gegaan.
20	De overheid heeft niets te zeggen in mijn huishouden, ik bepaal zelf of ik een cv-ketel gebruik.
21	Demonstraties om sneller van het gas af te gaan, vind ik respectloos.
22	Biomassa stoken is prachtig, want het is de meest natuurlijke vorm van verwarmen.
23	In een tijd waarin zoveel verandert, ben ik blij als ik mijn oude vertrouwde cv-ketel kan behouden.
24	Het is vervelend om zo'n grote, lawaaiige warmtepomp in huis te hebben.
25	Ik wil niet elektrisch koken, ik kan veel beter koken op gas.

Table 5: Dutch Formulation of the Statements

16 Appendix D Balancing of Statements on Sorting Grid Categories

This section discusses whether the moral emotions present within public discussions surrounding technological alternatives are adequately represented in the sorting grid categories. For each category, the final set of statements is presented along with their phrasing (ideal or reactionary), their contribution to the sentiment of the category (positive or negative), and the relevant category on the other axis of the sorting grid.

16.1 Technology Categories

Heating network

	Heating network	Ideal/reactionary	Moral foundation
Nm	Statement		
	Positive contribution technology		
18	A heating network provides much needed stability during uncertain times.	+	auth
	Negative contribution technology		
4	I don't believe heating costs stay the same if we switch to a heating network.	-	loy
9	The crazy thing about a heating network is that you have to pay even when you are barely using heat.	-	fair
14	I find it burdensome that you have to stick with one supplier with a heating network.	-	lib

Figure 13: Heating Network Statements

The heating network is well represented by various moral emotions, they all depict other morally challenging aspects of a heating network and there is a little overlay. The stability of infrastructure, the needed trust in an infrastructure supplier, the costs sustaining the infrastructure, and the long-term planning are discussed.

Renewable gas

	Renewable gas	Ideal/reactionary	Moral foundation
Nm	Statement		
	Positive contribution technology		
19	I trust gas pipelines in the ground because gas transportation went all right.	+	auth
	Negative contribution technology		
5	I don't trust hydrogen to be safe.	-	loy (care)

Figure 14: Renewable Gas Statements

The challenging aspect of renewable gas as an alternative is that is indeed an option to get rid of natural gas, but it is not regarded as a serious option in many municipalities because of the scarcity of resources. If you want to include this alternative as an option, it comes along with an extensive discussion of related technologies (hydrogen, biogas, etc), and a relevant history in the Netherlands of using gas (Correljé et al., 2003). The chosen two statements do not represent this complexity. Still, by focusing on the stability that the gas infrastructure has provided and on the trust in emerging technologies, the most relevant aspects are included in the Q set. In this way, the statements about renewable gas provide a relevant background for the interpretation of the other technologies.

Biomass

	Biomass	Ideal/reactionary	Moral foundation
Nm	Statement		
	Positive contribution technology		
10	It's not fair that Nijmegen gets to use all the biomass in the area.	-	fair (loy)
22	Using biomass for heating is wonderful because it's the most ancient form of heating.	+	sanc
	Negative contribution technology		
1	It is crazy that biomass is considered sustainable with the disappearing of all the forests!	-	care
6	I don't want a biomass plant pumping smoke into my home.	-	loy (sanc)

Figure 15: Biomass Statements

Research has shown that the discussion surrounding biomass is extensive which makes it challenging to make it personal (Cuppen et al., 2010). It is chosen to focus on the vulnerable nature with the care

aspect, to include the long human experience with biomass, to combine the fairness aspect with the scarcity of biomass, and include the question of trust whether the smoke of biomass is harmful.

Hybrid

Nm	Hybrid Statement	Ideal/reactionary	Moral foundation
	Positive contribution technology		
15	The good thing about a hybrid solution is that you get to choose when to get rid of gas.	+	lib
20	The government has no say in my housekeeping, I decide if I use a central heating kettle or not.		auth (lib)
23	I am happy to keep my trusty central heating kettle in this time of change.	+	sanc (auth)

Figure 16: Hybrid Statements

The aspects that make hybrid stand out from the other alternatives are its ability to create stability in a fast-changing environment, and its association with self-determination.

All electric

Nm	All electric Statement	Ideal/reactionary	Moral foundation
	Positive contribution technology		
7	If we work together in our neighborhood, we could generate enough electricity to heat our homes.	+	loy
16	It's amazing not having to rely on energy from outside when you have solar panels and a heat pump.	+	lib
	Negative contribution technology		
11	I refuse to pay for thicker electricity cables just because the neighbors want a Tesla.	-	fair (loy)
24	It's really annoying to have a big, noisy heat pump in your home.	-	sanc

Figure 17: All Electric Statements

The moral dilemmas of the all-electric alternative seem to be well represented by this set of statements because each statement covers a distinctive aspect of the discussion surrounding the all-electric alternative. The question of trust with a bottom-up approach is relevant, as well as the self-providing of your energy, the fairness related to the costs, and the living quality with a heat pump present in a home.

