A Co-Creation Approach Towards Gas-Free Homes in the Netherlands

Investigating how municipalities can use co-creation practices in transitioning towards a gas-free future.

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Executive Summary

Dutch national policy states a goal to rid 7 million homes of natural gas by 2050. Municipalities, along with inhabitants, will determine what is the best alternative technology for gas heating.

There are many challenges to this as municipalities must adapt to a relatively new role and subject matter, coordinate with the inhabitants within their jurisdiction, and ensure that it is economically feasible. This transition towards a sustainable future requires reimagining a whole industry, as well as, the relationship between municipality and inhabitants. This is something that cannot be addressed as an individual, but with the collaboration of numerous stakeholders. Design co-creation is emerging as necessary in complex issues. Using co-creation means considering how to connect different stakeholders, and facilitate collaboration and expression of deeper emotional needs of the participants of co-creation. This project explores how co-creation can support municipalities in achieving their goal of transitioning homes away from gas.

Frame Innovation provides the main structure for this project. First, there is an analysis of the problem situation. Various methods are used for this, for example, interviews were held with important stakeholders in the energy transition and experts in co-creation — civil servants at the municipality level, homeowners, and designers. Second, a frame is presented that explores solutions through a metaphor. The frame was crafted by exploring stakeholders and their underlying values, needs, and motivation. Finally, the frame is used towards designing new solutions. The third section of the project presents the final design concept.

The proposed design concept presented here is a mentorship program called ‘Plan-It Together’. This program is designed for municipalities to support homeowners in adapting their homes so that they are well insulated and are heated using sustainable options. The program connects homeowners who have not made their homes gas-free ready yet, but would like to (mentees), with those in the community who already have (mentor). The program consists of a series of workshops with a complementary toolkit. An implementation roadmap that outlines a plan for a pilot and ways to evaluate it was created. The design concept and roadmap were tested with civil servants and homeowners.
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Acknowledgements

Dear reader,

Before you is my report and the final deliverable for my masters program in Strategic Product Design at TU Delft. I was initially drawn to this project because I wanted to learn more about how design could play a role in a sustainable future. I have learned so much throughout this project and have had ups and downs, highs and lows. I would like to acknowledge and thank the people who have helped and supported me throughout this project, and without whom, this project may not have seen the light of day.

Thank you to my supervisors Sonja and Sander, as well as Jotte who was there at the beginning of my project. Thank you for guiding and supporting me through my first big independent design project. Thank you to everyone who participated in my interviews and the group brainstorming session - for contributing your valuable time and offering your honest feedback and thoughts.

Thank you to the following for all the behind the scenes and additional support. I can not express my gratitude enough. Thank you Marieke, Ineke, and Annemijn. Thank you to Bas and Nadia for reading my drafts, the emotional and mental support, and being on the receiving end of my doubts and fears.

Last but not least, thank you to my parents and family for their love and care, and although they are across the world, I can feel it all the same.

Enjoy reading!

Josephine

Table of Contents

Chapter 1 Introduction

This chapter presents an introduction to the project and the research questions. The research questions are comprised of a main question with sub-questions that will guide the project.

1.1 Topic introduction

The energy transition refers to moving societies away from fossil fuels toward renewable energy. This project focuses on transitioning Dutch homes away from natural gas and towards being well-insulated and using sustainable heating options. Municipalities along with inhabitants will determine what is the best alternative technology for heat and electricity for example, heat networks, heat pumps (Ministerie van Economische Zaken en Klimaat, 2022).

There are many challenges to this as municipalities need to adapt to a relatively new role and subject matter, coordinate with the inhabitants within their jurisdiction, and ensure it is economically feasible. This transition towards a sustainable future requires reimagining a whole industry and the relationship between municipality and inhabitants. It is something that cannot be addressed as an individual, but with the collaboration of numerous stakeholders.

Design co-creation is uniquely positioned to inform and facilitate collaboration and “emerges as necessary in complex domains” (Jones, 2018), such as, the energy transition. In the energy transition challenge, diverse stakeholders must work together and co-creation can support by facilitating expression of deeper emotional needs and contribute to shared understanding. The energy transition is a present-day issue and is a pressing goal for the Netherlands as Dutch national policy outlines a goal to rid 7 million homes of natural gas by 2050. This project will explore how co-creation can support municipalities in achieving this goal.

1.2 Research questions

The phenomena of interest are both to understand (1) the Dutch energy transition from the municipality perspective and (2) co-creation and how it is applied to projects related to the energy transition.

The main research question for this project is: How might co-creation help municipalities transition homes away from natural gas use?
The following sub-questions will help understand the main topic.

Research question 1: What is the situation around natural gas use and discontinuation for the built environment in the Netherlands?

1a. What does transitioning a home away from natural gas mean?

1b. Who are the main actors?

1c. What are the challenges that municipalities are currently facing?

Research question 2: What is co-creation from a design perspective?

2a. How is co-creation used in energy transition projects in the Netherlands?

2b. What are the challenges of co-creation in practice?

Design question: How can the municipality use co-creation in their goal of getting inhabitants to make their homes gas-free ready?

Chapter 2
Methods

This chapter provides an overview of all the methods that were used throughout the project. This lays the groundwork before diving into the content of the project. First, this chapter discusses the project approach and Frame Innovation. Second, the different research and design methods are described.

2.1 Project approach

This project is guided by the Frame Innovation approach (Dorst, 2015). Frame Innovation is used to address open, complex, dynamic, and networked problems. Co-creation in the energy transition is a complex societal issue that requires many stakeholders to work together; has no clear singular approach to address it; and is constantly changing with many different elements that are interdependent. Therefore, the Frame Innovation approach is suitable to address this topic.

Creating a frame is using a novel standpoint to solve the problem and for a designer to explore whether using a particular pattern of relationships will achieve the outcomes they are aiming for. A proposed frame includes using certain concepts that have meaning and significance that steer explorations. Frames should also be actionable, which means that "they should be capable of leading to realistic solutions" (Dorst, 2015, p.63). An inspiring and captivating frame can bring about mental images and trigger solution ideas.

A frame is "an organizational principle or a coherent set of statements that are useful to think with." (Dorst, 2015, p.63).

Dorst proposes the Frame Creation model, which follows nine steps (Figure 1). The general flow of this model involves: developing the problem situation, considering a broader context, building a deeper understanding of the underlying factors behind the problem, and creating a new approach or frame to the problem situation (Dorst, 2015, p. 73).

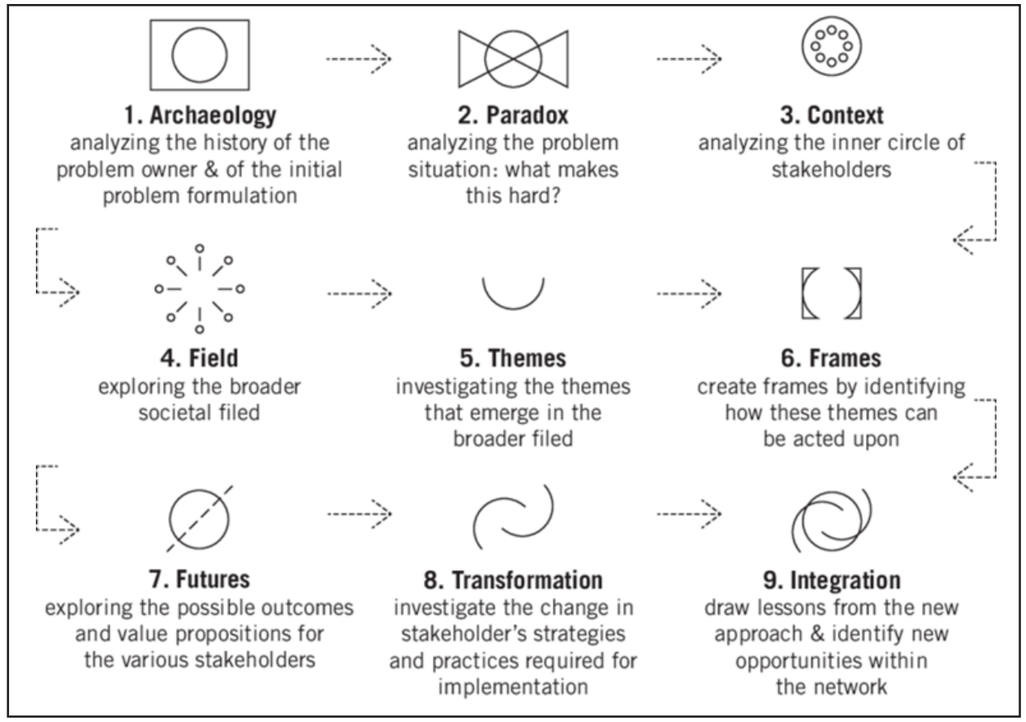


Figure 1. Frame Creation steps (visualization by Willemsen et al. (2018) based on Dorst (2015))

Design process

The report groups together Frame Innovation steps for clarity. This section presents an overview of this design process and what can be expected in subsequent chapters of this report.

There are three main parts to the design process:

- **(1) Analyzing the problem**
- **(2) Crafting a frame**
- **(3) Designing an intervention**

Frame Innovation steps contribute to the different parts and the corresponding steps are referenced at each part with the different colour dots (Figure 2).

- **(1) Analyzing the problem**
  In this section, the goal is to understand the problem by using various research methods to investigate and answer the research questions.

- **(2) Crafting a frame**
  In this section, a frame is crafted. Framing is used in this project to examine the problem differently and explore solutions. Crafting a frame is done here by investigating stakeholders and their underlying factors and then deriving metaphors.

- **(3) Designing an intervention**
  The selected frame is used to create a design intervention and it is presented here. This section includes an implementation roadmap and an evaluation of the design with municipalities and homeowners.

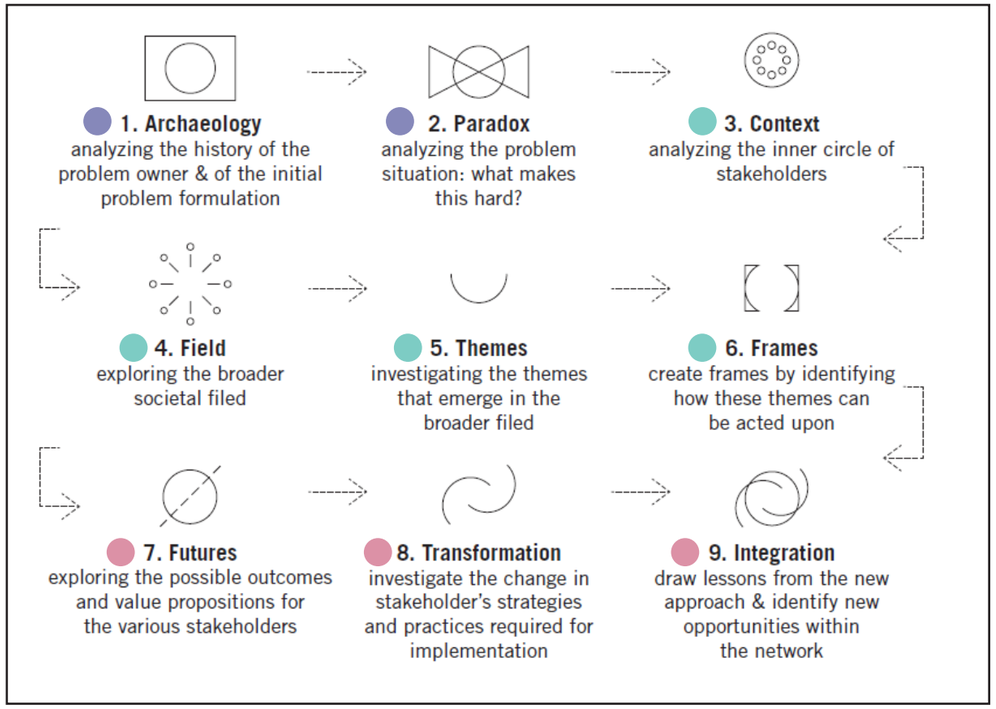


Figure 2. The design process: Analyzing the Problem, Crafting a Frame, & Designing an Intervention.

2.2 Research methods

This section describes the different methods used in the project. The research methods below were used to investigate sub questions: 1. What is co-creation from a design perspective? 2. What is the situation around natural gas use and discontinuation for the built environment in the Netherlands? 3. Design question: How can the municipality use co-creation in their goal of getting inhabitants to make their homes gas-free ready?

i. Desk research
ii. Literature research
iii. GIGA-mapping
iv. Questionnaire
v. Group brainstorming
vi. Design roadmapping
vii. Semi-structured interviews

i. **Desk research**
Desk research consists of online research of company websites, reports, blogs, news articles, and white papers that helped to understand the energy transition, for example: heating district network report by Accenture, a consulting company to understand the technology; design agency blog posts about their projects and design approach on their websites to supplement the understanding of co-creation projects of design agencies.

ii. **Literature research**
Literature research consists of peer reviewed journal articles and books that helped explore the topics of the energy transition, design, and co-creation. Databases used were TU Delft library and Google Scholar, with searches with the keywords: co-creation, co-design, energy transition, transition management, governance in the energy transition, systemic design, GIGA-mapping, sustainability transitions, sociotechnical transitions, public sector innovation, sustainable heating. Initial papers were provided by the supervisors of the project.

iii. **GIGA-mapping**
GIGA-mapping is a technique from Systems Oriented Design, which is a version of systems thinking and practice that has been developed within the design field. It is created by and for designers to help designers better deal with complexity. This field has emerged to help designers cope more with complex challenges. GIGA-mapping is “super extensive mapping across multiple layers and scales, investigating relations between seemingly separated categories, and so implementing boundary critique to the conception and framing of systems” (Sevaldson, 2011). GIGA-maps can be used for various different activities and in this project it is mainly used for research and learning. GIGA-mapping can be used to map out things that one already knows or assumes in order to help determine where missing information is needed to guide research. It can also help in organize knowledge gained from research.

iv. Questionnaire

A online questionnaire was used to get feedback from a policy advisor from the municipality of Oss on the implementation roadmap. This was done instead of an interview due to illness of the participant during that time in the project.

v. Group brainstorming session

During the design part of the project, a group brainstorming session was also held. This was a 2 hour session with 3 industrial design engineering masters students from TU Delft (see Appendix F).

Overview of session:
1 Sketch your relationship with your parents
2a Brainstorm about problem situation: Parent trying to get their child to do their homework
2b Brainstorm potential solutions
3a Brainstorm about problem situation: Parent helping their child make a decision about what their child wants to do after high school
3b Brainstorm potential solutions
4 Apply metaphor to project context, brainstorm design solutions

This group brainstorming session helped enrich the understanding of the framing as well as ideating on potential design idea solutions.

vi. Design roadmapping

Design Roadmapping adapted from Simonse (2018) was used to create an implementation roadmap for the mentorship program. A technique called Trend Views for Creative Trend Research from the same book was used to identify trends in the roadmap. Through DESTEP categories (demographic, ecological, social, technological, economic, political), trends were acquired through reading and design exercises such as cluster analysis.

vii. Semi-structured interviews

Some interviews were held in the exploratory phase of the project and some were held to test the design concept.
1. Exploratory
1a) design agencies
1b) municipalities
1c) parent

2 Design Testing
2a) municipalities
2b) homeowners
2c) national government
An overview can be seen in Table 1.

Inteviews with the purpose of exploring

Semi-structured interviews are a suitable method to supplement desk and literature research because it allows for the collection of data that consists of in-depth information to explore and understand complex issues to qualitative research questions (see Appendix B for interview guides).

1a) Design agencies

Interviews with different designers from different organizations will enrich the understanding of co-creation in practice by providing multiple perspectives on co-creation and the different ways that co-creation is contributing to the energy transition as opposed to going in-depth into a single project or organization. This is the most suitable method for this research because it allows for the exploration of a qualitative research topics - how expert designers use co-creation in general and in energy transition-related projects; the challenges they face when using co-creation in practice; and as an agency that is working on complex social issues.

Although Kennisland is not strictly a design agency, they are included because they have recently expanded their work in the energy transition, also use some design methods in their projects. They recognize the benefits of using design in addressing social complex issues, which is exemplified through their choice to have an intern from industrial design engineering to incorporate design in their projects. For simplicity, the name of this category will be design agencies.

1b) Municipalities

Two interviews with civil servants from different small to medium sized municipalities were conducted, each 60 minutes and online.

The first part of the interview was used to get acquainted with the interviewee, their role, and their work. This part also helped to validate my own understanding and interpretation of the Dutch energy transition from my literature and desktop research. These interviews provided grounding to my research and interpretations. I developed initial design solution ideas and presented them to the interviewees to gather feedback. Due to the fewer number of interviews here, insights from transcripts and taken during the interview were combined directly.

1c) Parent

To help inform the design portion of the project, a parent was interviewed to better understand the frame metaphor: the relationship between a parent and a child. The first part of the interview was about how to motivate a child to do something the parent wants when the child is around 5 years of age, the next part was about how the relationship changes when the child gets older (see Appendix B for the interview guide).

Interviews with the purpose of testing design concept and roadmap

2a) and 2b) Interviews with municipalities and homeowners were held to test the design concept (see Appendix B for interview guides).

The design concept in PDF form was shared with interviewees via screenshare (except one interview which was in person, and in this case the design concept was shown on a computer for the participant to see). The design concept was explained in parts: Roles & process, metaphor; Kick-off, assessing your home; Learning about tech; Financial planning, connecting with companies, final wrap-up. After each section, the interviewee was asked to respond to the design concept by saying out loud what they were thinking about the design and what they liked or thought could be improved. At the end asked questions about desirability, feasibility, and viability.

2c) An interview was held with a civil servant working at the national government level to test the roadmap. The inteview was held online and the roadmap was created on miro and shared via screenshare. The roadmap was shared in sections and the interviewee was asked to respond to each section.

Sampling Strategy

Convenience sampling was used in this project to identify and select participants for the interviews.

1a) Participants were recruited with the help of the chair and mentor of my project who had contacts with design agencies through the ENRGISED project. This is a research project with the aim to develop an intervention strategy for municipalities to stimulate households to transition away from gas (ENRGISED, n.d.). Criteria to select participants for the research were agencies that used design and work on energy transition related projects. Although Kennisland is not a design agency, they are included because they have recently expanded their work in the energy transition, also see the benefits of using design in addressing social complex issues, which is exemplified through their choice to have an intern from industrial design engineering to incorporate design in their projects.

1b) Participants were recruited through personal network and with the help of the project mentor. Criteria to select participants were civil servants who are working on the energy transition at a municipality in the Netherlands.

1c) Participant was recruited through personal network. Criteria to select participant was a Dutch parent with experience raising children.

2a) To test the design, it was important to receive feedback from people working at the municipality on the energy transition. One participant was a repeat participant from 1b. A second participant was recruited with the help of the second mentor of my project.

2b) Another important stakeholder to receive feedback from are homeowners. Both were recruited through my personal network. One was a repeat participant from 1c and an independent homeowner. The other participant is a homeowner who is part of a homeowner's association. This provided a different perspective than the first homeowner and helped get feedback on whether the design concept could apply to this target group in the second horizon of the roadmap.

2c) To get feedback on the roadmap, an employee at the Netherlands Enterprise Agency, which is a part of the Ministry of Economic Affairs and Climate Policy was recruited through my personal network. Although the RVO is a part of the Ministry of Economic affairs and Climate Policy and is not a municipality, they were able to provide insight on the terminology in the roadmap headings and general remarks about program implementation within government.

Table 1. Overview of exploratory interviews

Exploratory interviews					
1a) Design agencies					
Name of organization	Date	Abbreviation* (referred to in report text)	Participant	Duration of interviews	Online or in person
Noorderwind	14-03-2022	NW	1 innovation designer & start up coach	60	in person
Afdeling Buitengewone Zaken	24-03-2022	ABZ1	2 Co-founder & research director	120	in person
	04-04-2022	ABZ2	3 social designer	60	in person
Zeewaardig	06-04-2022	ZW	4 service designer	120	online
Kennisland	21-04-2022	KL1	5 Advisor social innovation	60	online
		KL2	6 Industrial design engineering intern	60	online
1b) Municipalities					
Wijk bij Duurstede	29-08-2022	WBD1	Project manager (energy transition built environment)	60	online
Harderwijk	02-09-2022	MH	Sustainability advisor	60	online
1c) Parent					
	22-11-2022	-	Parent	60	in person

Table 2. Overview of testing interviews

Testing interviews					
2a) Municipalities					
Name of organization	Date	Abbreviation (referred to in report text)	Role of interviewee	Duration of interviews	Online or in person
Wijk bij Duurstede	22-12-2022	WBD2	Project manager (energy transition built environment)	60	online
Oss	16-01-2023	MO1	policy advisor	60	online
2b) Homeowners					
	24-01-2023	H1	Independent homeowner	60	in person
	27-01-2023	H2	Homeowner part of homeowner's association	60	online
2c) National government					
Netherlands Enterprise Agency (a part of the Ministry of Economic Affairs and Climate Policy)	17-02-2023	NEA	Energy Innovation Advisor	60	online

Part A

Analyzing the problem

Chapter 3
Natural gas discontinuation in the Netherlands

In this chapter, the energy transition in the Netherlands is explored, particularly natural gas discontinuation in homes. There are top down national policies that have made the municipality a key actor in coordinating the district by district approach to making homes natural gas-free. Another main actor are the inhabitants who live in these homes. Homeowners are the focus of this project and here, you will get a sense of the challenges that they face in this situation. Lastly, the current situation of the energy transition is investigated through interviews with municipalities and design agencies.

3.1 Zooming out - energy transition in the Netherlands

This section looks at the broader topic of the energy transition in the Netherlands; how it has become priority in national policy; how the municipalities took on a central role in coordinating this transition; and how inhabitants are also a main actor in making homes gas-free ready.

Sustainability transitions refer to “large-scale societal changes” (Loorbach et al., 2017) and the energy transition refers to moving societies away from fossil fuels toward renewable energy. Climate change has repercussions on many levels – global, society at large, and individual. This makes it difficult to point at one entity or actor as solely responsible, or a ‘problem owner’. As pointed out in interviews with design agencies: “no one person is sole owner of this problem” and “complex problems aren’t resolved when your project ends” (NW).

This is one of the challenges of the energy transition. For the purpose of this project, the municipality is a main actor because they have a central role in transitioning away from natural gas for the built environment in the Netherlands. The following section will explain how this came to be.

In the Netherlands, the push to transition away from natural gas stems from the high level targets outlined on a global level to reduce greenhouse gases. Through national policy in the Netherlands, the municipalities are the directors of the energy transition and this specifically includes the district approach to transitioning the built environment away from natural gas heating and to low carbon alternatives. Please refer to Figure 3 for an overview.

Climate change is caused by greenhouse gas emissions and at COP21, the Paris Agreement, a legally binding international treaty on climate change was adopted by the Netherlands along with 195 parties. This treaty contains the central aim to tackle climate change by limiting temperature rise to well below 2°C (and preferably limit the increase to 1.5°C) compared to pre-industrial levels, and therefore means reducing greenhouse gas emissions and fossil fuel consumption.

In response to this, the Dutch government aims to reduce the Netherlands’ greenhouse gas emissions by 49% by 2030, compared to 1990 levels, and a 95% reduction by 2050. There are two large pieces of national policy that outline the country’s goals. The Climate Act is national policy that gives individuals and companies more certainty about climate goals, it sets out measures to ensure these targets are met. The national Climate Agreement contains agreement with sectors on what they will do to help achieve these climate goals. This agreement is part of the National Energy and Climate Plan (NECP) that EU member states are required to submit to the European Commission (this was submitted to the House by end of 2019). One of the sectors is the built environment, which states a more specific goal: 7 million homes and 1 million buildings will have to get rid of natural gas by 2050 by insulating and using sustainable electricity and heat (Ministerie van Economische Zaken en Klimaat, 2021).

A first step is that by 2030, the first 1.5 million existing homes must be made more sustainable, and this is happening district by district (Ministerie van Economische Zaken en Klimaat, 2021).

The central government in the Netherlands is “devolving more tasks to municipalities as they are in more direct contact with the public” (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2021) and are the tier of government closest to the people. Municipalities formulate and run programs, take on different roles such as regulator, facilitator, tailor their programs and policies to local conditions with aim to meet low carbon goals. Their focus is on public order and safety in the municipality.

In terms of the energy transition, municipalities are tasked with creating a Heat Transition Vision (Transitievisie Warmte in Dutch) that outlines a district by district step by step plan for sustainable natural gas-free heating and cooking (Government of the Netherlands, 2019, p.32). This includes a timeline and order in which neighbourhoods will be tackled, as well as making a plan as to how residents will be involved (Ministerie van Economische Zaken en Klimaat, 2022a). The municipalities, along with residents and building owners for each district, will determine what is the best alternative technology for heat and electricity for example, heat networks, heat pumps (Ministerie van Economische Zaken en Klimaat, 2022a)

Fuchs and Hinderer (2014) argue that transitions are initially organized locally and regionally; development and testing of technical and institutional innovations for the energy transition is sheltered from regulatory and market frameworks. Moreover, the Netherlands favours non-hierarchical, networked forms of governance due to the “country’s corporatist negotiation culture (polder model of decision making by reaching consensus)” (Hoppe & Miedema, 2020).