Other technical related

Nm	Other technical related Statement	Ideal/reactionary	Moral foundation
	Positive contribution technology		
3	Let's make it cheaper to isolate your home, in that way we can help people who cannot pay their energy bills.	+	care
	Negative contribution technology		
12	I think it is a bad thing that the heat pump subsidy goes to the first people who signed up.	-	fair
21	Demonstrating to get rid of gas quicker is disrespectful.	-	auth
25	I don't want to cook electric, cooking with gas is much better.	-	sanc

Figure 18: Other Technical Related Statements

These institutional aspects are intertwined with the technological aspect in the case of isolating, subsidy, cooking, and demonstrations.

Responsibility

Nm	Responsibility Statement	Ideal/reactionary	Moral foundation
	Positive contribution technology		
8	The government can be trusted when it comes to getting rid of gas.	+	loy (auth)
13	I want the people who pollute the most to pay for it.	+	fair
	Negative contribution technology		
2	I think it is a bad thing that the rich get richer and the poor get poorer when we get rid of gas.	-	care
17	We need to protest against those ridiculous climate plans.	-	auth

Figure 19: Responsibility Statements

In this category, the broader societal aspects are related to the participatory process in Wijchen. These aspects are the trustworthiness of the government in general, the question of who pays for the

pollution, the difference between the rich and the poor, and the evaluation of the climate plan that the government has presented.

16.2 Moral Foundation Categories

Care/Harm

Nm	Care/Harm Statement	Ideal/reactionary	Technology
	Positive contribution moral emotion		
1	It is crazy that biomass is considered sustainable with the disappearing of all the forests!	-	Biomass
2	I think it is a bad thing that the rich get richer and the poor get poorer when we get rid of gas.	-	Respons
3	Let's make it cheaper to isolate your home, in that way we can help people who cannot pay their energy bills	+	Other

Figure 20: Care/Harm Statements

The category of care/harm is represented by three different examples, namely care for the vulnerable nature, societal care, and practical care for the people that suffer from energy poverty.

Loyalty/Betrayal

Nm	Loyalty/Betrayal Statement	Ideal/reactionary	Technology
	Positive contribution moral emotion		
7	If we work together in our neighborhood, we could generate enough electricity to heat our homes.	+	Electric
8	The government can be trusted when it comes to getting rid of gas.	+	Respons
	Negative contribution moral emotion		
4	I don't believe heating costs stay the same if we switch to a heating network.	-	He. network
5	I don't trust hydrogen to be safe.	-	Ren. gas
6	I don't want a biomass plant pumping smoke into my home.	-	Biomass

Figure 21: Loyalty/Betrayal Statements

With the categories of loyalty/betrayal, the question of collaborating and trust is applied in multiple contexts. The question of trust is related to citizens, government, scientists, and towards the industry.

Fairness as Proportionality

Nm	Fairness as proportionality Statement	Ideal/reactionary	Technology
	Positive contribution moral emotion		
9	The crazy thing about a heating network is that you have to pay even when you are barely using heat.	-	He. network
10	It's not fair that Nijmegen gets to use all the biomass in the area.	-	Biomass
11	I refuse to pay for thicker electricity cables just because the neighbors want a Tesla.	-	Electric
12	I think it is a bad thing that the heat pump subsidy goes to the first people who signed up.	-	Other (Electric)
13	I want the people who pollute the most to pay for it.	+	Respons

Figure 22: Fairness as Proportionality Statements

The distribution of goods and punishment of bad behavior is relevant in different contexts. It is relevant to the price of pollution, subsidy, infrastructure costs, and regional collaboration.

Liberty/Oppression

Nm	Liberty/Oppression Statement	Ideal/reactionary	Technology
	Positive contribution moral emotion		
14	I find it burdensome that you have to stick with one supplier with a heating network.	-	He. network
15	The good thing about a hybrid solution is that you get to choose when to get rid of gas.	+	Hybrid
16	It's amazing not having to rely on energy from outside when you have solar panels and a heat pump.	+	Electric

Figure 23: Liberty/Oppression Statements

This moral emotion is about restraining domination which can occur in various ways. In the Q set it is chosen to represent the domination of a monopolist, the domination of the government, and the

prevention of any domination by being self-sufficient.

Authority/Subversion

Nm	Authority/Subversion Statement	Ideal/reactionary	Technology
	Positive contribution moral emotion		
18	A heating network provides much needed stability during uncertain times.	+	He. network
19	I trust gas pipelines in the ground because gas transportation went all right.	+	Ren. gas
21	Demonstrating to get rid of gas quicker is disrespectful.	-	Other (Respons)
	Negative contribution moral emotion		
17	We need to protest against those ridiculous climate plans.	-	Respons
20	The government has no say in my housekeeping, I decide if I use a central heating kettle or not.		Hybrid

Figure 24: Authority/Subversion Statements

This category is related to acts of disobedience against legitimated authorities, and artifacts that cause stability. In the Q set the category is represented by the question of the stability of infrastructures concerning a heating network or concerning gas pipelines. Furthermore, demonstrations as potential acts of disobedience are added to whether the authority is considered legitimate.

Sanctity/Degradation

Nm	Sanctity/Degradation Statement	Ideal/reactionary	Technology
	Positive contribution moral emotion		
22	Using biomass for heating is wonderful because it's the most ancient form of heating.	+	Biomass
23	I am happy to keep my trusty central heating kettle in this time of change.	+	Hybrid
24	It's really annoying to have a big, noisy heat pump in your home.	-	Electric
25	I don't want to cook electric, cooking with gas is much better.	-	Other (Electric)

Figure 25: Sanctity/Degradation Statements

A few pillars that are supporting a community are mentioned that are relevant to the energy transition. These are the quietness of a home, cooking activities, the usual objects related to heating and comfort, and the century-old tradition of heating.

17 Appendix E Data Presentation of Factors 1, 2, and 3

The figures 26, 27, and 28 present relevant data related to factors 1, 2, and 3 respectively.

Statement	Care	Loy	Fair	Lib	Auth	Sanc	Q Sort Value	Heat. net.	Ren. gas	Biomass	Hybrid	All electric	Other.	Respons.	Ideal/reactionary	Ideal score	Reactionary score
6		x					4			x					-		4
3	x						3						x		+	3	
2	x						3							x	-		3
16				x			2					x			+	2	
13			x				2							x	+	2	
14				x			2	x							-		2
7		x					1					x			+	1	
24						x	1					x			-		1
15				x			1				x				+	1	
4		x					1	x							-		1
1	x						0			x					-		0
12			x				0					x	x		-		0
9			x				0	x							-		0
18					x		0	x							+	0	
10		x	x				0			x					-		0
19					x		-1		x						+	-1	
11		x	x				-1					x			-		-1
5	x	x					-1		x						-		-1
23					x	x	-1				x				+	-1	
21					x		-2						x	x	-		-2
20				x	x		-2				x						
8		x			x		-2							x	+	-2	
25						x	-3					x	x		-		-3
22						x	-3			x					+	-3	
17					x		-4							x	-		-4
															Sum	2	0

Figure 26: Relevant data for Factor 1

Statement	Care	Loy	Fair	Lib	Auth	Sanc	Q Sort Value	Heat. net.	Ren. gas	Biomass	Hybrid	All electric	Other.	Respons.	Ideal/Reactionary	Ideal	Reactionary
3	x						4						x		+	4	
16				x			3					x			+	3	
7		x					3					x			+	3	
19					x		2		x						+	2	
13			x				2							x	+	2	
2	x						2							x	-		2
8		x			x		1							x	+	1	
12			x				1					x	x		-		1
14				x			1	x							-		1
18					x		1	x							+	1	
15				x			0				x				+	0	
22						x	0			x					+	0	
9			x				0	x							-		0
11		x	x				0					x			-		0
4		x					0	x							-		0
21					x		-1						x	x	-		-1
10		x	x				-1			x					-		-1
24						x	-1					x			-		-1
17					x		-1							x	-		-1
1	x						-2			x					-		-2
23					x	x	-2				x				+	-2	
6		x					-2			x					-		-2
25						x	-3					x	x		-		-3
20				x	x		-3				x						
5	x	x					-4		x						-		-4
															Sum	14	-11