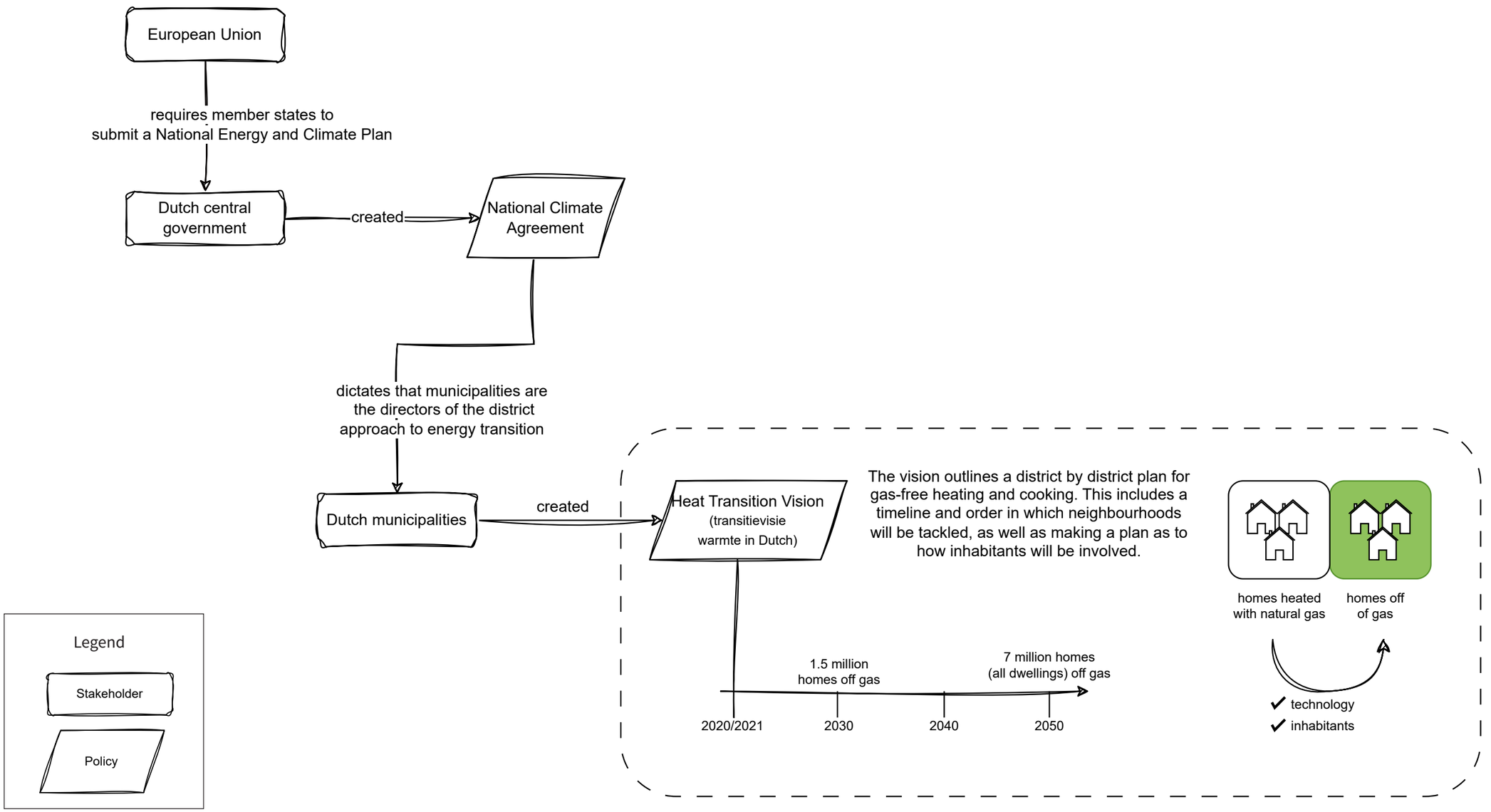
75% of 393 Dutch municipalities that were surveyed in the paper by Hoppe & Miedema (2020) state: “inter-municipal collaboration is necessary to develop effective policy, attain local policy goals, improve service provision and municipal operations”. Municipalities in the Netherlands vary greatly across different factors such as “resource availability and motivation of administrative staff, and policy output for energy transition varies widely between municipalities” (Hoppe & Miedema, 2020). Smaller municipalities are especially in need of inter-municipal collaboration. They lack capacities, political and administrative priority setting, and energy transition goals have not been “adopted in municipal coalition agreements and visions” (Hoppe & Miedema, 2020). Larger municipalities, on the other hand, have a larger population; the administrative staff have a higher motivation; more participation of citizens and businesses; and the cooperation with other municipalities and government entities, which contribute to a higher energy transition policy output. However, this means more and diverse public opinions and more need for co-ordination amongst more actors. Regularly encountered or perceived barriers when trying to implement policy are lack of technical knowledge within the administration, lack of budget for energy transition, and lack of support from civil servants.

The scoping of this project is guided primarily through the insights from interviews with municipalities Wijk bij Duurstede, Harderwijk, and Oss, which have small to medium-sized population relative to other Dutch municipalities. Table 3 shows the population of the municipalities interviewed in this project and the least and most populated Dutch municipalities for reference.

Table 3. Comparing municipality size based on population

Municipality	Population
Schiermonnikoog	936
Wijk bij Duurstede	23,762
Harderwijk	47,581
Oss	91,451
Amsterdam	893,783

Figure 3. Overview of transition away from natural gas in the Netherlands



Environmental and societal pressure to move away from natural gas in the Netherlands

There is building pressure to discontinue natural gas heating in the Netherlands. This is in part because of the development of natural gas outlook in the past decade. The Netherlands is the second largest European producer of natural gas, due to the substantial fossil fuel resources they possess, especially in the province of Groningen.

Fossil fuel-fired power plants produced over 80% of the electricity in the Netherlands, of which, natural gas makes up 42% ((International - U.S. Energy Information Administration (EIA), 2016). Moreover, natural gas is the primary source of energy for heating Dutch houses (Patrahau, 2021). Therefore, natural gas is a dominant, significant, and relatively stable part of the Netherlands energy mix.

As natural gas is being extracted in the province of Groningen, there has been an increase in earthquakes, causing damage to private property (Mouter et al., 2021). This has resulted in public outrage in response to the negative consequences of natural gas extraction and support for climate goals. Consequently, the Dutch government has turned their attention to stop domestic gas production as well as transitioning homes away from natural gas heating, as stated in the following:

adaptation of the 7 million homes and 1 million buildings we have built, many of which are moderately well insulated and virtually all of which are heated by natural gas, into well insulated homes and buildings that are heated using renewable heating and in which we use or even generate clean electricity. This process will be carried out incrementally right up to 2050 and will involve cooperation with residents and the owners of these buildings

(Government of the Netherlands, 2020)

3.2 Roles of inhabitants in the Dutch energy transition

Whether an inhabitant is a tenant renting their home or a homeowner, and whether they are a part of an overarching association influences their decision-making power to adopt an alternative heating solution or not (Figure 4). This also influences how the municipality approaches the inhabitant.

Homeowners are more independent in their decision-making than tenants. A homeowner may be a part of a homeowner's association (referred to as Vereniging van Eigenaren or VvE in Dutch). Any building with more than 1 independent home is required to be a part of a homeowner's association (City of Amsterdam, 2022). Each homeowner is a member of the homeowner's association and has an equal vote. 70% of members must agree before changing something in the building that everyone uses (for example, stairs). As a homeowner independent of a homeowner's association, there is more autonomy in making choices.

As a tenant, the landlord is responsible for shared parts of the building, such as a set of stairs in an apartment building that all tenants can use. About 75% of (the 3 million) rented homes in the Netherlands are owned by housing associations. These associations let or sell accommodation, and provide homes for older people or people with a disability. They also provide social housing and act as a landlord in this case (Ministerie van Binnenlandse Zaken en Koninkrijksrelaties, 2021). Other landlords include private entities who may be individuals, investors, or corporations that own the building.

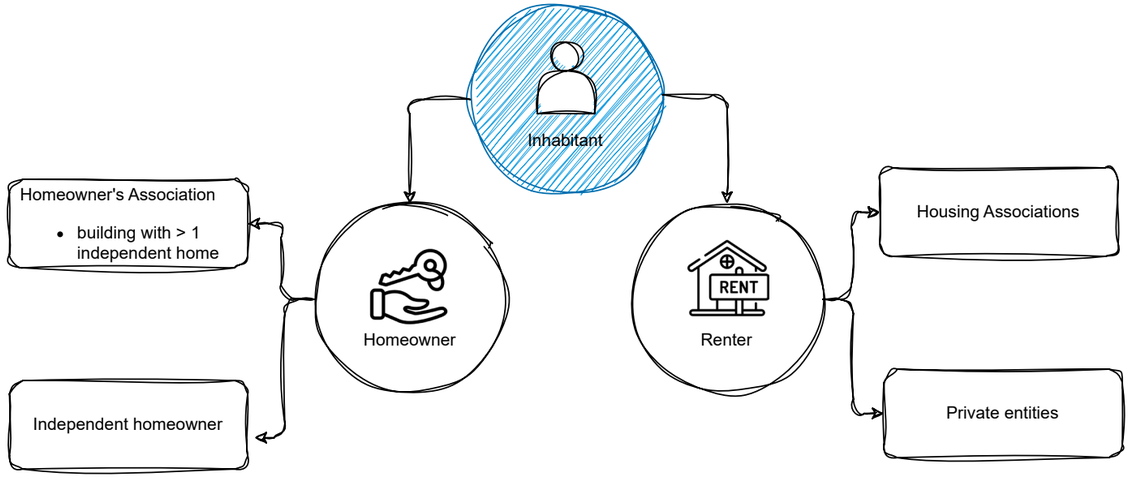


Figure 4. Inhabitants: renters versus homeowners

This project will focus on homeowners because homeowners have the most autonomy of the different residents over the heating decisions for their home. Figure 5 presents a path with different steps that homeowners take towards a natural gas-free home from TNO (2020). Two interviews with civil servants working at Dutch municipalities on the energy transition helped inform the understanding the situation when working with residents in transitioning away from natural gas.

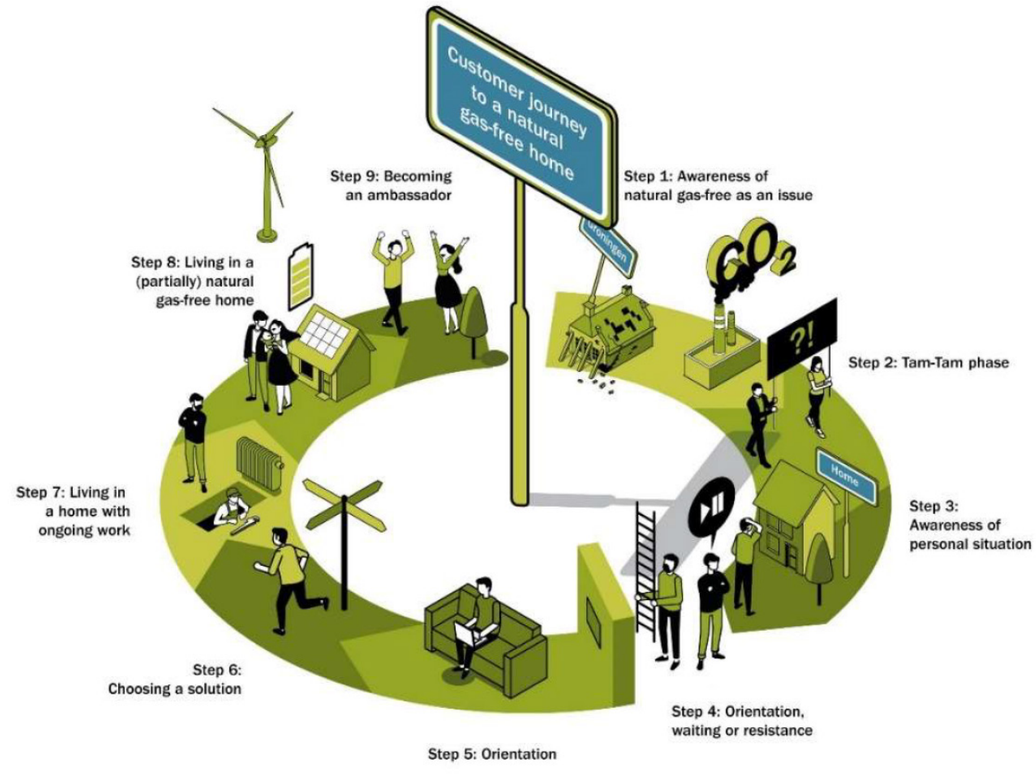


Figure 5. Homeowner journey to a natural gas-free home by TNO (2020)

Key takeaways from sections 3.1 & 3.2

- National policy states a goal for 7 million homes and 1 million buildings will have to get rid of natural gas by 2050 by insulating and using sustainable electricity and heat (Ministrie van Economische Zaken en Klimaat, 2021).
- Municipalities are the directors in the district approach to transitioning homes away from natural gas heating and to low carbon alternatives.
- There is building pressure to discontinue natural gas heating in the Netherlands. Environmental stresses due to gas extraction has resulted in public outrage and support for climate goals. Consequently, the Dutch government has turned their attention to stop domestic gas production as well as transitioning homes away from gas.
- There are two different types of inhabitants in the Netherlands: renters and homeowners. This project will focus on homeowners because homeowners have the most autonomy of the different inhabitants over the heating decisions for their home and journey.

3.3 Heating homes: the technologies and actors

After examining the bigger picture, we will now focus on supplying heat to homes – both the technologies and key stakeholders. In Figure 6, we have covered the central circle – and a bit of the national government and European Union – and now move onto the energy industry actors. In this section, the supply chain for heating homes is explored and how the transition is affecting energy stakeholders and their future roles.

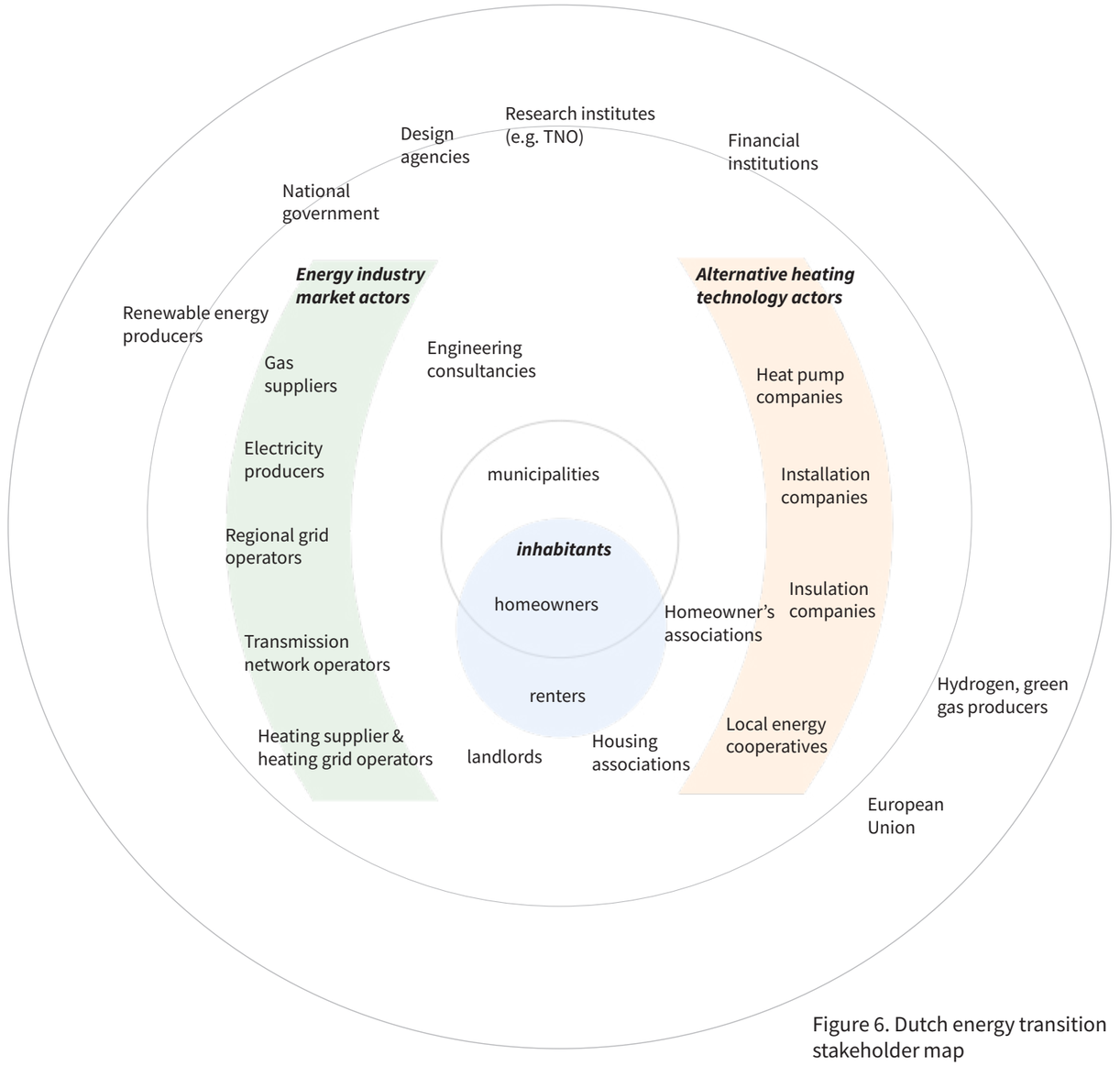


Figure 6. Dutch energy transition stakeholder map

The main aspects to consider when transitioning homes involves replacing natural gas heating with an alternative heating technology, such as, district heating network or a heat pump, and insulation. Figure 7 shows an overview of the technologies and actors that have a role in supplying heat to homes in the Netherlands (for more information about the technologies see Appendix D).

First natural gas heating is examined in order to have a basic understanding of the dominant current heating supply system and what exactly we want to move away from.

The Dutch central government – specifically the Ministry of Economic Affairs and Climate Policy – is responsible for the decision-making around gas extraction and how it is done in Groningen. After natural gas is extracted, it is stored and subsequently transported through the national gas grid, which is managed and maintained by network operator, such as Gasunie.

The major energy – electricity and gas – suppliers in the Netherlands include, amongst others: Eneco, Essent, Vattenfall (Dutch energy suppliers: Electricity & Gas, n.d.). They are responsible for ensuring gas and electricity supply to homes and inhabitants can chose their own energy supplier. This is as opposed to the transmission network operators who are not chosen by residents, but rather these operators are determined by place of residence.

The gas continues through to regional networks, which is managed by distribution system operators (DSOs), and they ensure the gas reaches your home (Gasunie, n.d.). The gas supply is connected to a gas boiler at your home, which provides hot water and heating. Natural gas is not only used for space heating in residential spaces, it is often that these households have gas stove tops. Save for exceptional circumstances, in the Netherlands newly built houses are no longer connected to a gas grid as part of the Dutch government's goal to phase out natural gas (Vitéz & Lavrijssen, 2020).

The two main alternative heating technologies to replace natural gas heating are heat pumps and district heating networks. Heat pumps extract heat from the environment (air, soil, water) using electricity and then the heat can be used for space and water heating. There are different types of heat pumps (see Appendix D for more details). The adoption of heat pumps will result in an increase in electricity demand.

District heating entails using heat sources already present around a customer area and transporting heated water over a network of pipes to a district heating customer area comprised of households (Accenture, 2020). District heating companies are companies that own the heat network, produce heat or purchase it, and then supply heat to users and they will have an expanding role in the future energy system (ACM, 2021). Currently, district heating companies have a monopoly position within the heating grid that they operate. However, the Dutch government is planning to put all heating grid infrastructure into (majority) public ownership by 2032 (Ministerie van Economische Zaken en Klimaat, 2022b).

There are several social considerations among these solutions. District heating networks are a collective solution for an area of households, and this requires the coordination of multiple parties. This means for an area that might comprise of renters and homeowners, that they must collectively decide that they want to be a part of it, which means agreeing to a heating network connection in their home.

For example in some cases with district heating networks, 70% of renters are required to vote for it/ opt-in, in order to make it economically feasible (ZW). Economically feasible means that it makes business sense for companies to develop the infrastructure and for residents to invest money to prepare their homes to connect to such a network. In addition to this coordination among different stakeholders, district heating network must be technically feasible, such as, proximity to heat waste.

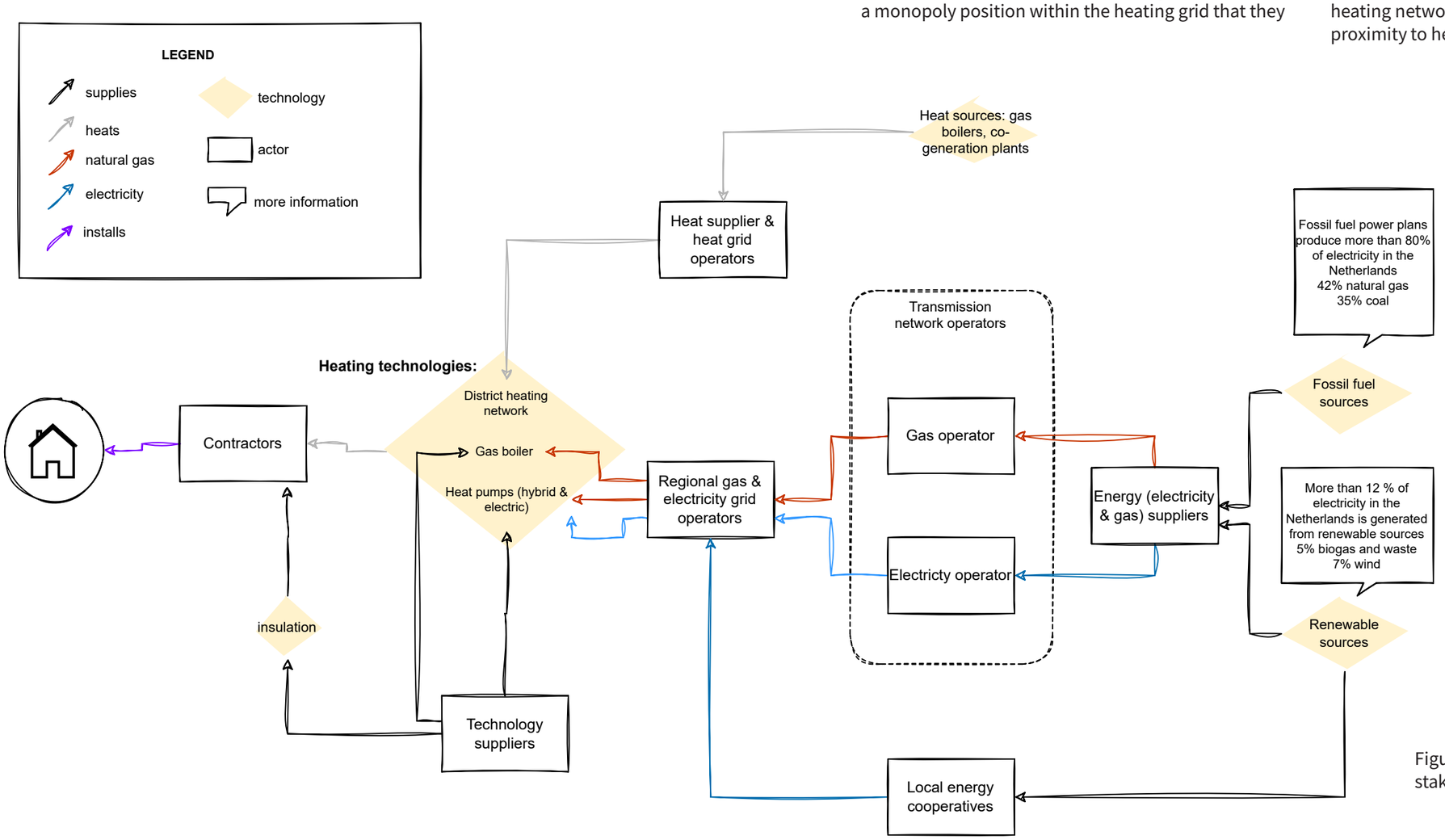


Figure 7. Overview of technology and stakeholders for heating homes in the

3.4 Ways that current dominant industry actors and technology are adapting their roles to remain relevant in the transition

As described in the previous section, the energy transition will bring about increasingly important roles for heat pumps and heating networks. As a result, current energy industry stakeholders involved with natural gas are exploring their future roles in this new energy system (Figure 8).

As natural gas is phased out, electricity will be relied on more because of heat pump adoption and the replacement of other uses of natural gas in the home, such as, stove tops with electric ones. Moreover, there will be more decentralized energy production, such as, solar panels installed on roofs of homes that will require integration.

Therefore, gas and electricity grid operators (DSOs) will have to construct energy infrastructure and increase number of electricity distribution substations as electricity demand increases. Potential other roles DSOs are exploring include distributing hydrogen and green gas, and developing heating grids. Currently, the Dutch Energy Act restricts most of these activities. DSOs run pilot projects, which are permitted and supported by the government. Recently, a pilot project involving a DSO, Liander, was set up to supply hydrogen gas to approximately 10 homes through an existing gas network. The homes have hydrogen boilers will provide central heating needs and hot water (ACM, 2021).

Transmission network operators for gas, such as Gasunie, are responsible for maintenance and extension of energy grid including connections to homes. Gas operators are exploring different roles, and in particular, ones that allow them to keep their current infrastructure such as the transportation of hydrogen, waste heat, and green gas*. Gasunie has a national plan to build a hydrogen grid and estimate that 85% of the hydrogen network will be recycled natural gas pipelines (Gasunie, n.d.). They are also exploring potential roles in carbon capture and storage.

*Green gas is derived from organic waste material like sewer sludge and animal manure will need to be more readily available. Commonly used methods to turn this material into biogas are anaerobic digestion and gasification. The biogas is then captured and upgraded to the quality of natural gas.