Figure 27: Relevant data for Factor 2

Statement	Care	Loy	Fair	Lib	Auth	Sanc	Q Sort Value	Heat. net.	Ren. gas	Biomass	Hybrid	All electric	Other.	Respons.	Ideal/Reactionary	Ideal	Reactionary
9			x				4	x							-		4
14				x			3	x							-		3
1	x						3			x					-		3
19					x		2		x						+	2	
17					x		2							x	-		2
3	x						2						x		+	2	
13			x				1							x	+	1	
6		x				x	1				x				-		1
11		x	x				1					x			-		1
12			x				1					x	x		-		1
20				x	x		0				x						
24						x	0					x			-		0
16				x			0					x			+	0	
2	x						0							x	-		0
15				x			0				x				+	0	
7		x					-1					x			+	-1	
23					x	x	-1				x				+	-1	
10		x	x				-1				x				-		-1
21					x		-1						x	x	-		-1
4		x					-2		x						-		-2
25						x	-2					x	x		-		-2
18					x		-2		x						+	-2	
22						x	-3				x				+	-3	
8		x			x		-3							x	+	-3	
5	x	x					-4			x					-		-4
																-5	5

Figure 28: Relevant data for Factor 3

18 Appendix F Presentation of Qualitative Information

Figure 29 provides qualitative information on statements of the Q set.

	Statement	Qualitative information
	1	Dat wat gekapt wordt wordt opnieuw aangeplant.
		het kappen voor biomassa is idioot
	2	dat is niet goed om de armoede te kunnen bestrijden
	3	Isoleren is zeker erg belangr/ijk scheelt enorm in de stookkosten
	5	eerst meer onderzoek nodig maar niet meteen zo negatief
		Ik geloof als het ontwikkeld is dat het zeker veilig is
	6	ongezond
	8	nee dat denk ik niet.
	9	de kosten voor het leidingnet moet je wel betalen ongeacht het gebruik
Factor 1	11	Is zijn keuze hoef ik niet voor te betalen
Factor 2	13	lijkt me logisch leg de rekening neer bij mensen die geen verantwoordelijkheid nemen
Factor 3		De vervuiler betaalt. Simpel.
	14	Men ziet dat er al snel een monopoly onstaat op het warmte net.Het is belangrijk dat mensen betalen voor hoeveel ze van warmte gebruiken; niet of ze zijn aangesloten op een warmte ne
		behalve als het de gemeente is dan hebben we een neutrale partner zonder winst oogmerk!
	16	Ik denk dat dat een mooi streven zou zijn.
		Eens dat we naar zelfvoorzienendheid moeten streven
	17	dan krijgen we weer heel veel uiterste
		dat is de kop in het zand steken
	19	Het is verstandig bestaande infrastructuur te gebruiken indien mogelijk en leidingen in de grond zijn het minst in het oog springend.
	22	niet echt een mening over
		dit is onjuist
	25	electrisch koken bevalt ook prima
		ik zou het verschil niet merken
		kwestie van wennen

Figure 29: Qualitative Data on the Q Set

19 Appendix G Argumentation for Narratives

The interpretation of the factors into a narrative has been guided by the categories of the sorting grid. For each category, it is discussed how it contributes to the construction of the narratives.

19.1 Technology Categories

Heating network

It is striking that every factor reacts strongly to the liberty aspect of a heating network. Factor 3 seems to respond highly reactionary to this technology and does not appreciate the formulated ideal. The other factors are less reactionary but do not resonate that much with the ideals of a heating network. The respondents seem to be aware of the difficulties of a heating network.

	Heating network		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
Nm	Statement						
	Positive contribution technology						
18	A heating network provides much needed stability during uncertain times.		0	1	-2	+	auth
	Negative contribution technology						
4	I don't believe heating costs stay the same if we switch to a heating network.		1	0	-2	-	loy
9	The crazy thing about a heating network is that you have to pay even when you are barely using heat.		0	0	4	-	fair
14	I find it burdensome that you have to stick with one supplier with a heating network.		2	1	3	-	lib
		He. network	-3	0	-7		
		Absolute	3	2	11		
		Ideal	0	1	-2		
		Reactionary	3	1	5		

Figure 30: Scores on Heating Network Statements

Renewable gas

Each factor understands the use of the existing gas infrastructure differently. Factor 2 and 3 have been satisfied with the way the gas infrastructure was working and are interested in using the same system. Factor 2 sees the infrastructure as a possibility to propel the transition and make it a smooth one. Factor 3 values the fairness of the infrastructure; you pay what you use. Factor 1 is not satisfied with how the gas infrastructure was organized and is critical of the institutions.

	Renewable gas		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
Nm	Statement						
	Positive contribution technology						
19	I trust gas pipelines in the ground because gas transportation went all right.		-1	2	2	+	auth
	Negative contribution technology						
5	I don't trust hydrogen to be safe.		-1	-4	-4	-	loy (care)
		Ren. gas	0	6	6		
		Absolute	2	6	6		
		Ideal	-1	2	2		
		Reactionary	-1	-4	-4		

Figure 31: Scores on Renewable Gas Statements

Biomass

The only positive formulated idea in statement 22 does not resonate with any factor. Moreover, factors 1 and 3 respond highly reactionary to biomass, their objections seem to be less present with factor 2. It was not possible to translate the reactionary subjectivity on biomass into positive formulated ideals because the responses were so scattered on each factor. One thing that stands out is the objections to the use of biomass change per factor.