Other important stakeholders that will become more important as homes become gas-free include: suppliers of technology such as manufacturers and importers of heat pumps; and companies that retrofit homes to make them better insulated and ready for alternative heating solutions. One challenge to transitioning homes are capacity issues, for instance, there are not enough contractors to realize plans for inhabitants and stock shortages for the technology options themselves.

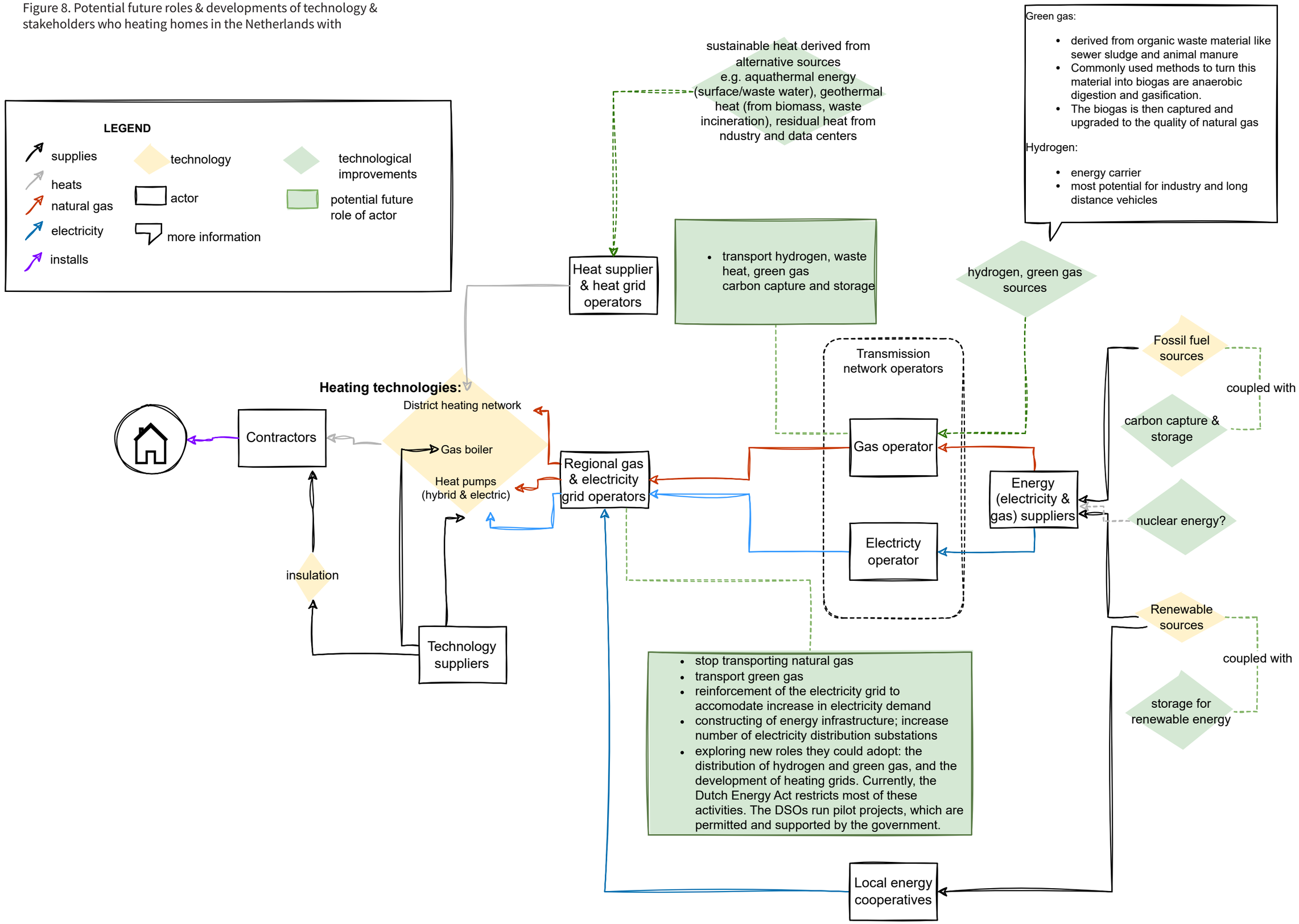
Another stakeholder group that has a role in the future energy system are local energy cooperatives. They can be defined by the following characteristics (Hufen, 2015):

- Initiators live in the local community
- Begin with the enthusiasm of volunteers, but develops into a legal entity such as a cooperative
- Goal is to develop and/or distribute renewable energy and improve energy conservation
- Pursue collaboration with other local citizens, government, and small medium enterprises

Energy cooperatives have a long history and recently have grown rapidly. In 2017, there were 286 local energy cooperatives producing enough energy for 85,000 households, but the total amount of renewable energy production is relatively small. They have also been developing horizontally and vertically, meaning they are involved in policy making. In order to apply to bank loans, cooperatives have to have starting capital; it is difficult to get bank loans for small projects – as banks think risk is too high and profits too low). National subsidies help them to have a closing business case (Janssen, 2017). These cooperatives raise awareness about renewable energy in cases where people living nearby are protesting wind power projects. They are able to create support and are a good advocate for sustainability. They have a desire to change ideas about energy production, not only as sustainable, but a way to strengthen local profits and local participation. relationships between municipalities and local energy cooperatives can be mutually beneficial. Their strong shared vision overcomes democratic slowness. These involved communities and local actors give a sense of ownership and can overcome resistance and create trust between the cooperative and municipality (Hoppe & Miedema, 2020). Energy cooperatives are mentioned here because they have an emerging role with many advantageous influences to support the energy transition, but they are not the main focus for this project.

There are also longer term developments to make these alternative heating solutions sustainable. Adopting heat pumps and district heating networks will only enable residential spaces to be ready to adopt truly sustainable solutions. Moving forward, district heating networks will need to find waste heat sources that are sustainable. These heat sources can be derived from many alternative sources including: aquathermal energy e.g. from surface or wastewater, geothermal heat derived from biomass, waste incineration, residual heat from industry and data centers. Renewable energy sources, such as, wind and solar coupled with renewable energy storage will need to be further developed.

Figure 8. Potential future roles & developments of technology & stakeholders who heating homes in the Netherlands with



Key takeaways from sections 3.3 & 3.4

- The focus of this project is making homes gas-free ready. This is the first step to a truly fossil fuel-free future. In addition to a truly carbon-free future, there needs to be further development in sustainable energy sources
- Main alternative technologies for natural gas heating for residential spaces are heat pumps and district heating networks in combination with insulating homes.
    - District heating network requires collective action
    - Heat pumps are a solution for a smaller area and can be purchased for one household
- Current regional electricity and gas operators will need to adapt to electricity demand as well as decentralized energy production
    - Replacing gas stoves with electric ones, increasing heat pump use, will cause electricity demand to increase.
- Gas transmission network operators are exploring what they can do with existing infrastructure, leaning towards carbon capture and storage, green gas and hydrogen
- Companies for district heating, technology installation, and insulation are becoming increasingly important in order to implement alternative heating solutions

3.5 Investigation into the current progress of the energy transition

We now have an understanding of the topic of energy transition in the Netherlands, the main technologies and stakeholders in supplying heat to homes, and why there is a pressure to transition homes. Now we will explore the current progress of the energy transition from municipalities and design agencies working on this topic and dive deeper into reasons why transitioning homes is challenging.

Interview legend

Abbreviation	Interview participant
MW1	Wijk Bij Duurstede (project manager for energy transition and built environment)
MH	Harderwijk (sustaina-biltiy advisor)
ZW	Zeewaardig (service designer)

Different groups in a neighbourhood
There are differentiated groups of people within the neighbourhood at different levels of readiness in making their homes gas-free, and this is because there are varying levels of technical knowledge, literacy, time available, and enthusiasm regarding the energy transition. Residents are varied in terms of their opinions about going gas-free, in terms of how they think the municipality should approach the problem, what option they want, and simply, whether they want to take action or not. The following are groups of people in the community that were mentioned from research:

Forerunners There is a small group of very knowledgeable people, the forerunners, who have the knowledge and have already transitioned their homes.

> *"we also see some people that are not on the events or anything, but they already did almost everything and are already sustainable because they think it's going too slow" (MH)*

There are some people who have strong opinions about certain technologies, for example hydrogen, which is not technically feasible for households yet. This makes it challenging to open up the dialogue and discussion for feasible and options now.

> *"Some people that have [a] strong opinion about it and that makes it quite difficult to talk. Tell them that it's not possible to use hydrogen at the moment because it's not there at the moment ...I think that's a problem… have to challenge people who have strong opinion about already 1 technology and they will already say this is the solution and they will forget the disadvantages." (MW1)*

Main group Then there is the main group of people who do not know that much about the technology and need accessible information. It is also noted from the interviews that the main group of inhabitants do not know anything about technologies and it is difficult to talk about the technical aspects (MH).

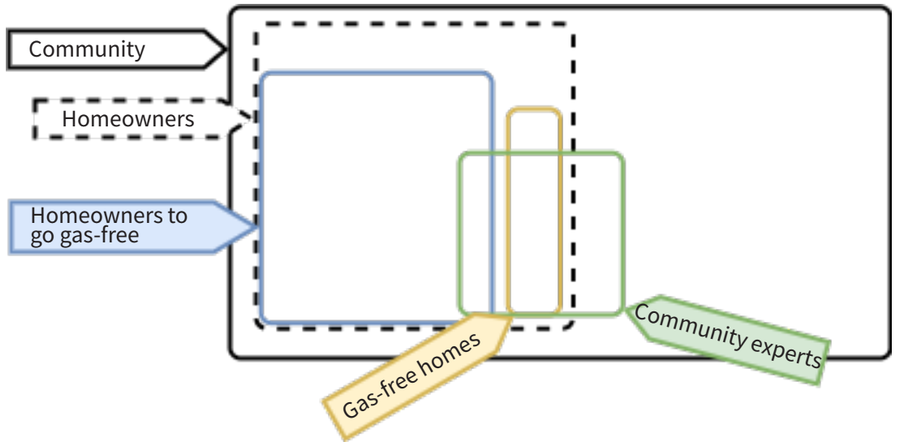


Figure 9. Differentiation of groups within a neighbourhood

> *"It's always difficult to talk about the technical aspects of the of the energy transition because I always see that there's a little group of people and they are engineering and they know a lot, a lot of stuff they know. They know a lot about technical solutions, but the main group, they don't, they don't know anything about heat pumps or. So it's very difficult to start a conversation about that because people don't know anything about it." (MW1)*

Marginalized group Municipality has trouble reaching everyone in the community, oftentimes, there are the same people joining sessions, mainly men and mainly white. One of the challenges that they have is how to get their conclusion to the rest of the neighbourhood, without them feeling like they were not a part of the process. A challenge for the municipality is how to reach the other people. Often people who are not part of the main group are people who have a problem with the language or have a different culture.

> *"it [people who come to public engagement events] is a small group most of the time... mainly men mainly white. It's one of the most difficult jobs ...I think about how do we get the all the others in the neighbourhoods and how and which way do we reach them...I think they're all possibilities you can think of. It's a poor people that get a higher bill for the electricity …this group as well as also a problem with language or culture. And that's also we have to think about it. How do we reach them if they don't speak the language or not." (MH).*

An ideal step for one of the interviewees is to have people who have already transitioned their homes to share their experience with others, for example how they can do it, and what contractors they used (MW1). Another key insight that I learned from these interviews were that these municipalities are finding themselves in a position where inhabitants need less convincing to make their homes gas-free ready, and instead want to know how to take action.

Figure 9 is a visual depiction of the different categories of community members. The purpose is to help visually represent the different groups. The proportions may not be accurate but it is an estimation as every municipality has a different make-up of community members. In a neighbourhood, there are a portion who are homeowners and of those there are those who want to make their homes gas-free (blue) and a portion who have already transitioned their homes (yellow). There are the community experts, who have knowledge or motivation about the energy transition, and is a combination of people who may or may not:

- Be a homeowner
- Have already transitioned their homes

Cost concerns of inhabitants

One large concern in adopting an alternative heating solution is the financial costs associated with it. People are worried and uncertain about the financial costs and whether these costs will be recouped in the future. There are upfront investments to insulate the home as well as the technology itself, such as buying a heat pump. The value of the technology could work as a driver for people who are interested in increasing the value of their property and to save energy bills (TNO, 2020). In response to this, there is some financial support from the government for residents: "goal of national government [is to have] lots of subsidies for people 1500 euros to switch off gas" (ZW).

Because households need to invest in order to be able to use new energy sources and alternative heating technologies, low-income households may be reluctant to do so due to high upfront costs. The cost of switching from natural gas to renewable sources for heating residential spaces "will lead to a significant increase in the number of households spending more than 10% of their income on energy costs" (TNO & ENGAGER COST Action, 2020). Despite the available grants and schemes, it is often difficult to "persuade households with debts, or people with low-literacy skills, to take advantage" (TNO & ENGAGER COST Action, 2020) of them. The following from an interview illustrates some of the negative reactions from the public when they were on the street interacting with them about going natural gas-free: "people come up to you[...] they were very aggressive, why are you doing this here, what is happening, we don't want you to start here, people are poor" (ZW). There is also a portion of the population that are somewhat neutral and apathetic towards the different options and don't want to put in the effort to decide themselves, but are willing to download that responsibility to someone else.

There are other non-financial costs such as the organization and hassle of the process. For example, even if the resident agrees to support the district heating network and allow their residential space to have a connection to the network, this solution requires a certain number of households to agree in order to make it economically feasible to develop the infrastructure, and then developing the infrastructure itself will take time as well.

For neighbourhoods where district heating network may not be an option due to technical feasibility, there is an overwhelming amount of technological considerations and solutions. This requires a certain level of understanding from residents so that they can make an informed decision for themselves. This is a barrier for those who are not well versed in this jargon, and relegates those less educated or literate people to a disadvantaged position.

There are also a lot of people who have time constraints that pushes the energy transition down the priority list.

> *"But there is also a lot of people that don't have time for this. Instead, because of the private problems or financial problems, or we also see a lot of people that have children or they say they don't have time...because the children are going to bed…they have no time besides the work..." (MH)*

Having said this, an important insight is that things are changing and people need less convincing to phase out natural gas due to war in Ukraine and higher gas prices. There are some people who want help on how to take action, make decisions, and choose companies.

> *"Now people will call us and say, well, I want to do something with my house. Can you please help me? And it's all about what kind of insulation people have to use and which company. It's the same question, the same things. They wanted to know a couple of years ago, but now they wanted to do their sales. We don't have to convince them." (MH)*

> *"People see, OK, maybe it's better to stop with using gas, part of the high prices also …the war in Ukraine...it's a little bit changing now, but still people [think] it's expensive" (MH)*

Lack of trust between municipalities and the public

According to the TNO report (2020), barriers for homeowners include a lack of trust in heat supplier or approach chosen by the municipality, this sometimes exists as a more general feeling of 'being fooled'. TNO also identified through their research that honest communication, personal approach, and trust in the Aardgasvrij (natural gas-free) team acted as drivers in a certain neighbourhood. In general, they conclude, it seems that a more intensive, personal approach in the resident's journey leads to more trust.

In one of the interviews with a municipality member who has worked on the energy transition for a while, they found that in the beginning their approach didn't work well because people found that they were being told what to do, but after learning from this mistake, they built up trust with residents by approaching it more on equal footing (MH).

They hired a company who helped them facilitate 'dialogue tables', which proved to be an effective approach with inhabitants. This is in contrast to their initial approach that led inhabitants to feel as though the municipality was telling the inhabitants what to do. The dialogue tables worked well because people want to be heard and have dialogue about the energy transition, as opposed to being told that they need to take action now by the municipality (MW1). Moreover, transparency is also important for some inhabitants. According to the interviewee, inhabitants like to know where the municipality is getting their information and the reasoning behind their decisions and process (MH).

In current affairs of the recent past, the Dutch government has been under pressure after mishandling different public affairs that has affected the trust between public and the government. "This increase in distrust in the government has not occurred in a vacuum. Scholars identify the Dutch government's repeated violation of democratic norms during the childcare benefit affair and the Covid crisis as instrumental in setting the stage for the growing rejection of democratic constitutional norms among citizens." (Luther, 2022).

To further support that there is public distrust in the government, an interviewee stated that the public were more willing to interact with them than their client who was a municipality (ZW). This is because the public saw that they are a design agency and considered them a third party and separate from the municipality, despite the fact that they were hired by the municipality.

Cultural context of the Netherlands

The cultural context in the Netherlands requires different approaches than command and control.

I grew up in a multicultural context – my family is from Hong Kong and I grew up in Canada. Because I am not Dutch, there are some things about Dutch culture and society that help enrich the energy transition context specific to the Netherlands. It seems quite simple that all households should adopt a low carbon alternative to natural gas, but there are some learnings from the cultural context that provide deeper understanding of why simply telling people or having a command and control regulatory approach might not work in this particular context.

Although every individual is different, and one should be cautious about making assumptions about individual traits based on where someone is from, learning about cultural context is not unnecessary (Meyer, 2014). As Meyer (2014) states in her book, she argues that "cultural patterns of behaviour and belief frequently impact our perceptions (what we see), cognitions (what we think), and actions (what we do)". Moreover, the following descriptions come from research that represents a normative distribution and there are of course those who may not conform to it all. Also these are not absolute statements and should not be taken as such, but rather be in comparison to another culture.

In the Netherlands, the power distance is low, meaning that power is often decentralized, hierarchy is for convenience only, and valuing equal rights (Hofstede Insights, 2022). There are some characteristics about decision making, disagreement, and communication that will supplement the understanding of the current energy transition and things needed to keep in mind in order to make it a success in this context, and why simply making it a law will not happen here. The Dutch fall towards a consensual approach to decision making as the "…Dutch are known for their long discussions until consensus has been reached" (Hofstede Insights, 2022). They tend towards confrontational disagreement, direct negative feedback, with debate and disagreement being positive for a team or organization (Meyer, 2014).

Key takeaways from section 3.5

- There are differentiated groups of people within the neighbourhood at different levels of readiness in making their homes gas-free, and this is because there are varying levels of technical knowledge, literacy, time available, and enthusiasm regarding the energy transition.
- Key groups are:
  - Main group
    - Do not know much about the technology and require accessible information
    - Want to know how to take action and make decisions
  - Forerunners
    - Those who have already transitioned their homes
- Barriers for homeowners include:
  - Financial costs
  - Hassle of the process
  - Trust in the municipality process
  - Competing priorities

To conclude this chapter, the key takeaways are translated into guidelines that will shape the design concept.

Design guidelines

The design addresses the following challenges for homeowners:
- The hassle of the process
- Lack of trust in municipality
- Understanding technical jargon
- Cost concerns

The design should take into account that homeowners have different levels of readiness with respect to transitioning their homes. Different factors that influence this readiness include (TNO, 2020)(MW1, MH, parent):
- Technical knowledge
- Financial situation
- Time they are able and/or willing to commit to this journey
- Motivation

The design should provide clarity to homeowners over what they need to do in order to transition their homes and to take action in transitioning their homes off natural gas.

The design considers important stakeholders: municipalities, homeowners, and community experts.
- Community experts are people in the community who have already transitioned their homes and/or ‘forerunners’ who are community experts. Working and supporting them works well because it creates an approach that is more equal footing between municipalities and the community.

Chapter 4
Co-creation & the energy transition

In this chapter, co-creation is explored through literature research about co-creation from the design perspective and interviews with design agencies who use co-creation in their projects and also work in energy transition-related projects. Co-creation is useful for facilitating collaboration in the face of complex social problems that cannot be solved by an individual. The challenge of transitioning homes off natural gas cannot be solved by one person and requires the co-ordination of multiple stakeholders and taking into account different motivations of these stakeholders. Therefore, the usefulness of co-creation in the challenge of transitioning homes off of gas is investigated here.

4.1 Zooming out: Co-creation in different fields of study and in the field of design

This section will look at the broader topic of co-creation from literature and different fields.

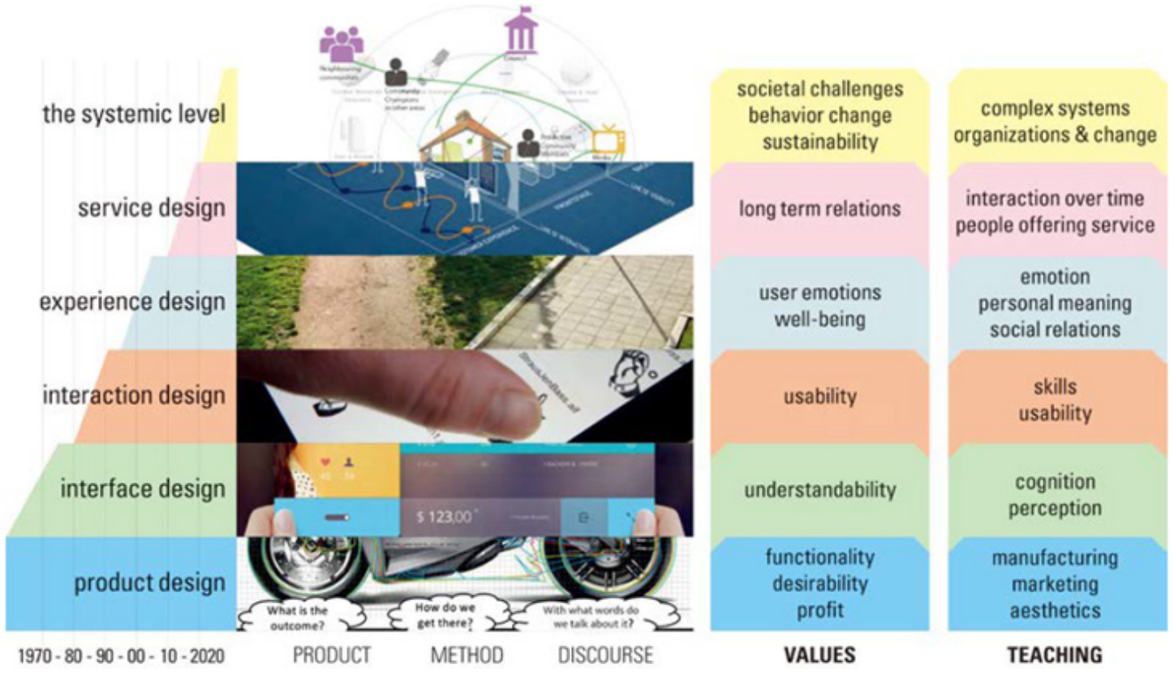


Figure 10. Evolution of the design field in recent past from Voûte et al. (2020)

Co-creation is a term that has emerged from various fields of study. In the fields of production and marketing economics, consumer participation was integrated into the supply chain in order to minimize costs and to increase customer satisfaction (de Koning et al., 2016). These are two trends in the private sector that influenced co-creation: end users taking up specific activities in the production chain and end users whose experiences with products or services are added value for a company and a source of innovation (Voorburg et al., 2014). In 2014, Prahalad and Ramaswamy introduced a core theoretical concept: “value co-creation” (Jones, 2018). This refers to value as being co-created in the interaction between consumers and a service provider.

In the field of design, co-creation has its roots in participatory design and user-centered design.

Participatory design dates back to the 1970s and much of the activity in participatory design has been happening in Scandinavia. This approach combines “the expertise of the system designers/researchers and the situated experience of the people whose work is to be impacted by the change” (Sanders & Stappers, 2013, p. 28), therefore providing people with resources to be able to act on their situation.

As opposed to consumers of a product or service as end users, in the public sector, the end-users are citizens (Voorburg et al., 2014). According to Itten et al. (2020), citizens may be identified as co-designers or co-initiators. In this case, the users of public services or goods to “ensure better quality or more effective governance” (Itten et al., 2020). Citizens may also be identified as co-implementers; being involved in delivering the public service.

“While design co-creation can inform and facilitate nearly any collaboration, it emerges as necessary in complex domains for which a design team would not have knowledge or agency” (Jones, 2018). This is especially true for societal issues, such as the energy transition, as it has an impact on a whole system. The field of design has greatly evolved in the recent past. In the past fifty years, the design profession and “context for design practice” have changed significantly. Figure 10 from Voûte et al., (2020), shows the progression of design approaches and their associated outcomes, perspectives, models, methods, values, and knowledge elements. Cross & Cross (1995), observe within the context of teamwork and social processes. They state that the design process is an integration of technical, cognitive, and social processes. This is reflected in the movement towards design as a process that involves more than one expert designer. The design development process has changed to reflect the application of design for more complex challenges.

Design competencies are growing to reflect the need to work in a collaborative context. As described by Voûte et al. (2020), the future of design includes broadening the designer’s view from a single user to include context and societal issues, as well as shifting from highly connected multi-actor processes.

Creativity and how to co-create

Often creativity is described as the "ability to produce novel and appropriate works" (Lubart & Sternberg, 1995), but there are more nuanced types of creativity. "Psychologically creativity" applies to everyone, and is not so unique, "where someone borrows an idea from one domain and applies it to another" (Sanders & Stappers, 2013, p. 38). For simplicity's sake, for this project, creativity refers to the "ability of seeing or making new, appropriate things" (Sanders & Stappers, 2013), and subsequently "people who have had creative ideas in the past are more likely to have them in the future and people who have new ideas frequently will continue to do so." (Sanders & Stappers, 2013, p. 38).