	Biomass		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
Nm	Statement						
	Positive contribution technology						
10	It's not fair that Nijmegen gets to use all the biomass in the area.		0	-1	-1	-	fair (loy)
22	Using biomass for heating is wonderful because it's the most ancient form of heating.		-3	0	-3	+	sanc
	Negative contribution technology						
1	It is crazy that biomass is considered sustainable with the disappearing of all the forests!		0	-2	3	-	care
6	I don't want a biomass plant pumping smoke into my home.		4	-2	1	-	loy (sanc)
		Biomass	-7	3	-8		
		Absolute	14	5	12		
		Ideal	-3	0	-3		
		Reactionary	4	-5	3		

Figure 32: Scores on Biomass Statements

Hybrid

As with the case of biomass, no ideal formulated statement concerning a hybrid solution resonates with the factors. At the same time, it is not clear what the arguments against a hybrid solution are.

Nm	Hybrid Statement	Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
	Positive contribution technology					
15	The good thing about a hybrid solution is that you get to choose when to get rid of gas.	1	0	0	+	lib
20	The government has no say in my housekeeping, I decide if I use a central heating kettle or not.	-2	-3	0		auth (lib)
23	I am happy to keep my trusty central heating kettle in this time of change.	-1	-2	-1	+	sanc (auth)
	Hybrid	-2	-5	-1		
	Absolute	5	10	2		
	Ideal	0	-2	-1		
	Reactionary					

Figure 33: Scores on Hybrid Statements

All electric

There is little variance between the factors on the amount of resonance with the reactionary content in this category. This contrast with the high variance in resonance with the formulated ideals. The liberty aspect of the all-electric alternative leads to the most consensus, while the loyalty aspect makes factor 3 respond negatively.

Nm	All electric Statement	Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
	Positive contribution technology					
7	If we work together in our neighborhood, we could generate enough electricity to heat our homes.	1	3	-1	+	loy
16	It's amazing not having to rely on energy from outside when you have solar panels and a heat pump.	2	3	0	+	lib
	Negative contribution technology					
11	I refuse to pay for thicker electricity cables just because the neighbors want a Tesla.	-1	0	1	-	fair (loy)
24	It's really annoying to have a big, noisy heat pump in your home.	1	-1	0	-	sanc
	All electric	3	7	-2		
	Absolute	6	11	2		
	Ideal	3	6	-1		
	Reactionary	0	-1	1		

Figure 34: Scores on All Electric Statements

Other technical related

There can be seen a consensus with almost every statement in this category. This consensus base creates contrast with statements from other categories where factors disagree, which has helped interpret the disagreement. The significance of this statement is indicated by substantial responses, as can be seen in the absolute array.

Nm	Other technical related Statement	Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
	Positive contribution technology					
3	Let's make it cheaper to isolate your home, in that way we can help people who cannot pay their energy bills.	3	4	2	+	care
	Negative contribution technology					
12	I think it is a bad thing that the heat pump subsidy goes to the first people who signed up.	0	1	1	-	fair
21	Demonstrating to get rid of gas quicker is disrespectful.	-2	-1	-1	-	auth
25	I don't want to cook electric, cooking with gas is much better.	-3	-3	-2	-	sanc
	Absolute	8	9	6		
	Ideal	3	4	2		
	Reactionary	-5	-3	-2		

Figure 35: Scores on Other Technical Related Statements

Responsibility

This category serves the same function as "other technical related" and the found consensus can help to interpret the scores on the other categories. Still, with this category, there is a substantial disagreement seen with statement 17, which has set the tone for the interpretation of factor 2.

Nm	Responsibility Statement		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Moral foundation
	Positive contribution technology						
8	The government can be trusted when it comes to getting rid of gas.		-2	1	-3	+	loy (auth)
13	I want the people who pollute the most to pay for it.		2	2	1	+	fair
	Negative contribution technology						
2	I think it is a bad thing that the rich get richer and the poor get poorer when we get rid of gas.		3	2	0	-	care
17	We need to protest against those ridiculous climate plans.		-4	-1	2	-	auth
		Absolute	11	6	6		
		Ideal	0	3	-2		
		Reactionary	-1	1	2		

Figure 36: Scores on Responsibility Statements

19.2 Moral Foundation Categories

Care/Harm

There seems to be a consensus that the moral foundation of Care/Harm is important in the energy debate. Still, each factor has a different focus on who or what they identify as vulnerable. Of all the moral foundations, the statements that are inspired by Care/Harm generates the strongest responses. It is important to note that factors 1 and 3 resonate with the positively formulated ideals as also with the reactionary statements.

Nm	Care/Harm Statement		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
	Positive contribution moral emotion						
1	It is crazy that biomass is considered sustainable with the disappearing of all the forests!		0	-2	3	-	Biomass
2	I think it is a bad thing that the rich get richer and the poor get poorer when we get rid of gas.		3	2	0	-	Respons
3	Let's make it cheaper to isolate your home, in that way we can help people who cannot pay their energy bills.		3	4	2	+	Other
		Care	6	4	5		
		Absolute	6	8	5		
		Ideal	3	4	2		
		Reactionary	3	0	3		

Figure 37: Scores on Care/Harm Statements

Loyalty/Betrayal

The responses on the moral foundation of Loyalty/Betrayal are dispersed. This difference can be explained by different parties that the respondent does or does not trust. Citizens of factors 1 and 2 do trust each other and have good hope in collaborating as members of society. However, when it comes to loyalty towards political actors, only factor 2 can approve this. Factor 2 and 3 both feel betrayed, with the difference that factor 3 also feels betrayed by most of the citizens. This moral foundation seems to be of fundamental value in relating the factors to each other. Although, it has remained unclear what factor 3 tries to say in this category.

Nm	Loyalty/Betrayal Statement		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
	Positive contribution moral emotion						
7	If we work together in our neighborhood, we could generate enough electricity to heat our homes.		1	3	-1	+	Electric
8	The government can be trusted when it comes to getting rid of gas.		-2	1	-3	+	Respons
	Negative contribution moral emotion						
4	I don't believe heating costs stay the same if we switch to a heating network.		1	0	-2	-	He. network
5	I don't trust hydrogen to be safe.		-1	-4	-4	-	Ren. gas
6	I don't want a biomass plant pumping smoke into my home.		4	-2	1	-	Biomass
		Loyalty	-5	10	1		
		Absolute	9	10	11		
		Ideal	-1	4	-4		
		Reactionary	4	-6	-5		

Figure 38: Scores on Loyalty/Betrayal Statements

Fairness as Proportionality

Each of the factors agrees with statement 13 which formulates a positive ideal based on this moral foundation. It is surprising that when it comes to statements that are formulated as reactionary, only factor 3 consistently gives a positive response. Each of the factors does think that fairness as proportionality is important, but only factor 3 thinks that it is not sufficiently addressed in the current situation.

	Fairness as proportionality		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
Nm	Statement						
	Positive contribution moral emotion						
9	The crazy thing about a heating network is that you have to pay even when you are barely using heat.		0	0	4	-	He. network
10	It's not fair that Nijmegen gets to use all the biomass in the area.		0	-1	-1	-	Biomass
11	I refuse to pay for thicker electricity cables just because the neighbors want a Tesla.		-1	0	1	-	Electric
12	I think it is a bad thing that the heat pump subsidy goes to the first people who signed up.		0	1	1	-	Other (Electric)
13	I want the people who pollute the most to pay for it.		2	2	1	+	Respons
		Fairness	1	2	6		
		Absolute	3	4	8		
		Ideal	2	2	1		
		Reactionary	-1	0	5		

Figure 39: Scores on Fairness as Proportionality Statements

Liberty/Oppression

Each factor does think that the moral foundation of liberty is important. Positive formulated statements as well as reactionary formulated statements based on this moral foundation do have strong responses from all the factors. It seems that the citizens are aware of what this moral foundation entails and could communicate about it properly.

	Liberty/Oppression		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
Nm	Statement						
	Positive contribution moral emotion						
14	I find it burdensome that you have to stick with one supplier with a heating network.		2	1	3	-	He. network
15	The good thing about a hybrid solution is that you get to choose when to get rid of gas.		1	0	0	+	Hybrid
16	It's amazing not having to rely on energy from outside when you have solar panels and a heat pump.		2	3	0	+	Electric
		Liberty	5	4	3		
		Absolute	5	4	3		
		Ideal	3	3	0		
		Reactionary	2	1	3		

Figure 40: Scores on Liberty/Oppression Statements

Authority/Subversion

Statements that are inspired by this moral foundation do generate strong responses. What is compelling is that the responses within each factor do not point in the same direction. That seems to say that citizens are not clear about what their moral compass says about authority and that it changes with different technologies. This means that a discussion on the need for stability and in which way a political actor can provide order and justice might be fruitful. Overall, factor 3 is on the subversion side of this category more than the other factors.