There are different levels of creativity i.e. doing, adapting, making, creating (Figure 11) and "it is important to offer relevant experiences to facilitate people's expressions of creativity at all levels. It takes different kinds of support at the different levels of creativity." (Sanders & Stappers, 2013, p. 40). It is best to:

- lead people who are on the doing level of creativity
- guide those who are at the adapting level
- provide scaffolds that support and serve peoples' need for creative expression at making level
- offer a clean slate for those capable of creating things from scratch

	level	motivated by	purpose	example
1	doing	productivity	"getting something done"	organizing my herbs and spices
2	adapting	appropriation	"making things on my own" or "make it fit better"	embellishing a ready-made meal
3	making	asserting my ability or skill	"make with my own hands"	cooking with a recipe
4	creating	curiosity	"express my ability"	dreaming up a new dish

Figure 11. Levels of creativity (Sanders & Stappers, 2013)

As mentioned earlier, with multi-actor processes, there are individuals who may not be trained in design, but are the experts of their experience and can contribute to ideas, knowledge and concept development. In order to express themselves, designers can create and explore tools and methods to facilitate this. The following will describe how design agencies facilitate expression of individual creativity through emotion, physical artifacts, and environment.

There are several parts components that make up this individual creativity framework presented by Sanders & Stappers (2013), please see Figure 12.

The first part posits that ideas in people's head are building blocks of creativity. The second describes emotion having a role in creative thinking and doing. The second part describes how the whole person is in action and using the body in the environment to express and experience ideas. Traditional design visualizations include prototypes, sketches, and models. On a larger scale and in bigger complex challenges, these visualizations encompass the exploration of "alternative ways to visualize future situations of use" (Sanders & Stappers, 2013). The third part describes the environment that the action takes place in, and includes the space itself and the things in it "such as materials, supplies, props, and tools" (Sanders & Stappers, 2013).

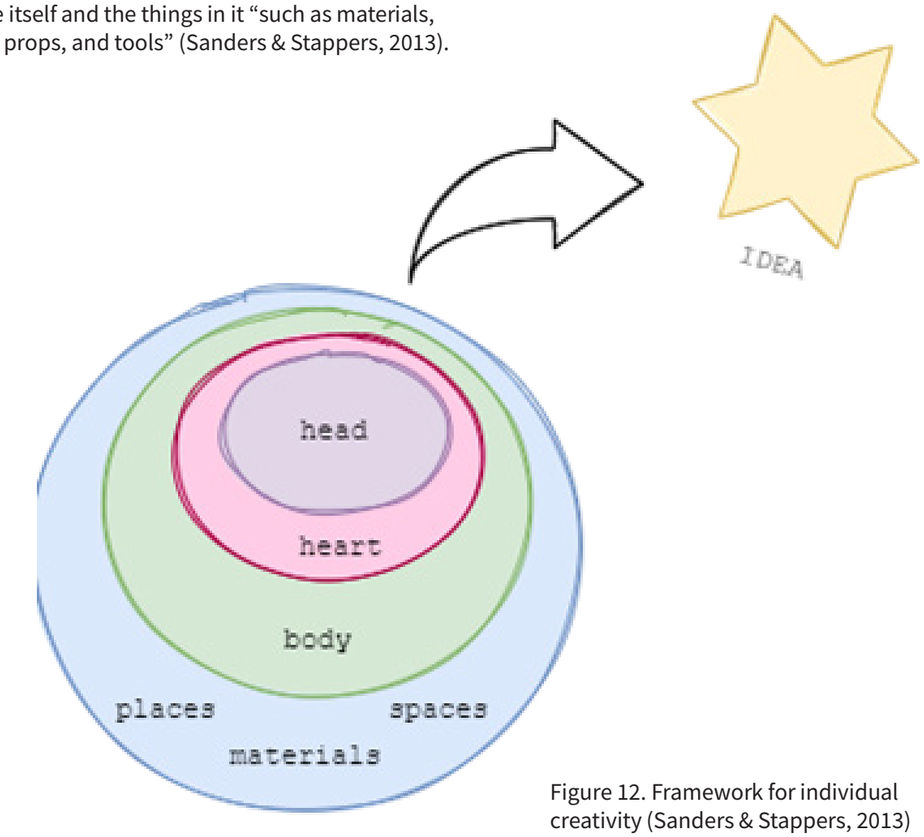


Figure 12. Framework for individual creativity (Sanders & Stappers, 2013)

One of the significant things about co-creation that agencies regard highly is the ability to reach beyond rational levels to emotional levels. In relation to the framework presented by Sanders & Stappers (2013), emotion plays a role in creative thinking and doing. Noorderwind believes that sharing values and needs is important in making sure things get done and to find a way forward in their projects. Co-creation is a way to reach deeper levels as it leads to participants sharing insights and their needs. Although bonding between participants is an important goal of co-creation, but not the end goal. Kennisland also believes that the energy transition requires thinking about what makes people tick and what values are important to them.

As mentioned above, using the body in the environment to express ideas and the interaction with materials, props, and tools as a component of creativity. Creating something together helps create a shared understanding between different people. Bringing diverse people together with different ways of seeing, doing, and thinking may make it hard for them to come to an agreement and using artifacts can help connect different ideas.

4.2 Complementing co-creation literature with interviews

In order to complement findings in literature research about co-creation, interviews with design agencies who use co-creation in energy transition-related projects were conducted.

Before moving forward, here is an overview of the design agencies that were interviewed. These design agencies have used co-creation in their work and have also worked on energy transition-related projects in the Netherlands.

Noorderwind
Noorderwind is a design agency comprised of both designers and non-designers, but they all have entrepreneurial backgrounds. They are focused on turning complex ideas into impactful business cases by bringing together institution level stakeholders in their informal network; creating new business cases by connecting stakeholders that might not traditionally see themselves as in the same value chain. The Innovation Designer & Startup Coach spoke broadly about how they use co-creation in different projects, such as a large hackathon competition with interdisciplinary teams and coaching them on design and entrepreneurship.

Afdeling Buitengewone Zaken
A/BZ is a social service design agency and the aim for their projects is to have impact on, what they call, the system level and street level. The system level refers to policy and institutions, while street refers to people on the street. They try and keep an open process for their projects, to remain flexible to adapt to what is needed. Their philosophy is to try and include everyone who has a stake in the issue . This means having an overarching goal and prototyping ways to include diverse perspectives in order to find a shared way forward. Two interviews were held with A/BZ employees. In the second interview with a social designer from A/BZ, they described the agency's 'co-reflection' process which was used to co-create a tool with municipality members to support a more equitable approach to the energy transition.

Zeewaardig
Zeewaardig is a service design consultancy who use creative facilitation and service design to solve complex problems. They work together with their clients through creative sessions and their aim is that the clients are able to be part owners of the process and can learn design thinking themselves. They are working for a municipality that is focusing on informing their residents about the adoption of alternative heating solutions. They do this by prototyping various ways to deliver information such as through neighbourhood walks or physical artifacts on the street.

Kennisland
Kennisland is a not-for-profit social innovation and action research agency. They use methods such as social labs, action research, and design thinking. In the past three years, they have begun working on the energy transition, and albeit not a design agency proper, they have recognized the advantages of design as a way to involve people in creative roles and think about new things. They believe in trying to include everyone who is affected by the energy transition and do this by bringing people from institutions and experts together with citizens. In their energy transition project, they are exploring public and expert values associated with the energy transition in order to prototype the narrative around the energy transition.

Interview Legend

Abbreviation	Interview participant
NW	Noorderwind (innovation designer & start up coach)
ABZ1	Afdeling Buitengewone Zaken (co-founder & research director)
ABZ2	Afdeling Buitengewone Zaken (social designer)
ZW	Zeewaardig (service designer)
KL1	Kennisland (advisor social innovation)
KL2	Kennisland (industrial design engineering intern)

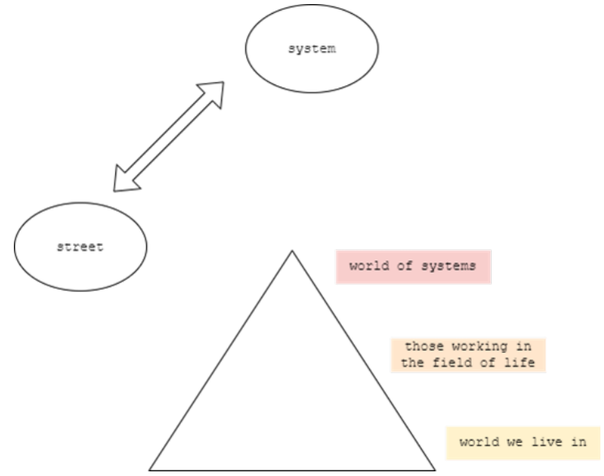


Figure 13. Levels of impact for Afdeling Buitengewone Zaken and Kennisland

Roles and stakeholders to involve in co-creation in complex challenges

Co-creation is useful for complex challenges such as the energy transition that cannot be addressed by the individual, but are comprised of multi-actor processes.

"The problems that designers are being invited to help identify and to solve cannot be addressed by individuals, no matter how smart or creative they are. The situation is far too complex" (Sanders & Stappers, 2013, p. 22).

The roles of designers and what has been generally termed the user, who is the person eventually served through the design process, have also changed based on this collective creativity. The user, who may be an individual who is not trained in design, is treated as an expert of their experience and contributors in knowledge development, idea generation, and concept development (Sanders & Stappers, 2013). The designer is then tasked with creating and exploring appropriate tools and methods for non-designers to express themselves (Sanders & Stappers, 2013, p. 24).

These agencies all work on social complex issues that impact more than just one narrowed down target group, such as issues like the energy transition. The following agencies have some way of distinguishing the different groups of people or often called different levels – these are the levels with which they want to make an impact as well as the levels that they want to bring together with their projects. A/BZ believe in making an impact on what they call the 'system' level and the 'street' level (Figure 13), meaning their work has an effect with people from policy and those who are on the street. They also believe it is important for both sides to meet.

Kennisland has three levels that every project aims to involve (Figure 13): world of systems (policy, law, institutions, government), world we live in (citizens elderly), organizations & professionals (school leaders, those working in the field of life). They also place an emphasis on inclusion, and in their projects, try to be aware of and look for groups of people who are not already involved that should be. These three agencies believe strongly in representing 'people' to their clients.

Because these agencies are working with different classifications of stakeholders, it is important to consciously use different ways to approach different stakeholders (for example an expert versus a non-expert), and to think about when in the different stages of the project to approach them.

"part of the design process of designing the process is kind of looking at how to set up something that does involve all those different stakeholders, but at a suitable time and in a suitable way.. Not everyone is same involvement" (ABZ1)

A/BZ and Kennisland have also expressed the importance of reaching experts and non-experts and creating moments for them to interact. Examples of ways experts are included in projects include organizing discussions with people from city governments, scholars, researchers. Kennisland have research labs where they hold interviews with experts in topics relevant for specific projects, which can range from health, safety, environment, to biodiversity.

There are also ways that these agencies approach non-experts. At Noorderwind, despite being selective for the people they co-create with and those who contribute ideas, this does not apply to those they ask to provide feedback or to validate their ideas. They do this with the user and is open to those with no experience. A common way that agencies reach the public is to physically go out onto the street or areas that people frequent such as grocery stores to create accidental meetings. One example is when A/BZ create something on the street that attracts random people to approach them. They want to avoid being the stereotypical people on the street with clipboards that everyone avoids. Another example is standing in front of supermarkets, asking them a series of questions, and reward them with something small like chocolates.

Not only is it about creating touchpoints for experts and non-experts separately, but also bringing these different groups together. Co-creation is also powerful because it allows different people who may not normally be in the same room, to interact with each other. Moreover, people can exchange information themselves and it's not just passing along information.

> *"Important for both sides (system and street) to meet" (ABZ1)*

> *"not us presenting the stories to them, but they also feel the value and they have faces of people." (KL1)*

For Kennisland, they try and bring people across different levels together, and have found that the experts usually find it uncomfortable to talk to the regular citizen.

> *"what we try to do is put more people in learning community, to put people from all levels together and that's something that's not happening very often, people feel a bit uncomfortable to talk to, be professional and talk to the person who you are actually talking about mostly uncomfortable for the people on the system or profession, for regular citizen is actually quite, very normal to do it, we try to put these people together" (KL1)*

In terms of the role of government, generally across the agencies, they all work with the government to some capacity, usually as their client.

> *"our perfect client would be people themselves, so the population or the people who are having a problem you want them as your client because they are the one with the perfect problem definition and you want to help them. But they are not an institution so you still go to institution who are responsible for them, so we mostly work with governmental organizations, schools, healthcare providers, more organizational or system level" (ABZ1)*

A reason for this is that all these agencies work on social complex issues and no one entity or individual owns these issues. Largely, these issues fall to the responsibility of the government. Moreover, there is funding from governments to work on natural gas discontinuation. As alluded to from A/BZ interviewee, that design has also become more valued by governments.

> *"position of design also evolved, I think more and more governments also see that maybe more strategic values of design or the impact that it can have on the system level" (ABZ1)*

This further supports the argument for the municipality to have a dominant role for the scope of this project.

For A/BZ, often in their projects, they use co-creation as a way to bring people together and make the intangible tangible by creating something together, and in this way find a shared way forward despite various perspectives.

The importance of artifacts is described by Star and Griesemer (Star & Griesemer, 1989): "Note that the artifacts they create help them to connect the ideas of individuals. The artifacts serve as 'boundary objects' that provide an interface between different communities of practice". A/BZ have expressed that creating something together indeed helps make something specific, as participants are referring to the same thing. This will create a shared understanding between participants because they are forced to make visual or articulate their point of view in a tangible way.

> *"as long as it's on paper, I think there are still many things that kind of miss each other, or I want to keep saying this, the other keep saying that, they maybe feel or think that, that they meet somewhere. But in reality, they might still be different. Whereas, you say, Okay, you have this idea now, let's try it out." (ABZ1)*

Artifacts help participants communicate with each other.

> *"really helps to make things specific and to make sure you can talk about the same thing. ...And it also makes it much more easy to involve others in your process"(ABZ1)*

A/BZ believe in the importance of a prototyping mindset. In one particular project, they use a 'co-reflection process' as a way to co-create with users. They were hired by the ministry to help develop a tool for a municipality to use. In this particular situation, they used a prototype to both test a design idea and to understand the needs of the user, who in this case were civil servants working at the municipality.

The environment or setting is also an important factor for co-creation moments. For example, A/BZ prototype different pubic interventions and the setting they are set up in depends on the context of the project. For example for their project about waste in homes, it would make sense to do it in the home. However, their project about the Royal family use of the golden carriage, they decided to go onto the street to engage with the public because then you also feel part of the public. The context not only influences the participants of co-creation but can also serve to inform the designer or facilitator's understanding of the participant.

The physical space of a place greatly affects the ability to co-create. The following quote describes the neighbourhood that Zeewaardig works in, and how not having a natural place for people to come together, such as a square, hinders whether or to the extent that the community self-organizes.

> *"not a place to come together, one neighbourhood house not in neighbourhood we're working in, no square, always end up at the coop, no natural place for people to come together" (NW)*

Why different design agencies use co-creation and what co-creation helps them achieve

For these agencies, they use co-creation to achieve different things. For Kennisland, they believe that co-creation is working together with people you are doing it for, so that their input is taken into consideration when making decisions and the plan. This means that the main point for them, is that in a project, the outcome is not set beforehand and can be influenced by stakeholders.

A/BZ use co-creation to discover different perspectives. They do this by creating moments where people can be brought together and to create something or make something specific. In some projects, people begin by already feel negatively and that the goal is not theirs. In order to engage these people, co-creation is used to help create a shared mission. A shared mission that allows people to play different roles or pursue different goals that all contribute towards the overall shared mission. For A/BZ, co-creation may lead to creating something physical, but the important outcome is gathering the insights and needs around the issue. In addition to discovering different perspectives, co-creation is used as a strategy for participation and a way to make people feel ownership. For instance, in their project about the Royal family use of the golden carriage, they were met with a lot of resistance, however, they prototyped the way that they framed the question to the public. As a result, they ended up with the question "What advice would you give the royal family?". In this case, that was the shared mission that opened it up for people with different perspectives, even negative ones to contribute.

In other projects where A/BZ use the co-reflection process, they are hoping to co-create a tool that the user (municipality) would find useful, that has impact, and is also well implemented in their organization. The interviewee from Zeewaardig considers the main thing about co-creation is really coming up with ideas together with citizens. The energy transition project they were working on, however, was not using co-creation. The technological solution in this particular case, district heating network, was already chosen by the government. Zeewaardig's main task in this project was to inform the community of this opportunity. They created public interventions and physical artifacts that public can interact with in order to learn more about the energy transition and to assess public attitudes. An example of this is a neighbourhood walk with information signs. People could then walk by and vote whether they agree or disagree with the statement.

> *"think we also do co-creation but we don't get citizens into help us design interventions even though we do learn from them and we do question what they need, but not getting them together to design interventions because government already did an offer, kind of weird to ask citizens how can we persuadae you how to take the offer, it's a bit weird" (NW)*

Challenges to co-creation and in working in the energy transition

There are various challenges to co-creation in practice. As mentioned earlier, there is a desire for agencies to bring together a diverse set of people including experts and non-experts. Sometimes it is uncomfortable for experts to talk to the person who you are actually talking about. So there is a need to be clear about the roles of different people in the co-creation intervention as well as stating clearly the purpose of the session.

Because co-creation for agencies mean opening up the process to users or to other stakeholders, the outcome is also open to input and change. This makes it difficult for clients because there is uncertainty. So the client's expectations need to be managed and the value of co-creation need to be communicated effectively.

> *"in practice [it's] difficult, because you do have clients that want something in the end, or they find it difficult that the outcome will be different, and to really listen to people involved that's a really uncomfortable for the client, not familiar with it to just have an open question" (ABZ1)*

The agencies interviewed had an open approach to their projects. This means that the process and method depends on different factors and is tailored for the problem or organization that they are working for or with. This means that there is no singular process, and many use the input from one step to inform next steps. This means that they have built their expertise through learning and past experiences. At the same time, they must be adaptable and open to adjusting their project as they go along, which contributes to the difficulties in managing client expectations. Especially when clients are usually government entities (municipality or a ministry department) that may have varying degrees of experience working in this way.

> *"Hard to work on sustainable projects and sustainable transitions because no one wants to pay for the whole transition...when funding is finished, the transition is not" (NW)*

One challenge with complex social issues is that the issue is usually not completely addressed at the end of the project. In terms of the energy transition, for example, when the project ends, the transition is not finished. Moreover, no one entity is paying for the whole energy transition. While there is funding for particular projects, as learned from the interview with Noorderwind, when the funding for a project is finished, the transition is not. This also affects what can be done with co-creation ideally versus what happens in practice. Ideally there is not one moment for co-creation, but it extends beyond the one moment. In cases where they are testing with a user, for the user to use and test the tool in a real setting.

There is an understanding from across the agencies that the energy transition is very technical and that there is a lack of how to implement the technological solutions and how to bring everyone along. People need to make the change and therefore they need to be involved.

> *"Energy transition is very technical, talk about how to save energy how tech innovation can help us save the world...revolve around solar panels or wind turbines, [there is a] role in how people think of it ...people feel disassociated from it because they are not in tech sector, why care? ...we believe ...that people need to make that change, [to]change their behaviour, people need to be involved" (KL1)*

In their energy transition project, Kennisland was working on was in collaboration with the government client and another organization. Kennisland was, in this case, a secondary partner and was brought into the project a bit later. Despite knowing that they would have preferred to include the public earlier in the process and be a part of the problem definition, they were not able to ideally execute it. This is because they came into the project later and also have to work in collaboration with their project partners.

> *"also problem for us as an organization, we come in when question is already made, client has a problem...then there is a question for us, help us with this, want to be there earlier, we want to be there earlier when defining the problem, maybe problem definition is different when you involve people" (KL!)*

Key takeaways from sections 4.1 & 4.2

- Design process has evolved to reflect application of design for complex challenges that shift from a single user to include context and highly connected multi-actor processes. Co-creation is useful for complex challenges as it brings together multiple stakeholders and taps into creativity, which is the ability to see or make new, appropriate things.
- Design agencies who work on social complex challenges that have systemic impact (beyond a single target user) identify different types of stakeholders:
    - Expert, system level stakeholders, such as, governments who create and implement policy
    - Non-experts, street level stakeholders who fit the more traditional ‘user’ term, the ones who use the public services or for which the public policy is written, and in this case are the public and inhabitants living in the communities that municipalities are trying to transition off of gas
- In these types of projects, design agencies like to keep the process open to adapt to what is needed and to have the outcome open to changes due to stakeholder input. Design agencies use co-creation to ensure that input from people you are designing for has influence on the design. This is a challenge for clients because it creates uncertainty.
- How to co-create
    - Creativity can apply to everyone and a framework is introduced that presents different levels of creativity. Experiences can be created to help facilitate people’s expression of creativity for these different levels.
    - Design agencies try and design different moments of involvement or co-creation for different groups of stakeholders, and some find it important to bring together expert and non-expert stakeholders
    - Co-creation is a way to reach deeper levels as participants share insights and needs, using the body in the environment can be used to express ideas and interaction with materials can help facilitate communication, creativity, and interaction between people.

To conclude this chapter, the key takeaways are translated into guidelines that will shape the design concept.

Design guidelines

The design considers the homeowner as the ‘user’ who is ultimately served through the design.

The design considers ways to help homeowners express their ideas.

The design considers how to bring together experts and non-experts and help facilitate interaction between them.

The design considers a process that can be adaptable and allow it to be changed based on stakeholder input.

Part B

Crafting a frame

Chapter 5
Crafting a frame

In this section, a frame is crafted. Framing is used in this project to examine the problem differently and to explore potential solutions.

First, the stakeholders identified in the previous chapter are used as the basis to derive underlying factors. These underlying factors include their needs, motivation, experiences, and values. These were informed by desktop research and interviews. Then, these underlying factors across all the stakeholders were clustered into themes. For these themes, metaphors were explored, and these became different frames. One frame was selected to help move towards designing an intervention (Figure 14). In this chapter, you will be taken through examples (see Appendix E).

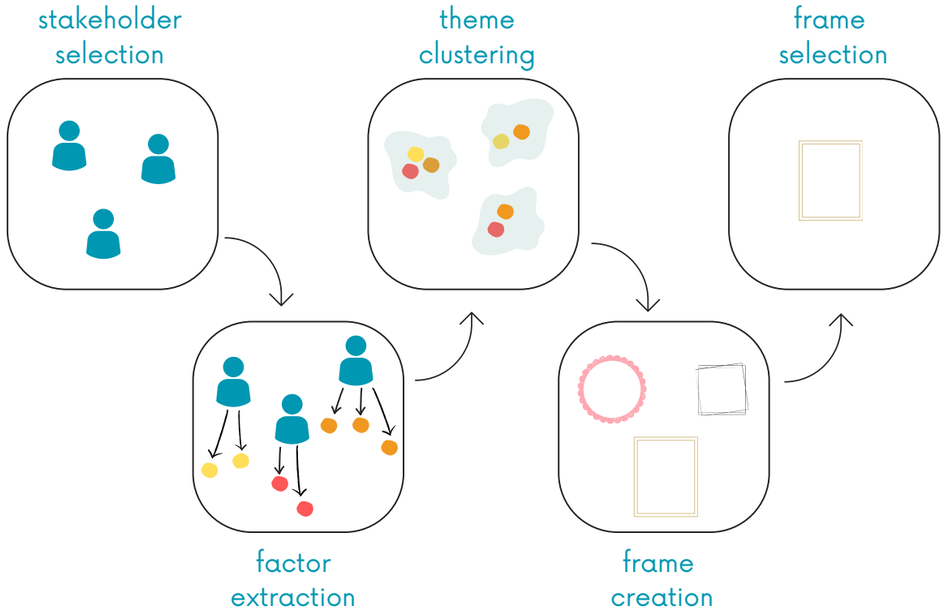
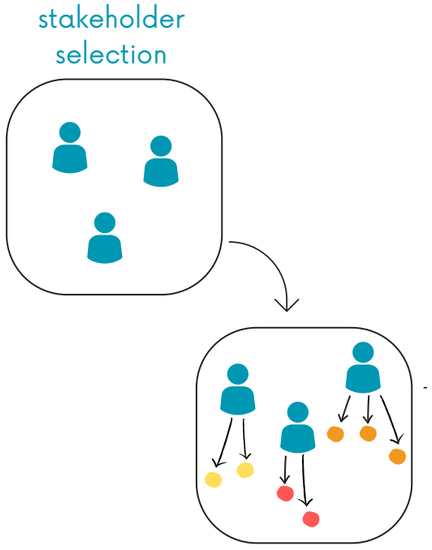


Figure 14. Steps taken to craft a frame

5.1 Description of the process



The stakeholders identified from the previous chapters are used as the basis to derive underlying factors. These underlying factors include their needs, motivation, experiences, and values. These were informed by desktop research and interviews. Figure 15 shows a visual depiction of the brainstorm (see Appendix E for more details).

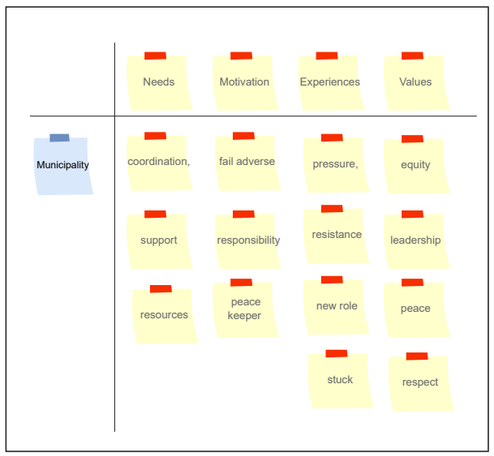
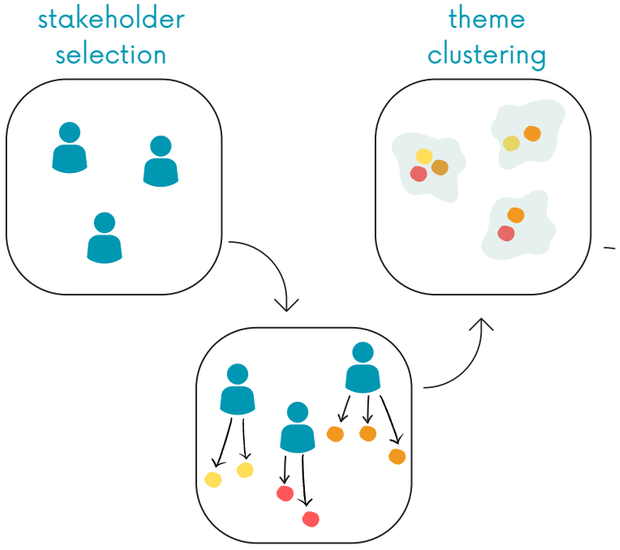


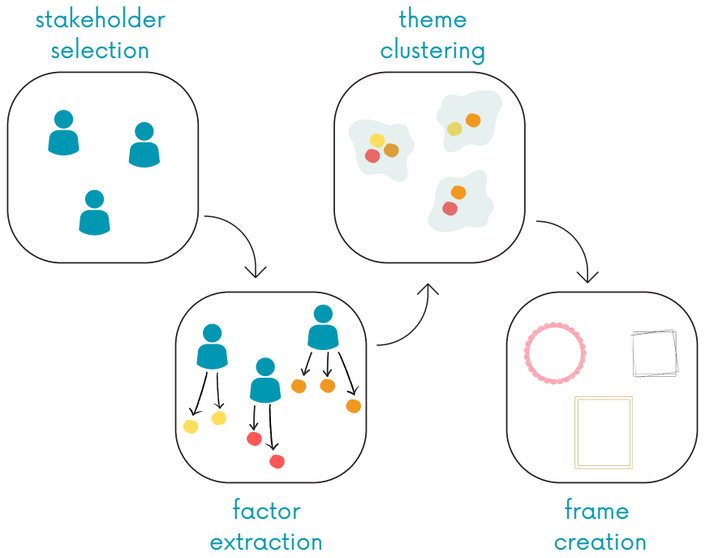
Figure 15. Depiction of brainstorming underlying factors of stakeholders



The underlying factors from all the stakeholders were then clustered. The clusters form a theme, which was then labeled(see Appendix E). One example of a theme is ‘power & control’ from underlying factors: authority, decision-making, ownership, sense of responsibility, accountability, autonomy, freedom.

From interviews with design agencies, co-creation is often used to create a sense of ownership with stakeholders (ABZ1). It is wondering about how to be inclusive to those who are not normally part of the conversation (KL1). It is also about considering how to redistribute power to those who might not normally have power to influence decisions and wanting to give a voice to those people (ABZ1, ABZ2, KL1). In the energy transition, this is important because there is a play between collective and individual goals; goals at the country level and goals for households. This also touches on choice, fortifying a sense of self, feeling heard, the desire to be self-sufficient and have autonomy and freedom. The interplay between what is the municipality responsible for and what is the inhabitant responsible for; and how can inhabitants feel that they are empowered and supported in a way that is not intrusive to their personal lives?

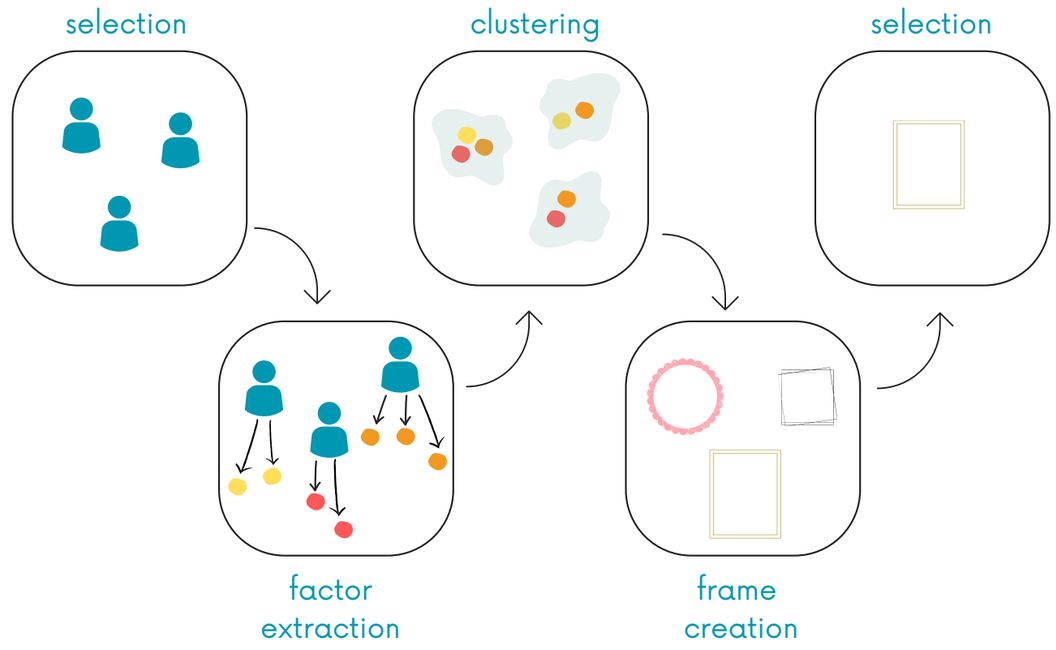
Multiple metaphors were inspired from each theme. These metaphors were mostly derived from situations, or aspects of situations outside of the energy transition where the theme was somehow exemplified. This step was informed by prior steps and these ideas came to the fore as I did preparatory work such as interviewing and clustering. Examples of metaphors derived from power & control theme are presented to help the reader understand that was done in this step.



- parenting, motivating children to listen to you, moving out of your parents house for the first time
- nursing home versus senior home (having to move into)
- ballroom
  - in the LGBTQ+ community, they have taken something where they are normally on the margins of and have created a space and community of acceptance
- Taylor swift owning her own masters
  - Typically in the music industry the record label owns the masters, and they sold it, in a move that Taylor Swift didn't like, so she re-recorded her music so that she can own her own tracks.

- self publishing, democratization of self representation through social media
  - With the advent of social media and the internet, there is a democratization of many traditionally regulated fields by institutions. For example the publishing industry for books and newspapers, people can self-publish their books and their opinions on places like medium on the internet, albeit with a different audience
- abortion
  - the U.S. government recently took away a woman's agency over her body by taking away the choice of abortion as a medical intervention or choice for her

- biking, mobility, having a car
  - people feel like they have the freedom of movement and independence to go where they want and when they want
- climbing vs roller coasters
  - when you taking the risk by your own hands or not
  - when you are bouldering you are in control of when you want to take the risk or jump off, this is in opposition to
  - when you are on a rollercoaster you are surrendering your agency or ability to get out as soon as you are strapped in, and where you go and what happens to you while you are on the ride is out of your hands



After exploring different metaphors, one was selected to further develop into a frame. The next section will be dedicated to exploring this frame.

5.2 Selected frame: parenting

From different frames, the parenting frame was selected to move forward with because it is inspiring for me, also a parent child relationship, which can exist differently (adopted children, parents are not very active, divorced, etc), is something that can be universally understood and comprehensible for most.

This frame was explored in three ways: a group brainstorming session, four parenting styles from literature, and an interview with a parent. The frame was explored with others to enrich the metaphor, and especially to gain insight from the parent perspective.

Group brainstorming

This section summarizes output from a group brainstorming session using the frame. Participants explored how parents get their children to do their homework – both the problem situation and solutions. Then the frame was applied to the project context, discontinuing natural gas use in homes, and design ideas were brainstormed (see Appendix F for more details from the group brainstorming session). Inspiring output from brainstorming ideas to motivate children to do their homework are the following:

- Making it fun, or into a little game
- Let them do the homework with a friend - make it a social activity to bond over
- Finding interests that the child already has, what ‘goals’ they might not be achieving and linking it to or reframing doing homework as a way to help them pursue those other interests
- Let the child talk to people who are a bit closer to his age about the benefits of doing homework, make the child do homework with another kid a year above them so they can see what skills they might be missing
- Have someone as a role model
- Sit with the kid, make a week planning together, let them “budget” their time

Four parenting styles

To further enrich on this parent and child metaphor, Sanvictores & Mendez describe four parenting styles: uninvolved parenting, permissive parenting, authoritative parenting, and strict parenting (2022). Strict parenting is called authoritarian parenting in the source, but for this project, strict is used for clarity because the word authoritarian is very similar to the other parenting style: authoritative. In Figure 16, each parenting style has a corresponding description of how a municipality might look like as this type of parent, and specific examples of an energy transition scenario. These examples were identified through desktop research and interviews with design agencies (ZW) and municipalities (MW1, MH).

One particular example in current events described in an article by NOS demonstrates a municipality adopting different parenting styles (NOS, 2022). In this case, Utrecht municipality is speeding up the energy transition after years of trying to make houses gas-free by forcibly removing residents in the Overvecht district from natural gas due to the building pressure to adapt rentals by the year 2050. This situation reflects a municipality moving across different parenting styles for a specific district. This demonstrates that a municipality may not exclusively act in accordance with one parenting style, but this may change over time based on their priorities or a different approach might be adopted based on the specific district that they are targeting.

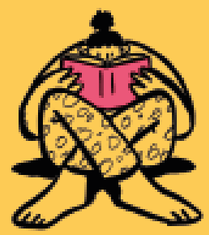
	Example of parenting style and what it means for parent and child		What could this look like for municipality as parent	Example energy transition scenario
Uninvolved parenting	Parent: ▪ stays out of the way ▪ fulfil basic needs of child ▪ limited communication ▪ low nurturing and few/no expectations	Child: ▪ resilient, self-sufficient ▪ trouble controlling emotions, less effective coping strategies, difficulty maintaining/nurturing social relationships		Municipality is hands-off and residents are self-sufficient Forerunners, homeowners are enthusiastic and knowledgeable, think that municipality is going too slow	Residents research their own options online or with people they know Example scenario: forerunners of the community who have knowledge and enthusiasm who think that the municipality is going too slow
Permissive parenting	Parent: ▪ more like friends than parents ▪ impose limited rules ▪ children figure out things for themselves ▪ low expectations	Child: ▪ freedom can lead to negative habits as parent does not provide much guidance on moderation ▪ some self-esteem, decent social skills ▪ can be impulsive, demanding, selfish, lack self-regulation		Municipality imposes limited rules and residents figure things out for theselves.	Municipality imposes limited rules, residents mostly figure it out for themselves Example scenario: energy bills are high and resident buys lots of fire wood for heating their home
Authoritative parenting	Parent: ▪ clear guidelines for expectations and explain reasons associated with disciplinary actions ▪ support ▪ frequent and appropriate levels of communication between parent and child, child can have input into goals and expectations	Child: ▪ confident, responsible ▪ able to self-regulate		Municipality has clear expectations and explain reasons associated with their expectations. Frequent communication between them and residents. Residents have input into goals and expectations.	Municipality provides open communication with the needs of their residents and provide different touchpoints for residents to interact with each other to help make decisions about their homes. Example scenario: municipality approaches residents with in a manner that is collaborative and open for input and influence from residents, they create different touchpoints for different types of residents.
Strict Parenting	Parent: ▪ one way communication ▪ establish strict rules, not usually explained ▪ no negotiations from child ▪ mistake usually leads to punishment ▪ high expectations, less nurturing, limited flexibility	Child: ▪ higher levels of aggression, difficulty managing anger ▪ shy, socially inept, unable to make own decisions ▪ poor self-esteem ▪ influence child to rebel against authority figures as they grow older		Municipality establishes rules and communicates one way about the energy transition.	Example scenario: Municipality decides on a solution such as district heating network, they do this in collaboration with industry such as energy company or engineering consultancy. The residents are presented with this choice and can decide to vote for it or not.

Figure 16. Energy transition and the parenting frame

Interview with parent

This frame was elaborated with insights from an interview with an individual who is Dutch and a mother of three children, who are now between the ages of 26-30 years of age. She was asked to think about times when she would have to motivate her children to do things. Getting her child to do homework was used as an example, but she was encouraged to think about other instances.
One important insight from the interview is that motivation depends on age. As her children grew older, her relationship with them and how she motivated them evolved. When her children were around 5-7 years old, she would haves rules with easy explanation. She personally believes that one can talk to a child, even if they are young, but the language used should be appropriate to their age. There are different steps between when a child hears what you are saying and when they do what you want – therefore it often is not so simple as going from verbal instruction to a change in behaviour. There are different ways to communicate besides instructing with words, such as, showing or using your body. One example is using actions in a situation when safety is an issue. She describes cycling with her child when he was younger, and using her hand to push down on his shoulder at a red light to emphasize the importance of stopping here for safety. In this situation, she communicates to the child that it is not a time to discuss, but to act first. Parents are also part of the system and this influences the situation and how the parent might approach the child, for example, being tired, not being present, if she has more or less patience.

When the children become older, the approach changes. She will let them think about why they do something – what's the problem, what solution is possible, what kind of support do you need? She begins to impart on them responsibility for their own situations, but supporting them so that they do not feel alone. She lets them think about what will help them so that it makes them responsible for the solution that they make together. She believes that for her children, failing is not a problem, but the important thing is for them to try.

Reflection on the parenting frame

The parenting metaphor was reflected on with others — a parent and in the group brainstorming session with other students. From these reflections, there were certain elements of the parenting frame that were very useful and other elements that I wanted to avoid taking forward with me in designing the intervention.

Useful elements:

Caring nature of parents and an eye on the future
In the metaphor and in the energy transition, the parent and the municipalities are trying to edge their child or constituents towards a particular outcome and this is usually with an eye on a longer term goal for example, instilling good habits in their children and a fossil fuel future. Parents really care for their children and want the best for them, similarly, municipalities feel a sense of responsibility for their constituents and the interviewees who work in the energy transition also really value this duty and a sustainable future. They are, at the same time, tied to this responsibility of reaching these goals set in national policy.

It takes a village to raise a child
Parents often do not raise their children all by themselves, but they enlist the help and support of family members, day care, baby sitters, teachers, tutors, etc. Similarly, making homes gas-free ready is a large task and can be benefitted with a mentality that different stakeholders need each other and can work together to make the load less for everyone.

Elements to avoid:

Homeowner as a child
The parent who was interivewed is also a homeowner and felt antagonistic about being treated as a child in the metaphor. As a parent of three adult children herself, she wonders why the government is trying to 'raise her' as she is a grown adult. Indeed I wanted to keep the caring and supportive nature of the parent role, but avoid reinforcing this perceived unilateral control and power of the municipality and a situation where homeowners feel infantilized and coddled.

Key takeaways from section 5.1 & 5.2

A parenting frame was crafted from examining the needs and values of the key stakeholders. It was then used to explore the relationship between municipalities and inhabitants in the energy transition. The frame was reflected on with others in a group brainstorming session and in an interview.

Reflections on the frame:

- Parents, like municipalities, are trying to edge their child or constituents towards a particular outcome and this is usually with an eye on a longer term goal
- Parents often do not raise their children all by themselves, but they enlist the help and support of family members, day care, baby sitters, teachers, tutors, etc. Similarly, making homes gas-free ready is a large task and can be benefitted with a mentality that different stakeholders need each other and can work together to make the load less for everyone.
- Homeowners feel antagonistic about being treated as a child and do not like to feel infantilized

Insights from brainstorming session & interview:

- To motivate children to do their homework, one could try to make it a fun and social activity
- Motivation strategies depend on the age of the child. A child approximately 5-7 years old, parent uses simple rules with easy explanation, with older children, the strategy for the parent is about supporting them in working through their problems
- Parents are also part of the system and this influences the situation and how the parent might approach the child, for example, being tired, not being present, if they have more or less patience.

To conclude this chapter, the key takeaways are translated into guidelines that will shape the design concept.

Design guidelines

The design should consider how municipalities could adapt their relationship with homeowners with different levels of readiness. For example those who have already transitioned their homes are treated as mentors, those who have technical expertise can be treated as teachers, those who have limited knowledge might need more attention.

The design concept can take inspiration from the ideas to make the process more fun, interactive. These ideas from the group brainstorming session were “make it fun”, “do homework with a friend”, “make it a social activity to bond over”, “have someone as a role model” and “make a week planning together, let them ‘budget’ their time”.

Part C

Designing an intervention

Chapter 6
Design concept

In this chapter, a vision is presented that describes the future desired state, as well as, a design direction based on the previous chapters. Then the design concept will be presented.

6.1 Towards new solutions

In this section, a desired future state will be presented as a vision. A design direction and design guidelines from the previous chapters are assembled. This recaps the overarching goal before presenting the design concept.

Vision
Municipalities, industry, and homeowners respect and are open to each other's experiences and perspectives, let go of reservations and skepticism of others, and bolster each other's strengths in order to act together towards a singular goal of gas-free homes.

Design direction
To develop a way for municipalities to empower homeowners and make the process of transitioning their homes easier by helping them co-create it with others in the community and express themselves.

Design guidelines
Design guidelines were presented at the end of the previous chapters.

Before presenting the design concept, all the design guidelines are gathered here so as to keep them in mind.

In the next sections text boxes to the side titled 'Connecting design concept to design guidelines' are used to relate the particular aspect of the design to a guideline or multiple guidelines.

From Chapter 3

1. The design addresses the following challenges for homeowners:
- The hassle of the process
- Lack of trust in municipality
- Understanding technical jargon
- Cost concerns

2. The design should take into account that homeowners have different levels of readiness with respect to transitioning their homes. Different factors that influence this readiness include (TNO, 2020)(MW1, MH, parent):
- Technical knowledge
- Financial situation
- Time they are able and/or willing to commit to this journey
- Motivation

3. The design should provide clarity to homeowners over what they need to do in order to transition their homes and to take action in transitioning their homes off natural gas.

4. The design considers important stakeholders: municipalities, homeowners, and community experts.
- Community experts are people in the community who have already transitioned their homes and/or 'forerunners' who are community experts. Working and supporting them works well because it creates an approach that is more equal footing between municipalities and the community.

From Chapter 4

5. The design considers the homeowner as the 'user' who is ultimately served through the design.

6. The design considers ways to help homeowners express their ideas.

7. The design considers how to bring together experts and non-experts and help facilitate interaction between them.

8. The design considers a process that can be adaptable and allow it to be changed based on stakeholder input.

From Chapter 5

9. The design should consider how municipalities could adapt their relationship with homeowners with different levels of readiness. For example those who have already transitioned their homes are treated as mentors, those who have technical expertise can be treated as teachers, those who have limited knowledge might need more attention.

10. The design concept can take inspiration from the ideas to make the process more fun, interactive. These ideas from the group brainstorming session were "make it fun", "do homework with a friend", "make it a social activity to bond over", "have someone as a role model" and "make a week planning together, let them 'budget' their time".

6.2 Design concept

Plan-It Together

Plan-It Together is a mentorship program run by municipalities for homeowners. This program helps homeowners adapt their homes into well insulated homes that are heated using more sustainable options. There are steps in the program, and complementary to this program is a toolkit.

Co-ordinator & facilitator of program
Municipality

The program connects homeowners who have not made their homes gas-free ready yet, but would like to (mentees), with those in the community who already have (mentor). Mentees and mentors will be grouped together to create a mentorship group. Together they will move through the program.

Mentee
Homeowner who is going to make their home gas-free

Mentor
Homeowner who has already made their home gas-free

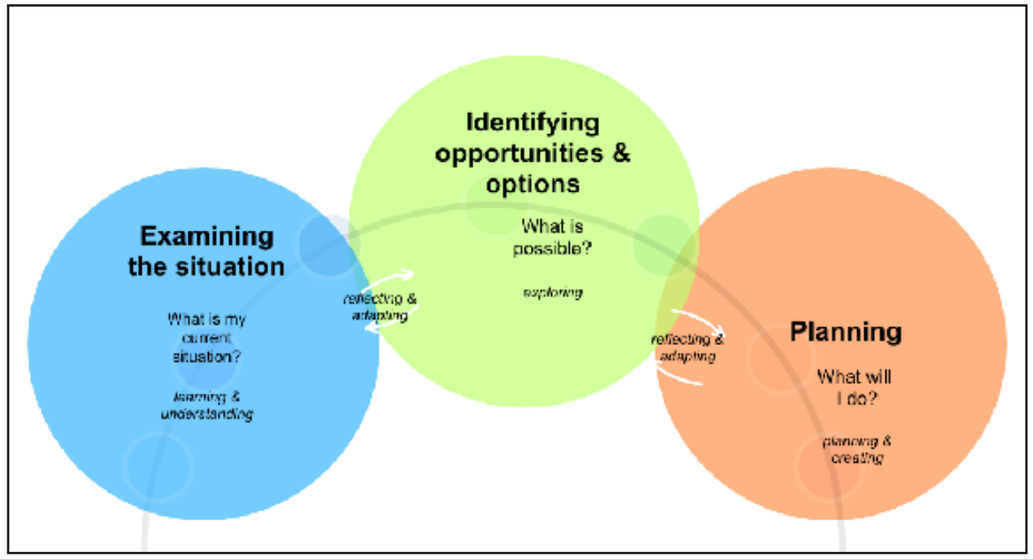


Figure 17. Plan-It Together mentorship program overview

The explanation behind the program

This program for homeowners is comprised of 3 main stages: Examining the Situation, Identifying Opportunities & Options, and Planning. This process is to help homeowners adapt their homes into well insulated homes that are heated using more sustainable heating.

Before making changes to their homes to make them gas-free, it is important to understand what you are working with. Therefore the first phase is for homeowners to orientate themselves to their situation. This means understanding your home infrastructure, such as the type of insulation and heating technologies your home already has. Additionally, costs are a main concern for many, so at this stage, it is also important to understand your financial situation.

After understanding your financial situation and home infrastructure, it is time to learn about the options alternative to gas and what is possible on the market. This means learning about the different ways to retrofit your home and what alternatives there are to natural gas heating, such as insulating technologies, heat pumps, and district heating network. This includes looking at what is available on the market, what is feasible in terms of financially and technically.

The last phase is about planning into the future and evaluating your current financial and home infrastructure with available and options into a plan based on your finances and preferences

Because these different phases can influence each other, for instance if you decide you want PV panels but they are not available on the market due to material shortage, then you will have to revise your plan and perhaps other options.

Workshops that make up the program

In keeping with the program, there are a series of monthly workshops addressing topics that are important to consider when making a home gas-free. In the figure below, you can see how the workshops correspond to the 3 stages of the overall process. Municipalities are encouraged to work with different experts to address different topics from steps 2-6, as needed.

Expert

Expert who has specific expertise to lend to workshop sessions in the program (by facilitating the session with the municipality, or give a presentation). Experts could be from the community (those who live in the neighborhood) or industry (may include, but is not limited to engineering consultancies, energy companies, etc.)

The mentors and mentees move together through the process. They will be grouped together based on the type of dwelling they live in and similar motivation and knowledge level. This is because they will be in similar situations and the retrofitting for their homes will be similar and they can share and discuss similar concerns.

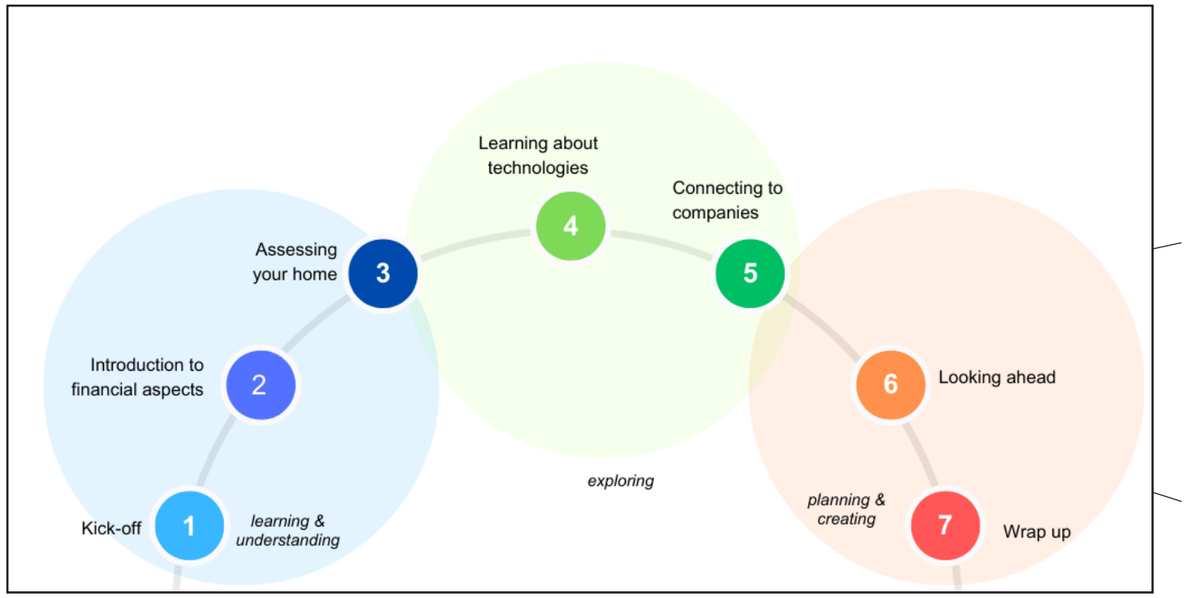


Figure 18. Plan-It Together mentorship program workshops

Connecting design concept to design guidelines

In these textboxes are elaborations of specific aspects of the design concept that was informed by previous steps in the project. It explicitly describes connections between the design concept and the design guidelines. It grounds the design aspect in the key takeaways from research and crafting the frame.

The inhabitants who are further along in their journey, particularly those who have already transitioned their homes and/or have technical expertise will need to get special roles in the program to help lead these mentorship groups through the program. There is space for those with knowledge expertise to contribute to the different workshops who may not want to commit to the whole program.