	Authority/Subversion		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
Nm	Statement						
	Positive contribution moral emotion						
18	A heating network provides much needed stability during uncertain times.		0	1	-2	+	He. network
19	I trust gas pipelines in the ground because gas transportation went all right.		-1	2	2	+	Ren. gas
21	Demonstrating to get rid of gas quicker is disrespectful.		-2	-1	-1	-	Other (Respons)
	Negative contribution moral emotion						
17	We need to protest against those ridiculous climate plans.		-4	-1	2	-	Respons
20	The government has no say in my housekeeping, I decide if I use a central heating kettle or not.		-2	-3	0		Hybrid
		Authority	3	6	-3		
		Absolute	9	8	7		
		Ideal	-1	3	0		
		Reactionary	-6	-2	1		

Figure 41: Scores on Authority/Subversion Statements

Sanctity/Degradation

The response of all the factors on each statement inspired by the moral foundation of sanctity points in the same direction. Arguments based on sanctity can not be a reason to slow down the energy transition. What above all seems to be paramount is the ability to have a rational debate, and this moral foundation challenges such a debate.

Nm	Sanctity/Degradation Statement		Factor 1	Factor 2	Factor 3	Ideal/reactionary	Technology
	Positive contribution moral emotion						
22	Using biomass for heating is wonderful because it's the most ancient form of heating.		-3	0	-3	+	Biomass
23	I am happy to keep my trusty central heating kettle in this time of change.		-1	-2	-1	+	Hybrid
24	It's really annoying to have a big, noisy heat pump in your home.		1	-1	0	-	Electric
25	I don't want to cook electric, cooking with gas is much better.		-3	-3	-2	-	Other (Electric)
		Sanctity	-6	-6	-6		
		Absolute	8	6	6		
		Ideal	-4	-2	-4		
		Reactionary	-2	-4	-2		

Figure 42: Scores on Sanctity/Degradation Statements

20 Appendix H Reflection on the Balancing of the Q Set

This section reflects on the balancing of the Q set by identifying ambiguous statements and determining whether the categories of the sorting grid categories represent the subjectivity sufficiently.

20.1 Reflection on the Balancing Act

The balancing act of the Q set has been seen as the sum of multiple balancing on different aspects; positive and negative phrasing, on categories, salience, etc. The emerging perspectives might have been clearer and more distant from each other, or another narrative might have emerged, if the Q set has been better balanced on the categories such as "biomass" and "hybrid". Still, the Q set as a whole can be considered balanced in light of the different balancing aspects taken together. Further verification is needed to support this claim.

It can be argued whether fewer technology categories should have been included in the Q set. The discussion at the Bewonersdag was mostly centered around the technologies 'Heating network' and 'All-electric'. The other technological alternatives could have been added to the category 'Other technological aspects' and thereby allowing more in-depth elaboration on the most relevant technological alternatives.

All the statements of the Q set have been given at least once the maximum positive or negative score by participants, except for statement numbers 21 and 23. This is an indication that the Q set design has succeeded in the balancing act of being salient and covering a wide range of subjectivity (Watts & Stenner, 2012).

20.2 Identification of Ambiguous Statements

Table 6 provides an overview of all the statements that are regarded as too ambiguous. The remarks of each statement are presented along with the categories of the sorting grid.

Number	Statement	Moral foundation	Technology	Positive/ Reactionary	Remarks
4	I don't believe heating costs stay the same if we switch to a heating network.	Loy	He. network	-	The negative formulation might be confusing to distinguish whether the statement is in favor of a heat network or not.
5	I don't trust hydrogen to be safe.	Loy (care)	Ren. gas	-	The negative formulation might be confusing to distinguish whether the statement is in favor of hydrogen or not.
10	It's not fair that Nijmegen gets to use all the biomass in the area.	Fair (loy)	Biomass	-	This statement is in favor of biomass, but that might be unclear because of the negative formulation.
12	I think it is a bad thing when heat pump subsidy goes to the first people who signed up.	Fair	Other (electric)	-	The link between the statement and a notion of proportionality might be too far-fetched.
20	The government has no say in how my housekeeping, I decide if I use a central heating kettle or not.	Auth (lib)	Hybrid	Both	This statement is ambiguous because it contains two different sub-statements of which one is positively formulated and the other negatively.
21	Demonstrating to get rid of gas quicker is disrespectful.	Auth	Other (respons.)	-	This statement is related to creating stability. However, it is related in two ways and in two different directions, which might be confusing. One direction is not wanting to change too quickly, and the second direction is protesting and disrupting a decision-making process.
23	I am happy to keep my trusty central heating kettle in this time of change.	Sanc (auth)	Hybrid	+	This argumentation seems not be the reason why people want to use their central heating kettle, but there might be other reasons.