Addresses design guidelines 2 & 4

The program is designed for homeowners and has a clear process from beginning to end. The workshops break down the gas-free journey into smaller steps and address specific topics, such asa technology and finances, one at a time.

Addresses design guidelines 1, 3, 5

The workshops put together different people who may not normally be in the same room, to interact with each other. People can exchange information themselves and it's not just passing along information, for example one-way communcation from expert to homeowner.

Addresses design guideline 7

The design concept groups people first based on readiness and then on dwelling. This will help mentees share experiences and because they are in similar scenarios, they are more likely to share common challenges and technical feasibilities that they can discuss together.

Moreover, it will be easier for municipalities to get some insight on the levels of knowledge of the community and adjust the content of their own workshops accordingly. For example, if many mentor groups have already a basic understanding of the different technologies then maybe it makes sense for the municipality to only quicky touch upon the basic technologies in the process and/ or dedicate more time on other topics so as to keep participants interested and adjust to their participant needs and wants.

Comparable to one of the ideas from the brainstorming the design creates social support around the mentee by creating the environment for them to connect with other homeowners in similar situations and matching them with a mentor, someone with more experience who can share their learnings.

Addresses design guidelines 8, 9, 10

Toolkit

The toolkit is complementary to the different workshops. These tools are inspired by co-creative practices from the field of design. These aim to help program participants express their creativity and facilitate collaboration. It is likely that the municipality is already addressing the workshop topics with existing initiatives, so think of this toolkit as a way to complement those.

The tools are:

- Step 1 Kick- Off:
  - **Mentor journey mapping**
- Step 2 Introduction to financial aspects:
  - **Reflection on home heating and budgeting**
- Step 3 Assessing your home:
  - **Home Energy Assessment Self-Guide**
- Step 4 Learning about technologies:
  - **Tiny Tech Cards**
- Step 5 Connecting to companies:
  - **Question brainstorming template**
- Step 6 Looking ahead:
  - F**uture planning template**

In the next section, there is a deep dive into Tiny Tech Cards, but for the full toolkit please see Appendix G.

Connecting design concept to design guidelines

Using materials can be helpful for self-expression. Creativity can apply to everyone and experiences can be created to help facilitate people's expression of creativity. Co-creation is a way to reach deeper levels as participants share insights and needs. Using the body in the environment can help participants express. Interaction with materials can help facilitate communication, creativity, and interaction between people. Therefore there is a toolkit with various canvases, templates, and materials to help visualize and communicate ideas.

Addresses design guidelines 6 & 7

A closer look at a tool: Tiny Tech Cards

To illustrate the toolkit, this section will take a closer look at the tool Tiny Tech Cards that supports Step 4 Learning about technologies.

Description of tool

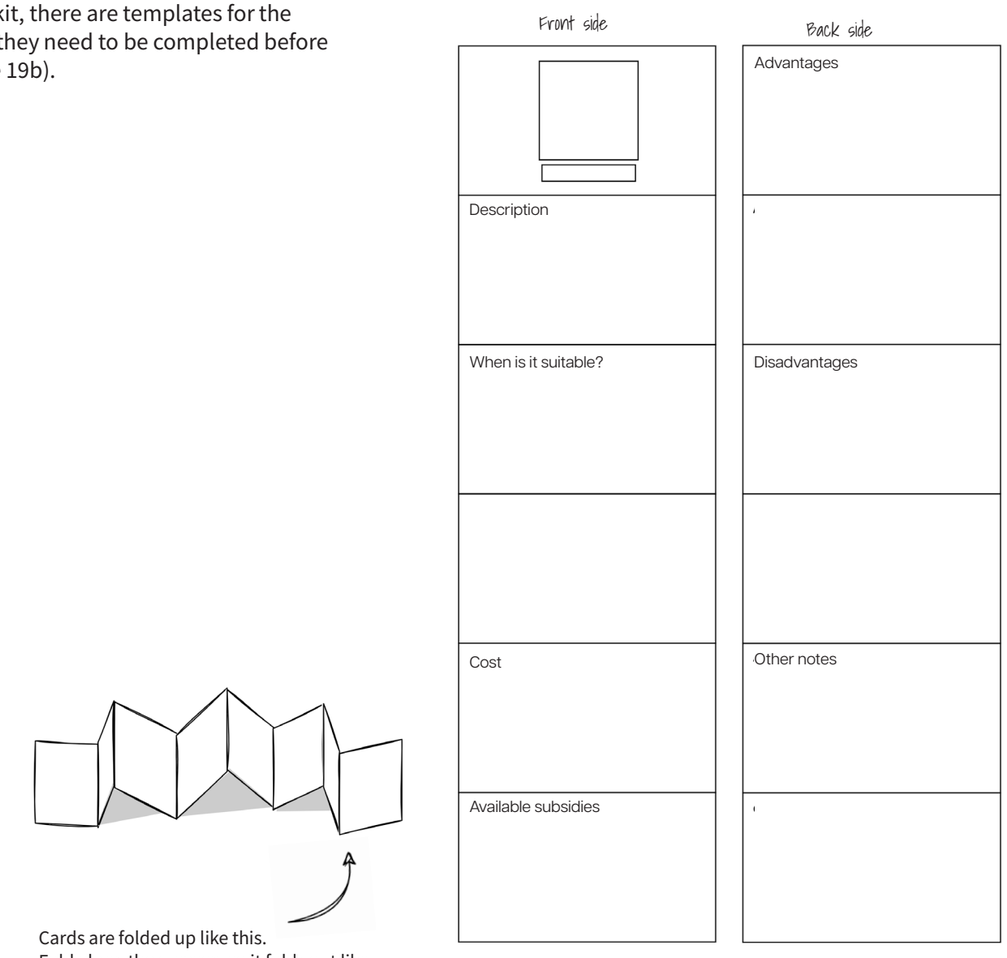
Tiny Tech Cards is a tool that can help homeowners learn about the different types of heating technologies (Figure 19a).

The cards provide a simple overview of the different alternative heating options. The information includes: a brief description, an image, advantages, disadvantages, when is it suitable, cost range, and available subsidies.

In the toolkit, there are templates for the cards, but they need to be completed before use (Figure 19b).

Figure 19a. Tiny Tech Cards

Figure 19b. Templates for Tiny Tech Cards



Cards are folded up like this.
Fold along the creases, so it folds out like a hand held fan and the front is the image and name of the technology

There are two different workshops described here. One for co-creating the Tiny Tech Cards and the other for using the Tiny Tech Cards.

Workshop 1: Co-create Tiny Tech Cards with community experts

This is a municipality-facilitated workshop with a bigger group of experts who have knowledge about these different technologies. The aim is to gather information to create the Tiny Tech Cards.

Workshop 2: Use Tiny Tech Cards with mentorship groups

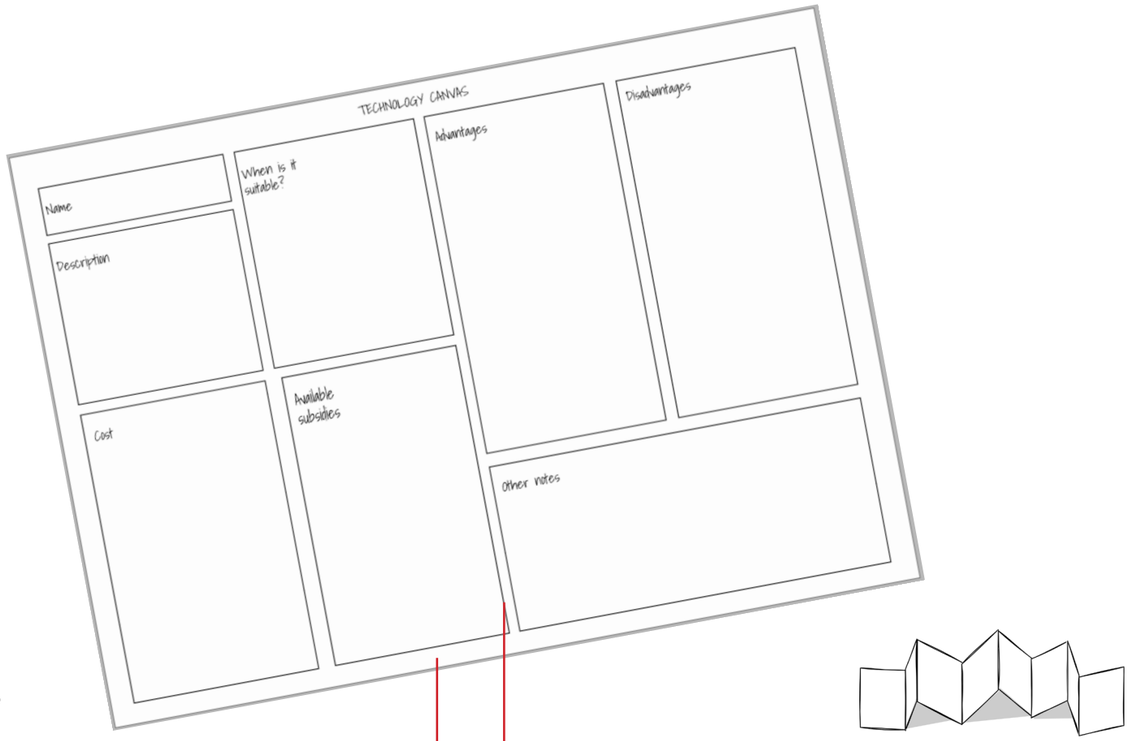
This is a municipality-facilitated workshop where the mentorship groups use the Tiny Tech Cards. The aim is for the mentees to be acquainted with the basic alternative heating solutions and other relevant technical aspects such as insulation and to think about what options are feasible and preferred for their own homes.

Workshop 1: Co-create Tiny Tech Cards with community experts

This section describes a workshop to help co-create Tiny Tech Card tool. It is intended to be facilitated by the municipality and co-created with community experts.

Because the aim for this workshop is to gather information from the participants, the Technology Canvas is a way to capture all the insights and information from many small group discussions. After the workshop, the information needs to be distilled into the Tiny Tech Card format so that it can be easily used for the mentorship groups in Workshop 2.

Figure 20. Technology canvas



Why?

A bottom up way to collect information and gather knowledge from the community in order to build trust and transparency with community members, and also to acknowledge that they are being heard, that they are a valuable resource and experts.

Community members will help tailor the technology solutions to the community context, e.g. if people who have already made their homes sustainable via a particular heat pump + insulation combination. The small groups will help distribute the discussion space more equally so that loud opinions do not overpower others.

1. In preparation for the workshop

- Invite participants: experts from community and municipality with technical expertise and knowledge about financial subsidies
- Logistics: printing card templates, facilitators, room with multiple tables for small discussion
- Municipality compiles a list of main technologies and topics that are important (such as insulation).
- Can already send an email attached with document with the main technologies that will be discussed at the workshop session, and ask if there are any other specific technologies that the participants find important to discuss, and make sure those are added to the discussion list
- Recommended that the municipality already prints and fills in the basic descriptions of the technologies

2. Workshop

2a. At each table there are:

- small groups suitable for discussion (2-5 community experts)
- facilitator (municipality civil servant) who will take notes and keep track of time
- Technology canvas. It is recommended to have it partially filled out with information such as description. The important points of discussion are the advantages, disadvantages, and when it is useful. Please put the canvas somewhere where everyone can see such as on the table or on a wall.

Allot 20 minutes to discuss the one technology category. The note taker can fill out the card during the discussion.

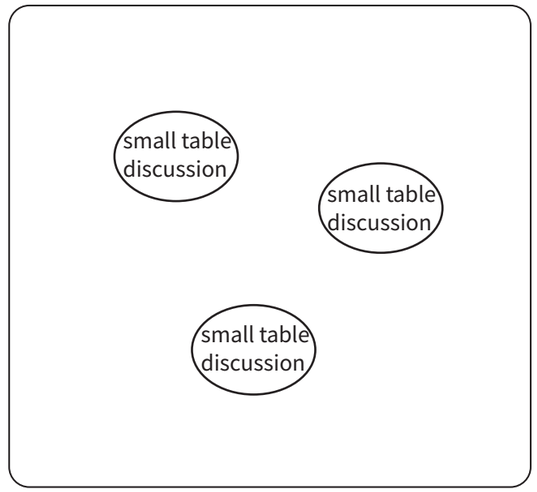


Figure 21a. workshop step 2a small group discussions

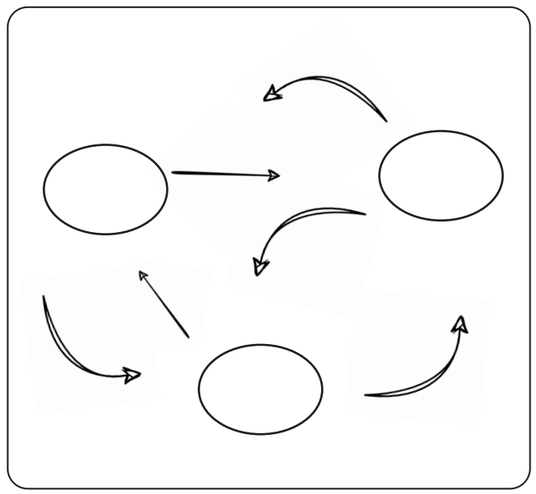


Figure 21b. workshop step 2b group members switch tables to create new groups

2b. After 20 minutes, participants will move to a different table to create different groups to discuss the next topic. Facilitator can stay at the table.

Continue until all the technologies topics are covered. Have extra empty canvases in case there are other technologies that participants want to discuss/think are important. And make sure to have extra space for extra topics.

3. At the end of the workshop

Municipality will have to transfer the information from the canvases onto the Tiny Tech Cards. The results of the session can be shared by taking photos and uploading on the municipality website or emailed to participants.

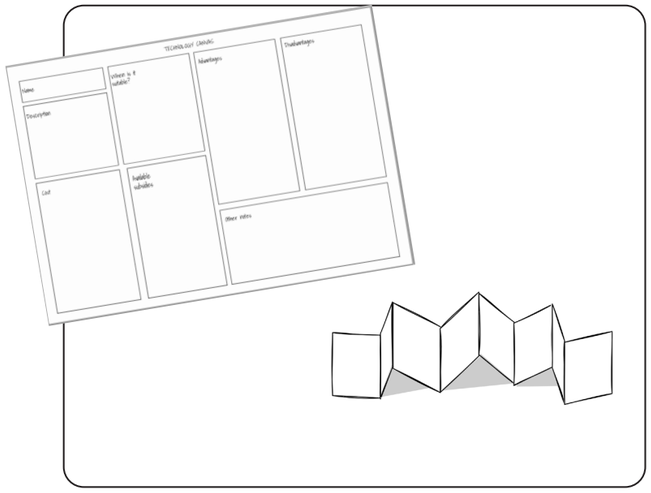


Figure 21c. Workshop step 3: Information from Technology Canvas is transferred onto Tiny Tech Card templates.

After co-creating the Tiny Tech Cards, this next section will describe how they can be used by mentorship groups to discuss the different ways they can change their home.

Workshop 2: Use Tiny Tech Cards with mentorship groups

This section describes a workshop use the Tiny Tech Card tool. It is intended to be facilitated by the municipality for mentorship groups.

The goal is to:

- Facilitate conversation about technologies
- Guide the homeowners as they contemplate the different options with respect to their specific home

This is the My Home Canvas. The mentees will fill in their current home information.

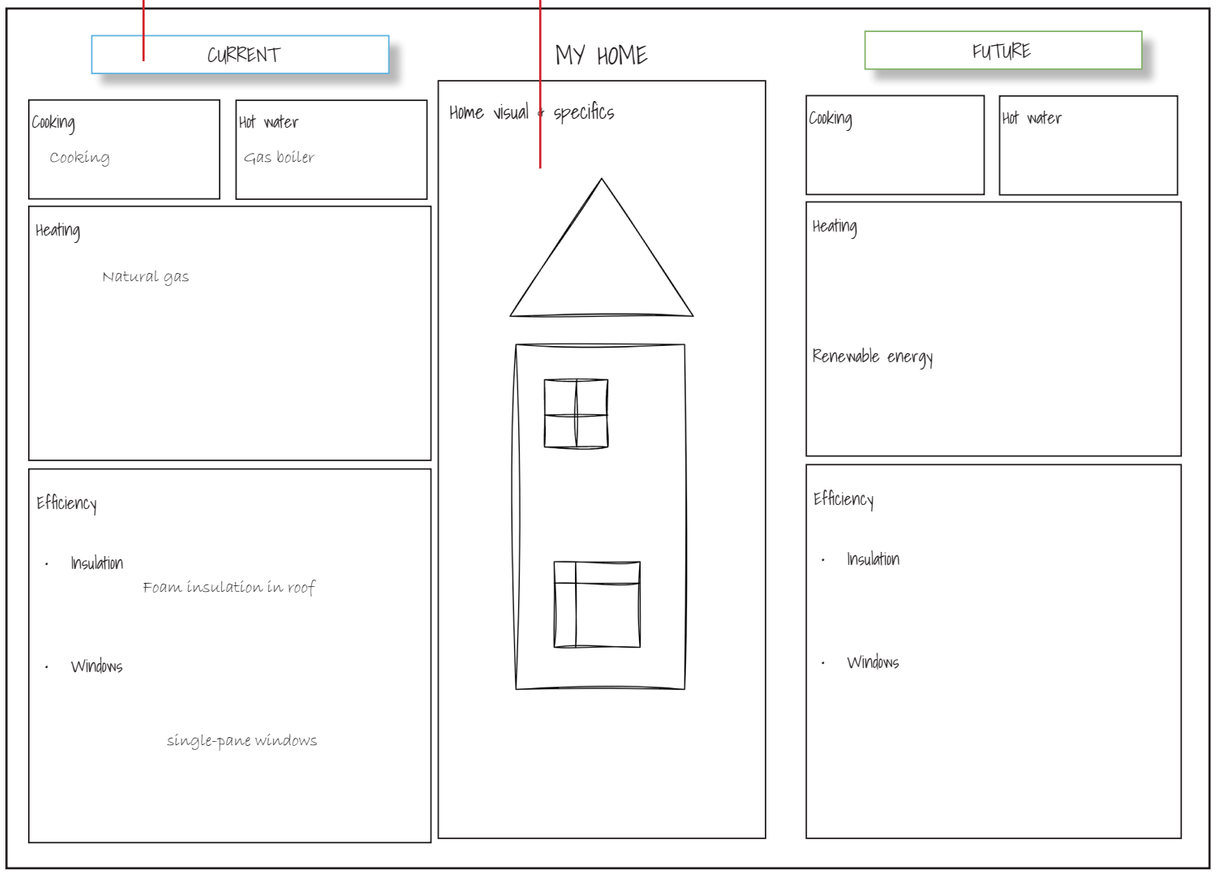


Figure 22a. Example of partially filled My Home canvasa

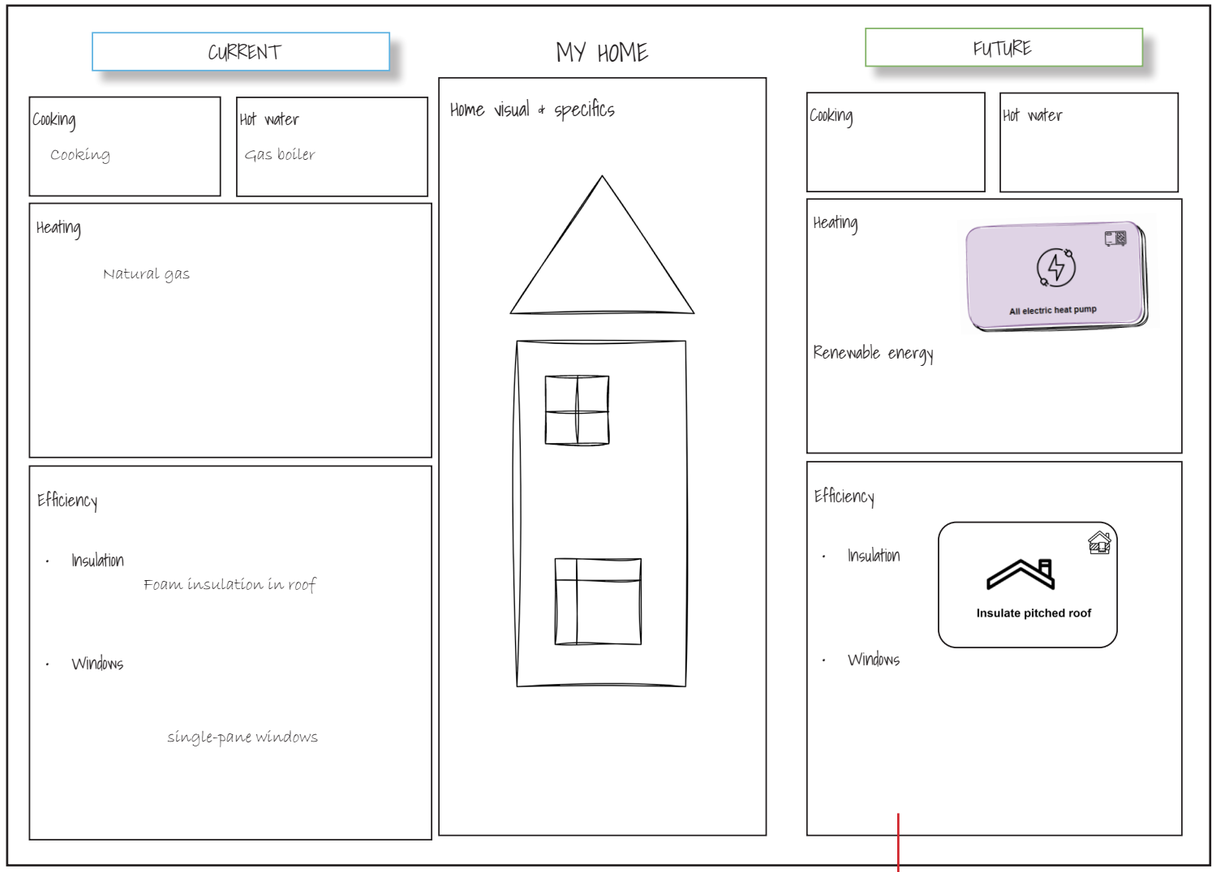
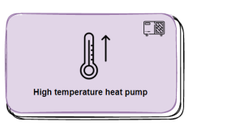
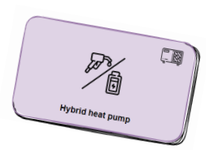


Figure 22b. Example of filled My Home canvas with Tiny Tech Cards placed on the 'future' spaces of the canvas.

Tiny Tech Cards are given to the mentorship groups to both provide mentees with technology information and to be placed on the 'Future' part of their canvas to visualize changes to their home.





By incorporating the mentee's specific home information, it makes it specific to their situation.

The canvas and Tiny Tech Cards make the information visual.

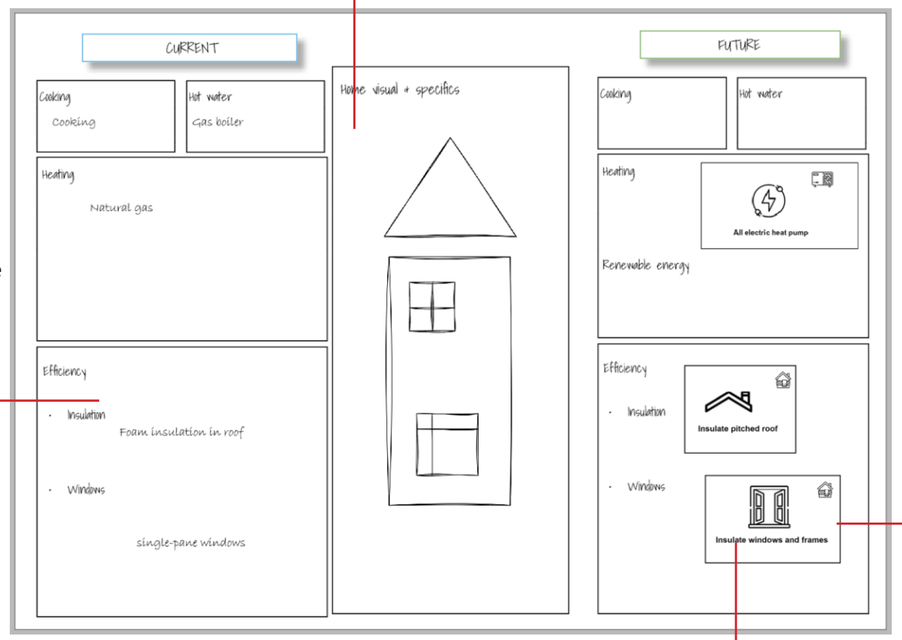


Figure 22c. Value of the workshop

Tiny Tech Cards help facilitate the discussion and serve as a low-fidelity paper prototype for the homeowner's home.

Technical information presented in a bite-sized and accessible way.

6.3 Implementation Roadmap

For a municipality to successfully implement the Plan-It Together the mentorship program, it is helpful to develop a roadmap to show the implementation plan over multiple years (Figure 23).