Table 6: Identification of ambiguous statements of the Q set

20.3 Discussion on the Categories of the Sorting Grid

For each category of the sorting grid, it is discussed to what extent the subjectivity is sufficiently represented.

20.3.1 Technology Categories

Heating network

It would have been interesting if a statement concerning the care aspect of a heating network would have been included. Some infrastructure policymakers do see the care aspect of taking care of the vulnerable as relevant to the reason to invest in infrastructure (Rodhouse et al., 2021). Still, it would have been

good to include at least one more positive formulated ideal. Even more, because the only formulated ideal in this category did not resonate very much. Furthermore, the fact that statement 4 seemed to be interpreted in different ways, made the interpretation of the technology of a heating network challenging.

Renewable Gas

It might have been relevant to include a statement about the care aspect, and specifically the cost aspect of renewable gas. The following statement is not chosen in the end because of limitations of the number of statements and because it is a contested fact that renewable gas will be cheaper than natural gas: Natural gas is way too expensive, let's change to renewable gas quickly

Biomass

The biomass debate is represented by only one positive formulated ideal, which did not find resonance among the participants. The questionnaire would have been improved if more formulated ideals would have been included. Furthermore, multiple statements might have been confusing to participants and difficult to interpret. Statement 10 is complex because of its confusing denial, and the intertwining of fairness and loyalty moral emotion. The entanglement of moral foundations is also present in statement 6. In conclusion, the responses to the biomass statements are difficult to interpret, and that might be the result of a non-coherent balance of biomass statements.

Hybrid

The discussion on hybrid is non-ideally represented. In this category, there is a lack of reactionary statements. Statement 20 was initially formulated as a reactionary statement but later it seemed that there the statement contained partly a formulated ideal. Furthermore, the term central heating kettle is used to represent the hybrid technology alternative, but that notion might be too far-fetched. It might only be seen about natural gas. It might have been interesting to add a statement on the effect that a hybrid solution has on the speed of the energy transition. However, the discussion of a hybrid solution is on such an abstract level, that it is challenging to make understandable, salient statements.

All Electric

It might be the case that statement 11 is too complicated to be understood on short time notice. Furthermore, the ideal and reactionary formulated statements are balanced equally. The ideal formulated statements do find relatively high resonance with the participants, which is unique in the overall questionnaire.

Other Technical Related

There can be seen consensus with all the statements of this category, and it is unclear where that consensus comes from. It might be the case that when technologies become concrete and specific they produce dilemmas that divide the participants. It is still the case that there are much more subjects that are relevant to the institutional aspects of technological alternatives. It would have been relevant to add more statements in this category.

Responsibility

This category would be of more value if the statements would disperse the responses more. During the debate in Wijchen, the question of who is responsible for the energy transition and how to let it take place was relevant, bringing forward the notion that there might have been statements that would elicit different reactions.

20.3.2 Moral Foundation Categories

Care/Harm

The statements did not diverge the respondents. It might be that there was no difference in sentiments were present or that different statements have to be used.

Loyalty/Betrayal

The statements on this moral foundation have often overlapped with other moral foundations. Therefore, the interpretation has been challenging. Furthermore, factor 3 did not respond to the ideal and reactionary formulated statements, which could signal that some subjective content is not represented.

Fairness as Proportionality

There is only one formulated ideal statement in this category with whom all the perspectives resonate. It might have been interesting to add another positive formulated statement to see whether the perspective thinks differently on this moral foundation. It is challenging to interpret the statements of this category since these statements in particular could be answered with a quick emotional glance, or by deep societal analysis.

Liberty/Oppression

The responses on statements of this category show a lot of consensus. It might have been interesting to make the statements more extreme, to see whether the responses would be more dispersive. The following statement might be useful but has not been selected due to the limited amount of statements. We have control as a neighborhood if we collaborate in energy cooperation.

Authority/Subversion

The responses to the statements of this category show inner conflict in the perspectives. The perspectives are not clear on the need for stability and in which way a political actor can provide order and justice.

Sanctity/Subversion

The statements of this category have been focused on practical examples, and therefore it is risky whether people do recognize the moral foundation but not the concrete example that is given. Furthermore, the statements of this category might have been formulated too extremely and thereby losing connection with the participants. The sentiments of this category did not find resonance with the participants, but the following statement might have helped with that: *A world with only renewable energy is fantastic!*