Roadmap Feedback Legend

Abbreviation	Participant
NEA	Netherlands Enterprise Agency (energy innovation advisor)
MO2	Municipality of Oss (policy advisor)

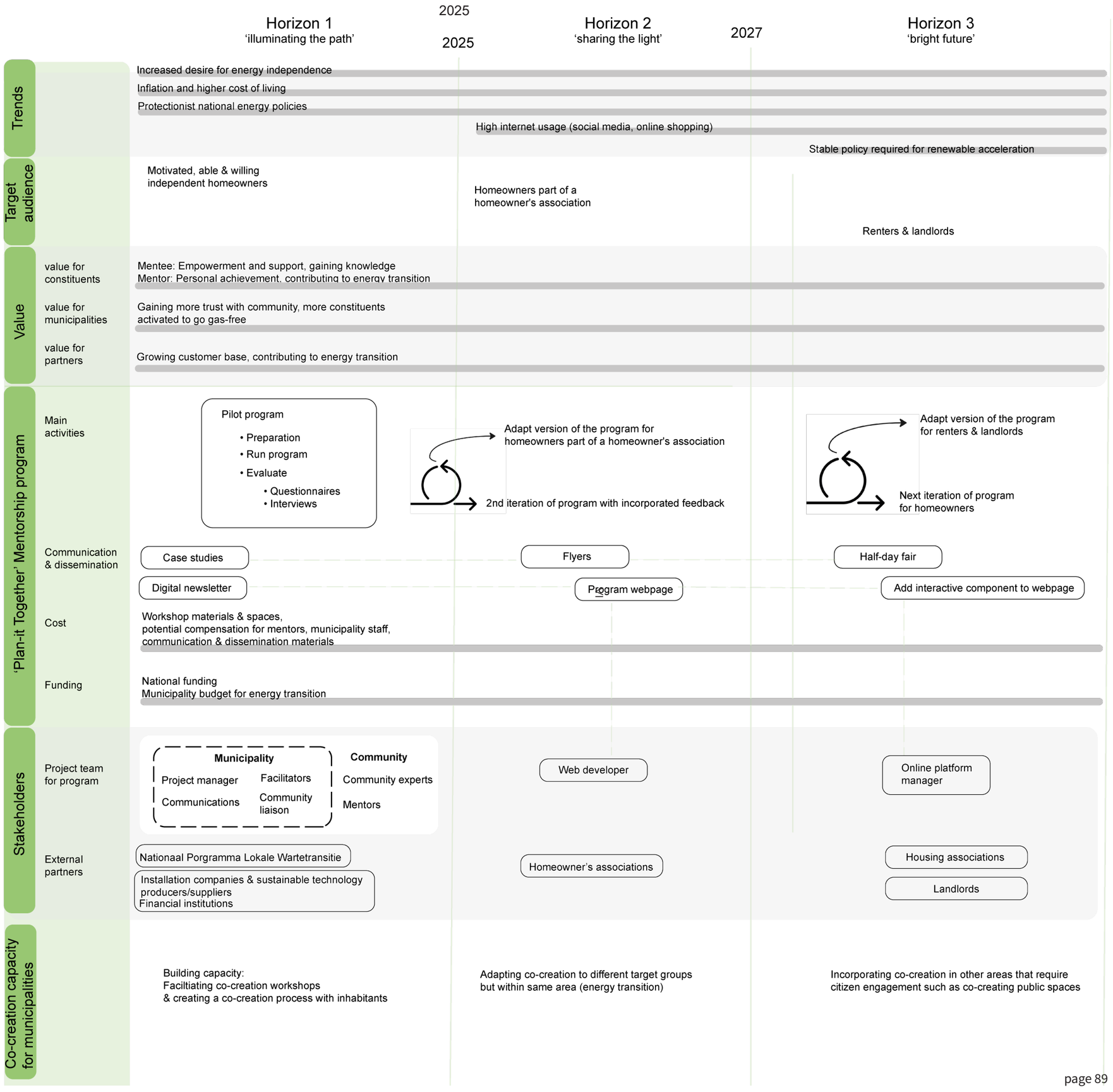


Figure 23. Implementation roadmap for Plan-It mentorship program

First horizon

The first horizon is titled 'Illuminating the Path' to reflect providing structure and providing clarity to the homeowner in their journey to a gas-free ready home. According to feedback, this horizon would need about 2 years (MO2).

The first horizon is focused on implementing a pilot of the mentorship program. Figure 24 describes important preparation steps to take to tailor the program to the specific community. The aim at the end of this horizon is to carry out a pilot of the program for independent homeowners who are motivated to transition their homes.

Available market*: Approximately 1,087,234 households from all 244 medium-sized muncipalities.

Target audience: For one pilot program, the aim is to have approximately 20 homeowners who participate as mentees and 5-10 mentors. This makes 5 groups of 4 mentees and 1-2 mentors per group.

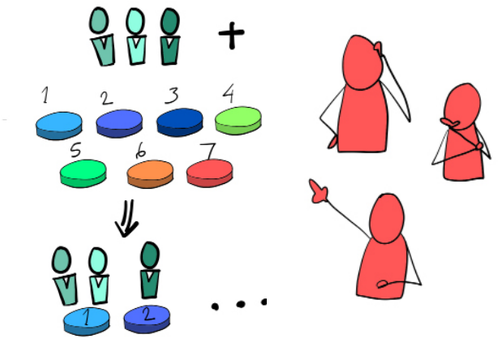
Because it is a pilot program, it is also important to evaluate it. Often within government, it is preferred or useful to include quantitative information, something that can be measured (NEA). Therefore, a questionnaire can be used with scales to measure the opinions, thoughts, and decision process of the participants in the program. A questionnaire can be filled out at the beginning of the program and one at the end of the program, so that the results at the end can be compared to base levels of participants at the beginning. Some important assessment variables may include: knowledge level of getting home gas-free ready, feeling empowered to move forward in their gas-free journey.

The municipality can practice an approach with their inhabitants that is more collaborative and less like they are telling them what to do. They can build their facilitation skills and experience first-hand the advantages of this type of approach in engaging with the public.

Figure 24. Important considerations for program

Put together municipality project team. Pick a community for the pilot, one with active homeowners who want to transition their homes. Identify important stakeholders in this community.

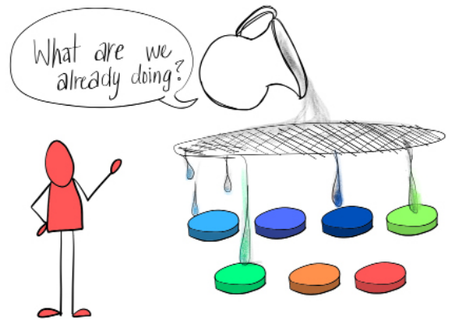
Investigate and understand the current needs of homeowners in the community who want to go gas-free.



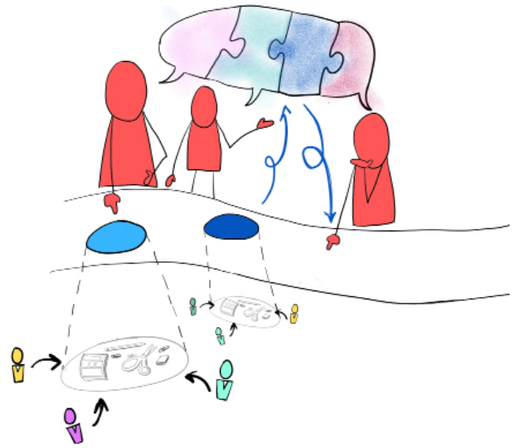
The order of the workshop topics serves as a skeleton for municipalities. The program is designed for the municipality to adapt to their own context, community needs, and stakeholders. This should be tailored.

It can be adapted by:

- removing or adding sessions rearranging sessions
- duplicating sessions due to demand
- having sessions on the same topic but with different external experts



Identify current municipality gas-free home iniatives and projects. These can be incorporated as one of the steps of the program or as complementary and can influence the order of the steps (for example if a financial information presentation is already planned, you can incorporate that into the program schedule).



Throughout the program, the project team should regularly incorporate feedback with the community after each step.

Table 4. Dutch municipality sizes & populations

Category (by municipality size)	**No. of municipalities (in each category)**	**Total population**
small municipality (≤20 000)	66	898,289
medium municipality (20 000 - 100 000)	244	10,157,062
large municipality (≥ 100 000)	32	6,760,157

(Netherlands: Administrative Division (Provinces and Municipalities) - Population Statistics, Charts and Map, 2023)

*There are about 244 medium-sized municipalities in the Netherlands. The total population of these municipalities are 10,157,062. Please see Table 4.

Approximately 60% of inhabitants live in a bought house and 40% in a rental property (De Sociale Staat Van Nederland, 2020), therefore about 6,094,237 people are live in a bought house.

There are on average 2.13 persons per household in the Netherlands (CBS, 2022). Approximately 76% of all bought homes are not part of a homeowner's association (CBS, 2022). Therefore there are about 2,174,469 households.

Out of these households, 50% is taken as an estimation of the number of households interested and able to participate in the program.

Therefore, approximately 1,087,234 households from all medium-sized municipalities is the avaialble market.

In addition, impact can also be showcased qualitatively by doing interviews and creating case studies. Case studies such as plans made by graduates of the program, can be collected to be used as input in a webpage to be developed in the second horizon (anonymously, with identifiable information redacted). This webpage is an addition to the existing municipality website. The results of some of the workshops can also be captured by taking photos or via blog posts from the project team to share with all the program participants. The terms 'Communication and Dissemination' was also suggested by the interviewee (NEA). Communication as a two-way between public and government such as a questionnaire and dissemination as one-way communication such as flyers.

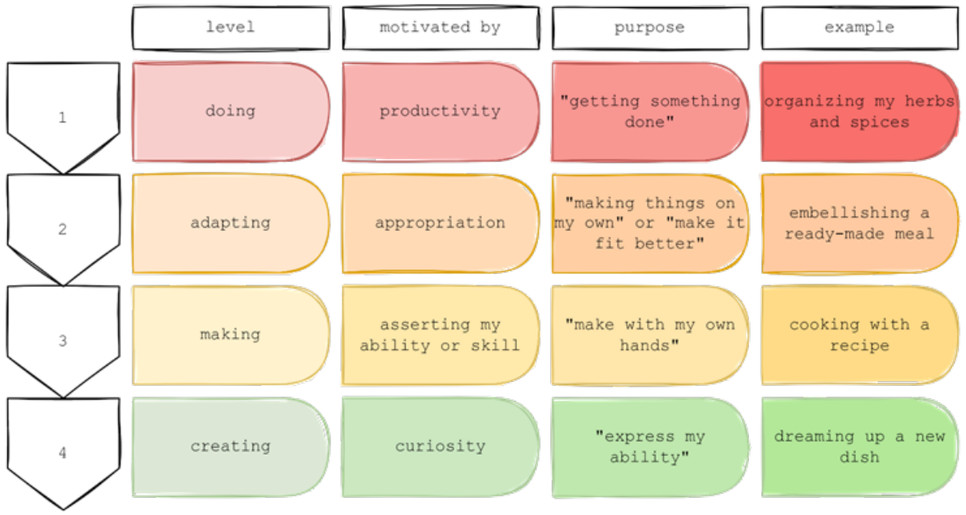
Because small to medium-sized municipalities regularly meet up with neighbouring municipalities to support each other with the energy transition (MW1, MH), it would be worthwhile to embrace this by sharing the program between municipalities. According to MO2, the most logical partner is the Nationaal Programma Lokale Wartetransitie (www.nplw.nl). This program is a fusion of two former national programs that supports municipalities on making homes more sustainable and off natural gas.

In terms of money sources for this pilot program, something that currently happens is that municipalities receive national funding for similar processes and the municipality decides what they spend this money on (MO2). Another option is that municipalities can apply for specific national program they want to join and then the program decides what the money is spent on.

The output of this program could inform policies. Lining up a good participation process is a challenge for many municipalities. Therefore they are searching for lessons learned or a blueprint which can help them in defining that process (MO2). The pilot program could be used as policy research and development, for instance, if a blueprint is made of the whole process and compared to other similar processes. But according to MO2, the program can be used to influence the agreements made with the alderman. The alderman implements policy and together with the mayor make up the council. Types of agreements include how people can participate during the process or what kind of financial instruments (such as subsidies, collective purchase, loans, etc) are offered to people. These agreements can be logged and evaluated and in the end serve as input for making policy.

Connecting design concept to design guidelines

The interviews with the design agencies concluded that co-creation means opening up the process to being changed. This is because co-creation means that input from stakeholders should influence next steps, and that no one project addresses the same issue in the same way and should be tailored to the particular context. The process is meant to be tailored to community context and needs.



The design concept can be compared to cooking with a recipe, for example, with workshops as the ingredients and an exemplary process as a recipe. The municipality may choose to add different ingredients together in a different order and make it fit better for their communities.

The homeowners are motivated by productivity and appropriation. The target group of the design are homeowners who want to get something done. This design should support participants who want to have autonomy or control over their planning by helping them understand the different options and to choose their preferences with intention. The mentees are making the journey their own by choosing existing options fit with their individual situations.

Addresses design guidelines 5 & 8

Second horizon

The second horizon is titled ‘Sharing the Light’ because the reach of the program is larger. The most important developments of this horizon is that there will be a second iteration of the mentorship program based on the evaluation results. In parallel, an implementatino of a mentorship program to be develop for an adjacent target group: homeowners part of a homeowner’s association. Graduates of the first iteration of the program are invited back to be mentors in this new program.

The aim at the end of this horizon is to carry out a second iteration of the program for independent homeowners who are motivated to transition their homes and to adapt the program for homeowners who are part of a homeowner’s association.

Available market: for households part of a homeowner’s association is 343,337

Target audience:
20 participants from independent households for 2nd iteration of program
20 participants from households part of a homeowner’s association

In order to scale up, the results of the program are organized on a webpage on the government website. This platform is chosen because most municipalities already have a website. It is also an assumption that people living in a localized area will have similar types of homes (for example year it was built, house or flat, etc) and if plans made by a homeowner can be shared, they can be used as success stories or case studies so that others can get inspiration from it or adapt from it. Homeowners who are considering to make a plan, or to do the program or not, may be encouraged to do so if there is more information on the results of the program. Moreover, they may already be able to narrow down the technical options based on feasibility (based on dwelling type). According to the interviewee, the government will always need to think of non-digital alternatives for those with low levels of digital literacy, cultural differences, and the elderly (TN1). Therefore, the case studies can be printed on flyers and shared at citizen forums.

Although this target audience is a conservative estimate for one program in its entirety, it is also estimated that the overall reach of the program is greater than in horizon 1. This is due to the experience gained from the municipality in implementing the program, the streamlining of the program, and the communication & dissemination of the results of the first program that contribute to the base knowledge of the community.

Third horizon

The third horizon is titled ‘Bright Future’. The most important developments of this horizon is a third version of the mentorship program developed for renters. This is because they are a different category of inhabitants than homeowners and it will require the involvement of housing associations and landlords.

Available market for households who rent 953,714

Target audience:
20 participants from independent households for 3rd iteration of program
20 participants from households part of a homeowner’s association
20 participants from rented homes

To continue scaling up, the website will have an additional function where it is not just presenting information, but have some way for website visitors to interact with the material. This can be a place where website visitors can submit a message on the website, or contact information for someone who wrote a blog post about the program. One more elaborate idea is to create an online forum with different discussion threads based on different topics or categorized based on the type of dwelling. This will allow people who want to be more autonomous through the process to more easily access information and people can do a more targeted search for information. It will also be a platform to cultivate an online community and people can answer questions from each other. The non-digital alternative is to create a half-day fair with different booths based on different topics so people can pose questions face to face as well as to generate interest in the program.

The results of the program can be used by the municipality to inform policy development. The type of policy that this can inform might depend on the municipality and would be best to be decided by the municipalities themselves. But one example of how policy could change is perhaps the subsidies available for different technologies. For example, there could be households clustered that have a similar socioeconomic level that might inform the types of financial assistance options. If there are many households with the same type of dwelling, they might have similar technical feasibility constraints, which may lead to similar technology chosen, which could inform the types of subsidies the municipality might work to make available for the community.

Also in the third horizon, the skills gained from facilitating co-creation workshops by the project team could be applied to a different context in the public sector. For example workshop sessions with inhabitants to determine what to do with public spaces (like how they would like a park tor library to function like).

As mentioned during the testing of this design with a municipality, this process is new for people working in the energy transition and with municipalities, there is not one way how to do it. Moreover, it is mentioned by the interviewee that municipalities often turn to each other to share experience and through earlier interviews it was also mentioned that neighbouring municipalities, especially smaller ones already meet in order to exchange practices (WBD1). Therefore it is also possible that the program is shared between municipalities during these existing meets or potentially through the Association of Dutch Municipalities (Vereniging van Nederlandse Gemeenten (VNG)), as they connect all municipalities in the Netherlands.

One of the challenges discussed with the interviewee here is that capacity of people and learning at the municipality, that is generally the case and does not just apply to this program. To the knowledge of the interviewees municipalities are quite preoccupied with things asked to do by national and provincial government not much time to collect insights bottom up and making own policy based on that, so need to have resource capacity that can carry out this work, or hire more staff. Also you will need the space to do something with the insights gained, for instance to work with the city council, and the city council will also need to be open for this.

6.4 Evaluation of design concept

Interview Legend

Abbreviation	Interview participant
MW2	Municipality of Wijk bij Duurstede (project manager)
MO1	Municipality of Oss (policy advisor)
H1	Independent homeowner
H2	Homeowner part of a homeowner's association

Roadmap Feedback Legend

Abbreviation	Participant
NEA	Netherlands Enterprise Agency (energy innovation advisor)
MO2	Municipality of Oss (policy advisor)

Four interviews were held with two civil servants from two different municipalities and two with homeowners: one an independent homeowner and the second part of a homeowner's association to test the design concept (see Appendix B for interview guide).

Feedback for the roadmap was received in two ways (see Appendix B for interview guide and questionnaire). First, an interview with someone who works at the Netherlands Enterprise Agency as an Energy Innovation Advisor was held to get feedback on the roadmap. Although the Netherlands Enterprise Agency is a part of the Ministry of Economic affairs and Climate Policy and is not a municipality, they were able to provide insight on the terminology in the roadmap headings and general remarks about program implementation within government. Secondly, a questionnairew was sent to a civil servant who works at Municipality of Oss.

Parts That Were Most Interesting For The Interviewees

For the municipalities, one of the challenges that this design helps solve is providing structure and organization to a process that is really difficult and complex. Moreover, what they really recognize is the last step, connecting with companies, is something that is important for homeowners. This is because helping homeowners go from plan to action is something that as a municipality, they need to pay more attention to. The municipalities want homeowners to go through the whole process, and what is important is not just gathering the information and plan, but taking those steps into action. There are existing companies that can provide advice, but there are not many companies that can provide advice for one homeowner's entire journey. People also find it hard to make an own program for their home because it is specific for their own situation.

The most interesting part for the homeowners is the focus on collaboration among municipalities and homeowners and that the process is clear from the beginning. It is important that it takes a co-creation approach and they are glad to have visual tools. With the second homeowner, she lives in the jurisdiction of one municipality, and works for another one, and she feels that the municipality often only gives tips, but never a clear program from beginning to end. Therefore, she likes that the design provides a clear overview from point A to B, with steps to take in between.

Although, this design was created with the focus on independent homeowners, one of the homeowners interviewed is a member of a homeowner's association. When asked whether this design could still be useful for her, she said yes because the process is the same and the topics are still relevant and the different stages can be adapted.

For example, the Assessing your home step is still very relevant because the situation is different for every apartment – e.g. ground floor versus 3rd floor, and whether the unit is completely surrounded by other units or not. As a member of a homeowner's association, they pay a particular financial sum that contributes to a pool of money that they then communally decide what to do with, therefore, the finances stage could be adapted to financial options for the whole building - what is good for them, advantages/ disadvantages, what it costs.

Another example is that the mentorship groups could be comprised of mentees who are the representatives of the building and the mentors could be owners of an apartment in a close by neighbourhood who already did the construction.

Desirability

According to a civil servant interviewed, this program is something that she feels that municipalities need and that the visuals could help with communication between municipality and homeowners (MO1). According to the other civil servant, the main challenges that he sees through his project work are that people cannot afford to make this transition, and that the process is really difficult and complex. In his opinion, he thinks that this design addresses the latter problem. This provides an insight that making homes more sustainable and gas-free is really complex and that this design addresses a specific aspect of the transition, but does not solve everything. The value of this program is also in line with one thing that they currently try and do, which is to reduce the hassle of the process for the homeowners (MW2).

From a homeowner's perspective, they are glad to have the visual tools because it helps provide more clarity about what they are doing, and reflect on the different aspects of the journey. Moreover, the tools help participants feel that they are doing it together with others and that they have an influence on what happens. One of the most interesting aspects of the design is that it is co-creation and a collaboration between municipalities and homeowners.

"Black box is not good" (H1)

One of the homeowners who was interviewed works at a municipality and lives within the jurisdiction of a different one and she says that municipalities give tips but never arranges things in a clear A to B process. Therefore, she likes that the program provides a clear beginning and end.

Feasibility

When asking the municipality about whether this solution fits the capabilities and current resources of the municipality, the interviewee says that it does, especially since they previously have linked local community members with each other to share experiences and learn from each other.

> *"Yes, it fits [with the capabilities and current resources of the municipality], with the program with what they want to do with some specific parts that they haven't thought of yet like the safari which is logical if looking at other transition areas, comparison with wind and solar fields and logical to do it with gas free" (MO1)*

One of the biggest challenges that the interviewee can foresee in implementing the program is to find the mentors. They think that at a certain point it is a lot to ask of volunteers and they don't think they can rely on the volunteers. It could be that there are ways to compensate them for their time, but this would differ per municipality (MO1). For municipalities, it is important to reach everybody and not only the intelligent who find it easy to understand the all the different aspects (MO1). A lot of people do not have an overview and do not know what is going on (MO1, MW1, MH). Therefore, this program provides a process with clear topics to address and the visual aids assist with making the information more assessible and approachable.

Viability

For the municipalities that were interviewed, they often work with people in the community, albeit in a different way than described in the mentorship program design concept. One example is that one municipality work with local community members to better understand how the municipality can improve the manner in which they bring information to the rest of the community. Sometimes the municipality will use specific jargon that is uncommon for a lot of people and this group of people help bridge this information gap.

The municipalities really recognize the workshop topics. From what they know from their experience working with homeowners, the Step Connecting with companies, is where the municipality feels that they should and need to pay more attention to. This is because the municipality not only wants the inhabitants to gather information, but progress from planning to action – and that is a big challenge (MO1).

Important changes to the initial design idea

The following are the main changes to the design concept in response to the feedback:

1. The topic finances is moved to earlier in the process

In the initial design idea, the topic of finances was only addressed later in the process. However, one interviewee (MO1) stated that for many of their initial meetings with the public, people who attend are more concerned about the financial aspects than the technology. She said that ideally, they would do the technology sessions before the finances, but this may depend on the neighbourhood. For example, in communities where socioeconomic level is lower, it might make more sense for the municipality to address the financial aspects earlier in the process because it is more of a concern. Therefore, in the final design the finances are addressed earlier in the process.

2. Assessing the readiness or levels of knowledge of inhabitants, which was hinted at in the initial design but now should be made more explicit to keep people motivated.

For homeowners, people have different levels of knowledge and for some of the initial steps, it might get boring if the pace is too slow and they are learning things they already know. It might be worthwhile to evaluate the knowledge level of people already, what they are expecting, and their motivation in the first stage.

One interviewee remarked that people often like to go straight to solutions i.e. technologies, and skip steps such as assessing your home. When they skip a step such as that, they might not learn that insulation is quite an important step. Therefore, step 2 assessing your current home and step 3 learning about technologies might be important to keep.

3. More emphasis on reflecting and adapting between different stages of the process

The last stage connecting with companies, is when participants find out what is available on the market and this can really influence what homeowners can do and plan for. For example, if the homeowner decides that they want to have PV panels on their roof, but there are no companies who are offering to sell these or there are capacity issues for the installation, the homeowner will have to change their plan. Therefore connecting with companies provides new information that, if found out earlier, the participants of the program will have time to adapt their plan.

Besides connecting to companies, the financial and technology options influence the homeowner's decision-making as well. Homeowners might need to go back and forth on these topics to make their decisions. Therefore, the understanding of the process, became more about gathering information and how this input will interact with each other to inform the homeowner's decisions and plan. The homeowner also noted that it seems that when you move onto the next stage, the previous stage is not finished and that participants may need to go back and forth between stages.

Therefore, in the final design, it begins with an explanation of the overall process and there is emphasis in the implementation explanation that the municipality project team needs to be responsive to feedback and to tailor the process and workshop to community needs.

Chapter 7
Discussion

Design limitations

In terms of testing the design concept, what I noticed is that municipalities err on the side of trying to represent the whole community. A pattern found in the interviews with municipalities was a concern for people who do not have technical knowledge or who cannot do things independently – for example senior citizens or those with low literacy. On the other hand, in the interviews with homeowners, they were concerned that the initial steps were too easy and that motivation of participants to complete the program is a concern because they will become bored. Upon reflection, these homeowners are both highly educated, both have a master's degree and are already aware of the energy transition. For a future direction, it would be useful to validate the design idea with other types of inhabitants such as those with different socioeconomic levels, education levels, and ages.

Another aspect of the design to pay attention to is the amount of adaptability in the process. Indeed, with design agencies, they often do not subscribe to a singular process for all their projects. This is because they strongly believe that their approach should be informed by what they have done so far in the project, and what is needed in the next steps. However, this comes with experience and one of the reasons design agencies were interviewed is to see how design experts work with co-creation and what their design processes look like. The design is designed for municipalities, and assumes that they may have varying levels of design and co-creation experience, but are not experts. Therefore, the design plays with this tension between having a really open process and having a specific, step by step sequence that must be followed.

An interesting future direction to pursue is the role of the 'designer' (as referred to in chapter 4, p.51, where the designer is tasked with creating and exploring appropriate tools and methods for non-designers to express themselves). This design concept can benefit from a further elaboration on the role of the 'designer' and whether that would be a third party who facilitates the process or a designated role of one or two people from the municipality.

The end result was inspired by the different ways to facilitate people's expressions of creativity at different levels. For example, it is often easier to respond and react to something rather than working from a blank canvas. For instance, the design concept has different workshops and a toolkit that makes it easier for the municipality to critique and edit what is there.

In an article in de Volkskrant (van Weezel, 2023), TNO concludes that good communication is essential to successfully get a neighbourhood to be gas-free, for instance having a good contact person for residents and making it clear to residents how their house will look at the end of their journey. This could support the design decision to use a mentor-mentee relationship and the importance of communication and dissemination in the implementation plan.

The effectiveness of the program and its output is an important future point of exploration. Moreover, in testing the roadmap, one of the challenges mentioned is the capacity of people and learning at the municipality (NEA). To the knowledge of the interviewee, municipalities are quite preoccupied with things they have been asked to do by the national and provincial government. Therefore, space and time is needed to implement the program and do something with the insights gained from the program. This includes a willingness from the municipality, enough resource capacity to carry out this work or to hire more staff.

Reflection on co-creation for municipalities

The design concept is an example of helping people take ownership over their transition journey. Co-creation is one of the many approaches that will move the energy transition forward in the Netherlands, but it cannot be the only approach. Co-creation takes a long time and requires people to be open minded. If the co-creation process is opened up to people with opposing views it requires strong facilitators and expert designers, and it is time consuming if they need to prototype different approaches to reach people with different perspectives (ABZ1).

Because the process presented in this project is designed for municipalities with varying levels of facilitation and co-creation experience, it, therefore, focuses more on the inhabitants who are already open-minded. With this target group, the impact will be greater, the program will more likely find success, and generate proof of concept not just for the program on the municipality side, but also bottom-up with community members.

The program and its associated toolkit helps provide structure and organization to a process that would otherwise be really complex. In a test of the design, homeowners mentioned feeling like: they gained more clarity around the process because of the visual tools; and that they are collaborating with the municipality. The municipalities feel that the process helps homeowners go through an entire journey, specific to their own situation.

This design thus supports the homeowner as an expert of their experience and active contributor in the development of their plan – if they are willing to commit time to the program.

Reflection on the Frame Innovation process for this project

As someone with limited design background and did not complete a bachelor's study in industrial design engineering, I felt that the Frame Innovation approach helped me by providing structure when approaching a very complex problem such as the energy transition. It helped me feel less overwhelmed by the subject matter, especially having known very little about the energy transition in the Netherlands, because there was a process I could follow. Frame Innovation was only used in my project part way through, and I had to retrofit things that I did into the different steps. The identifiable steps helped to organize the information. Although, it would have been much easier setting out to use Frame Innovation at the beginning of the project since now I found myself struggling to decide what goes where. Moreover, this is why the report is structured to follow the general flow of the approach and attempting to force fit the content of the project sacrificed the overall narrative.

One of the things I need to work on as a designer is knowing when it is time to move along in the process, especially on an individual project with such a topic, where I often find myself feeling that there is always more to learn. Although the Frame Innovation process has a sequence of steps and could be thought of as a prescriptive method, Dorst states in the book that "in practice the activities that are captured in the steps all interact with each other…the 9 step model, while useful, should in no way become a straitjacket to the practitioner" (Dorst, 2015, p.99). Because of the steps of the Frame Creation process, and the malleability of the steps, I could push myself to the next step because first, I had a clear next step and second, I felt that I could always go back and revisit previous steps to see how they interact with each other.

In many of the case studies described in the Frame Innovation book (2015), they often work together with stakeholders, especially when creating the frame and thinking about the 'fruitfulness' of it. Especially as Dorst (2015) describes how frames are useful for team members:

> *frames are really only fruitful when they are fully embraced by all team members, and absorbed as an active thought process. For this reason, it's useless trying to communicate a frame by just blurting it out – if your team members are thinking about the issue from another perspective, they probably won't know what you are talking about. It is also not very productive to try to convince a team member that your frame is the right one: the frame is only going to be 'right' if the team members find it inspiring and can use it to guide their own mental structuring of the situation (Dorst, 2015, p.64)*

In my project, I was working mostly on my own for about half the project before having contact with stakeholders. The brainstorming of different frames was done individually.

The following is how Dorst (2015) describes a good frame:

> *create an image that spans and integrates a broad range of issues under consideration and might draw in even more issues from outside the original problem arena. Good frames are coherent, and provide a stable (noncontradictory) basis for further thought. Good frames are also robust, in the sense that the images they conjure up in the minds of the participants are sufficiently similar to provide a 'common' ground for the discussion of the problem and possible solutions. Of course, good frames need to be inspiring and original – perhaps not completely new to the world, but at least new to the problem setting (Dorst, 2015, p.64)*

The process in my project was very much driven by my own ideas as a designer. The frame needed to be useful for me, to move from research and analysis to designing solutions. It is hard to say that if I had co-creation sessions with stakeholders, such as, municipalities and homeowners, what types of frames would have been created. I did, however, validate this frame with other people, and incorporated their insights into my decisions as a designer. For instance, I interviewed a parent about the parenting frame. She had many insights about raising her children, but she is also a homeowner and needs to transition her home. In regards to using the metaphor to think of the energy transition – which was only in the last bit of the interview – she was quite critical of the frame. This lead me to believe that it would be difficult to use this frame as a way to find common ground to discuss possible solutions.

I had a discussion with a former student who also used the Frame Innovation process for her graduation project, but her approach was quite different as she held many co-creation sessions with stakeholders throughout her entire project. She remarked that one of her biggest challenges was to ask stakeholders to think of the problem situation in metaphors. In my project, I used the frame to think about the energy transition through a different lens and to transition into the design phase. I cheated a little by working with similar minded design students, who have learned about problem framing and are familiar with creative ways to approach problems, to use the parenting frame to brainstorm solutions. Then it was easy to work with the frame to find solutions.

But in this project, I did not rely on stakeholders to find possible solutions, therefore I used the frame in a way that was useful for me. This is partly due to the fact that the civil servants and homeowners that I connected with were not tied to the project in a formal way. For the future, it would be interesting to co-create a frame with stakeholders and use it as a way to think of possible solutions. It is highly likely that it would have gone differently if co-creating with stakeholders was planned into my project, but in this case, the frame worked for what I needed and stakeholders were used to validate it. It could be an interesting future direction to involve stakeholders earlier in the design process, especially in brainstorming frames and using those frames to imagine a desired future scenario and possible solutions.

My project also deviated from the Frame Innovation approach in another way. In the field step, my supervisor remarked and suggested that I should explore players outside the energy transition field. However, I only considered design agencies. Design agencies made sense to examine because my project focuses on co-creation, and they work on other social issues and not only energy transition projects. Because of this, I believe that it did help push me to think outside the energy transition field. It would be interesting to have broadened the field of players and really explored outside the topic of interest and seen how it could have influenced the direction of the frame creation.

Chapter 8
Conclusion

The intent of this project was to explore co-creation and its potential in supporting the municipality's in discontinuing natural gas in Dutch homes.

This project aimed to design a way for municipalities to use co-creation in their goal of getting inhabitants to make their homes gas-free ready. Based on qualitative analysis of the challenge, a design concept Plan-It Together: a mentorship program, is proposed.

The proposed design concept shows that municipalities can use visual materials to help make information more approachable, bring experts and non-experts together, and experiment with their roles and citizens' role in the implementation of a public program. Conclusions from co-creation research show that it is important to consider visual materials to help participants of co-creation to express themselves and to facilitate communication between stakeholders. The testing of the proposed design illustrates that indeed the visual materials from the toolkit and the program itself, help provide structure to the transition journey. Additionally, the materials make difficult information more approachable and assist homeowners envision their future homes.

The design encompasses a process with multiple points of interaction, in the form of workshops, between expert and non-expert stakeholders. Co-creation allows different people, such as technological experts, who may not normally be in the same room as non-experts, such as homeowners, to interact with each other. This allows people to exchange information themselves rather than just passing along information.

According to research, co-creation in the public sector considers the end users as citizens and citizens may be identified as co-designers, co-initiators, or co-implementers. In this design, the municipality takes on a facilitator role and citizens are divided into different roles. Homeowners are the end users that the program ultimately serves. Community members, with experience transitioning their homes, are placed in the role of a mentor. They are co-implementors and are involved in delivering the public service. Through research, it was found that in smaller and medium-sized municipalities there is untapped potential with the knowledge and experience within a community; and trust between inhabitants and municipalities can be built with a more equal approach. Making inhabitants active contributors in the program allows them to have more influence on the public service and leads them to be more engaged and to have more influence on the public service. Conclusions from testing the design showed that homeowners liked the collaborative nature and that there is potential that the design can help strengthen the connection between municipalities and their communities.

The project followed the Frame Innovation approach (Dorst, 2015). The process was author-driven with limited involvement of stakeholders in the formation of the parenting frame, which was used to steer the direction of the solutions. While this limits the generalizability of the results, this approach illustrates that it is possible to generate a desirable design solution, even with the parenting frame that was not so desirable with an important stakeholder: homeowners. Additionally, this raises questions on how the implementation of the design concept will be influenced by not using the frame as 'common' ground for discussion of the problem and possible solutions with stakeholders.

Future directions

The workshops require further research to determine the effectiveness of the visual aids and whether they indeed facilitate discussion between stakeholders.

Although the testing of the design concept showed that homeowners liked the collaborative nature and would likely improve the relationship inhabitants have with the municipality. But an interesting future direction is to further explore this relationship and how much and in what way a co-creation approach improves citizens' trust in municipalities.

With respect to the Frame Innovation approach, an interesting future direction is to involve stakeholders earlier in the design process to explore the impact on the development of the frame. Furthermore, future studies could examine the Frame Innovation approach with varying levels of stakeholder involvement and at different steps of the process.

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Appendices

Appendices

Table of Contents

Appendix A: Project Brief

DESIGN FOR our future

5659

TU Delft

IDE Master Graduation

Project team, Procedural checks and personal Project brief

This document contains the agreements made between student and supervisory team about the student's IDE Master Graduation Project. This document can also include the involvement of an external organisation, however, it does not cover any legal employment relationship that the student and the client (might) agree upon. Next to that, this document facilitates the required procedural checks. In this document:

- The student defines the team, what he/she is going to do/deliver and how that will come about.
- SSC E&SA (Shared Service Center, Education & Student Affairs) reports on the student's registration and study progress.
- IDE's Board of Examiners confirms if the student is allowed to start the Graduation Project.

USE ADOBE ACROBAT READER TO OPEN, EDIT AND SAVE THIS DOCUMENT

Download again and reopen in case you tried other software, such as Preview (Mac) or a webbrowser.

STUDENT DATA & MASTER PROGRAMME

Save this form according the format "IDE Master Graduation Project Brief_familyname_firstname_studentnumber_dd-mm-yyyy".
Complete all blue parts of the form and include the approved Project Brief in your Graduation Report as Appendix 1 !

family name: Chan
initials: J.Y.W. given name: Josephine
student number: 5380456
street & no.:
zipcode & city:
country:
phone:
email:

Your master programme (only select the options that apply to you):

IDE master(s): ( ) IPD ( ) DfI (★) SPD
2nd non-IDE master:
individual programme: - - (give date of approval)
honours programme: ( ) Honours Programme Master
specialisation / annotation: ( ) Medisign ( ) Tech. in Sustainable Design ( ) Entrepeneurship

SUPERVISORY TEAM **

Fill in the required data for the supervisory team members. Please check the instructions on the right !

** chair: Jotte de Koning dept. / section: SDE
** mentor: Sonja van Dam dept. / section: SDE
2nd mentor:
organisation:
city: country:

Chair should request the IDE Board of Examiners for approval of a non-IDE mentor, including a motivation letter and c.v..

Second mentor only applies in case the assignment is hosted by an external organisation.

comments (optional): S. van Dam has extended expertise in the energy transition and behaviour change. J. de Koning is experienced in Transirion design and systemic design. We share an interest in co-creation. This makes for a complementary team.

Ensure a heterogeneous team. In case you wish to include two team members from the same section, please explain why.

TU Delft

Procedural Checks - IDE Master Graduation

APPROVAL PROJECT BRIEF

To be filled in by the chair of the supervisory team.

chair Jotte de Koning date 24 - 03 - 2022 signature [redacted]

CHECK STUDY PROGRESS

To be filled in by the SSC E&SA (Shared Service Center, Education & Student Affairs), after approval of the project brief by the Chair.
The study progress will be checked for a 2nd time just before the green light meeting.

Master electives no. of EC accumulated in total: 32 EC
Of which, taking the conditional requirements into account, can be part of the exam programme 30 EC
List of electives obtained before the third semester without approval of the BoE

(X) YES all 1st year master courses passed
( ) NO missing 1st year master courses are:

name C. van der Bunt date 08 - 04 - 2022 signature CB

FORMAL APPROVAL GRADUATION PROJECT

To be filled in by the Board of Examiners of IDE TU Delft. Please check the supervisory team and study the parts of the brief marked **.
Next, please assess, (dis)approve and sign this Project Brief, by using the criteria below.

- Does the project fit within the (MSc)-programme of the student (taking into account, if described, the activities done next to the obligatory MSc specific courses)?
- Is the level of the project challenging enough for a MSc IDE graduating student?
- Is the project expected to be doable within 100 working days/20 weeks ?
- Does the composition of the supervisory team comply with the regulations and fit the assignment ?

Content: (V) APPROVED ( ) NOT APPROVED
Procedure: (V) APPROVED ( ) NOT APPROVED

comments

name Monique von Morgen date 26/4/2022 - signature MvM

The Role of Co-Creation in the Dutch Energy Transition — project title

Please state the title of your graduation project (above) and the start date and end date (below). Keep the title compact and simple. Do not use abbreviations. The remainder of this document allows you to define and clarify your graduation project.

start date 14 - 03 - 2022 — 08 - 09 - 2022 end date

INTRODUCTION **

Please describe, the context of your project, and address the main stakeholders (interests) within this context in a concise yet complete manner. Who are involved, what do they value and how do they currently operate within the given context? What are the main opportunities and limitations you are currently aware of (cultural- and social norms, resources (time, money,...), technology, ...).

Sustainability transitions refer to "large-scale societal changes" (Loorbach et al., 2017) and the energy transition refers to moving societies away from fossil fuels toward renewable energy. Sustainability transitions go beyond technological shift but deals with power struggle and sociocultural change (Loorbach et al., 2017). These sustainability-related complex societal problems are "characterized by dissent on goals, values and means. Different people have different perspectives on what is being discussed as 'the problem', they have different values and favour different solutions." (Kemp et al., 2007).

The energy transition is very complex and cannot be done alone. In the last decades, many different technical solutions have been developed and are now available, such as solar panels and heat pumps. The current challenge at the moment is to bring these solutions to neighborhoods and households. To do so, many different stakeholders have to work together, from the national government, to municipalities, housing corporations, energy providers and homeowners, please refer to image 1 below. Therefore it is important to explore different ways to bring people or groups of people together to create a future society that is different from the current system (i.e. from fossil fuels to renewable energy). Co-creative practices are essential in the energy transition as they mainly function to bring different people together to share, make sense and to collaborate, and to rethink current and explore future possibilities (Holmlid et al., 2015). This makes it important to understand and explore how it is currently being done and how it can be supported in the future.

The field of design has a long-standing tradition in the method of co-creation, starting in the 1960's with the ideas of participatory design and democratizing processes. An example is Peter Ehn's work in participatory design research community. The methods and approaches of design can help tackle complex challenges as design methods naturally deal with complex challenges that involve different stakeholders. This helps in moving forward in unknown territory, imagining and creating new value (Design Council & The Point People, 2021).

With the need to bring different stakeholders together in the energy transition, and the potential opportunities with the co-creation methods in the field of design, this project explores co-creation towards the energy transition from a design perspective.

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introduction (continued): space for images

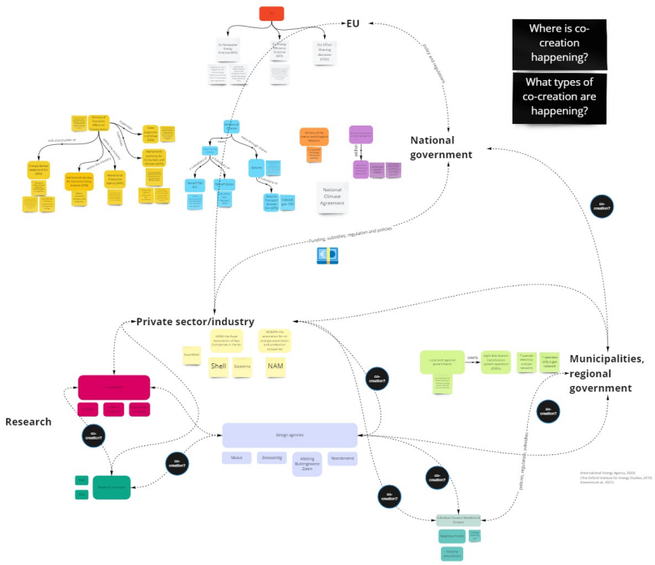


image / figure 1: Visual of stakeholders and their relationships (just a start and not comprehensive yet)

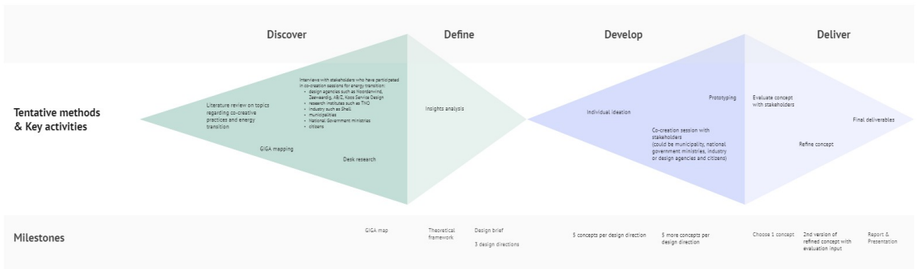


image / figure 2: Project design approach

PROBLEM DEFINITION **

Limit and define the scope and solution space of your project to one that is manageable within one Master Graduation Project of 30 EC (= 20 full time weeks or 100 working days) and clearly indicate what issue(s) should be addressed in this project.

In order to understand and design for co-creation towards the enery transition, my main research question is:

how can design be used to support co-creation processes towards natural gas discontinuation?

Different subquestions support the investigation of the main research question:

1. Exploring co-creation and the Dutch energy transition:
   a. What is co-creation? (literature study)
   b. Where is co-creation happening now within the Dutch energy transition? (literature, desk research, interviews)
   c. How can stakeholders be engaged in effective ways to support the energy transition? (literature, co-creation)
   d. What are the different co-creation tools used? (literature, desk research, interviews)

2. The role and use of design in supporting co-creation in the Dutch Energy Transitions?
   a. What are the current (best) design practices and challenges of co-creation processes to support the Dutch energy transition? (interviews, co-creation)
   b. What is the role of design agencies in co-creation towards the energy transitions? (literature, desk research, interviews)

3. Design question: how can co-creation be supported through design in the Dutch Energy Transition?
   a. Who needs to be engaged in co-creation for the energy transitions?
   b. Design of a tool, toolbox, roadmap or handbook

ASSIGNMENT **

State in 2 or 3 sentences what you are going to research, design, create and / or generate, that will solve (part of) the issue(s) pointed out in "problem definition". Then illustrate this assignment by indicating what kind of solution you expect and / or aim to deliver, for instance: a product, a product-service combination, a strategy illustrated through product or product-service combination ideas, ... In case of a Specialisation and/or Annotation, make sure the assignment reflects this/these.

How can design be used to cultivate co-creation processes to support the Dutch energy transition towards natural gas discontinuation?

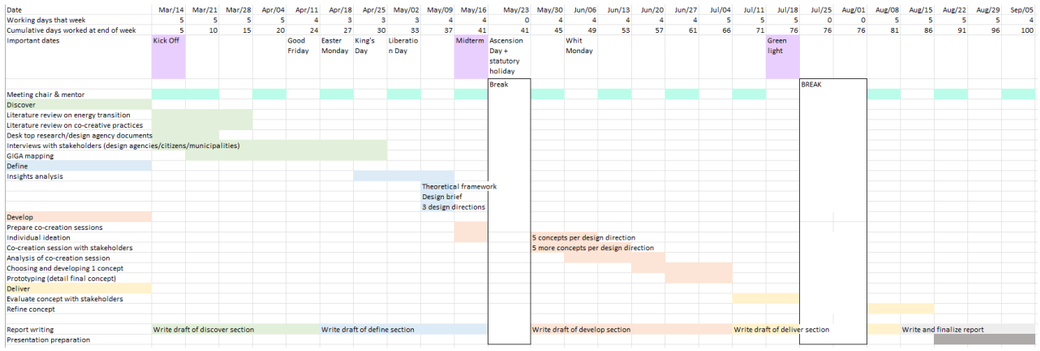
The first part of my assignment is to explore and understand co-creation and the role of design in the Dutch energy transition. This include understanding the system with literature review on co-creation, transition management, energy governance. Semi-structured interviews and mapping with stakeholders, such as design agencies and municipalities will help develop an understanding of the current practices and challenges in designing for co-creation in this context. A GIGA map will be used to understand the complexity and to generate leverage points for intervention.

After this phase, I will reframe and create a design brief. This is when I will brainstorm and co-create with stakeholders on an intervention. The solution is highly dependent on the research phase, but there are some examples of what the deliverable could entail. One example is a portfolio of different services/concepts that tackle co-creation, one such thing could be a tool that supports co-creation. This could mean that it will help with the implementation of co-creation processes/methods or help stakeholders adopt a co-creation mindset to make stakeholder engagement more successful, or a tool to evaluate and measure co-creation sessions and how to understand its effect on the energy transition. Another example of an outcome is a roadmap. This roadmap will outline: types of co-creation, what stakeholders are involved, how to find the right people, and when and how to work with which stakeholders at different times.

PLANNING AND APPROACH **

Include a Gantt Chart (replace the example below - more examples can be found in Manual 2) that shows the different phases of your project, deliverables you have in mind, meetings, and how you plan to spend your time. Please note that all activities should fit within the given net time of 30 EC = 20 full time weeks or 100 working days, and your planning should include a kick-off meeting, mid-term meeting, green light meeting and graduation ceremony. Illustrate your Gantt Chart by, for instance, explaining your approach, and please indicate periods of part-time activities and/or periods of not spending time on your graduation project, if any, for instance because of holidays or parallel activities.

start date 14 - 3 - 2022 8 - 9 - 2022 end date



This Gantt Chart shows planned activities. In Q4, I will be working part time because of a teaching assistant job.

References

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MOTIVATION AND PERSONAL AMBITIONS

Explain why you set up this project, what competences you want to prove and learn. For example: acquired competences from your MSc programme, the elective semester, extra-curricular activities (etc.) and point out the competences you have yet developed. Optionally, describe which personal learning ambitions you explicitly want to address in this project, on top of the learning objectives of the Graduation Project, such as: in depth knowledge a on specific subject, broadening your competences or experimenting with a specific tool and/or methodology, ... Stick to no more than five ambitions.

- My interest through coursework: In my SPD Research course, I set up and wrote a group research paper in the systemic design track and looked specifically at the role of the designer in social networks. I also took the elective course, Design for Social Innovation at TU Eindhoven. In this course, I was introduced to different approaches and theories within the field of social innovation and transformation design. Through these courses, I became more interested in the role of design in social problems and co-creation (because I think that these problems cannot be solved by any one person). I have been interested in the field of sustainability and in my initial search within topics of design and sustainability, I found many things with respect to circular economy and looking at materials and products. I was happy to find this project where I could apply design to the energy transition, and has less of a focus on a product and more on processes, people, and transitions of systems.
- My past experience facilitating government employees through design methods and tools to tackle public issues has sparked my interest and through this project, I hope to learn more about co-creation for sustainability issues and think strategically about who to include in these processes and how to incorporate it meaningfully.
- Because I do not have an academic background in IDE, one of my learning goals is to actually do design -- to produce a concept/tool independently.
- Want to learn what design looks like in a real life scenario through the work of the design agencies. For example in this case how a design agency designs for energy transitions because in the future I might want to work as a designer, so I am interested in what the role of design can be for this topic and not just theoretically, but practically.
- I want to experiment with working in complexity -- learn how to make sense of and make something from a complex problem that has many different stakeholders and parts.
- Skills to learn: I want to learn how to visualize complexity (GIGA map), run a co-creation session, facilitate a co-creation session

References (continued)

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FINAL COMMENTS

In case your project brief needs final comments, please add any information you think is relevant.

Appendix B: Interview Guides

Appendix B.1: Exploratory interview with design agencies

How can design be used to support co-creation processes towards natural gas discontinuation?

Exploring co-creation and the Dutch energy transition
Where is co-creation happening now within the Dutch energy transition?
What are the different co-creation tools used?

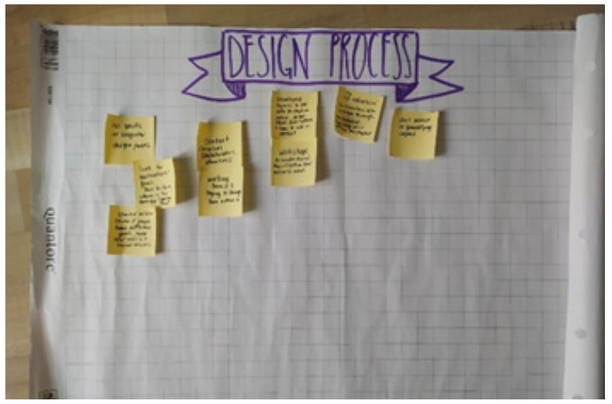
Role and use of design in supporting co-creation in Dutch energy transition
What are the current (best) design practices and challenges of co-creation processes to support the Dutch energy transition?
What is the role of design agencies in co-creation towards the energy transitions?

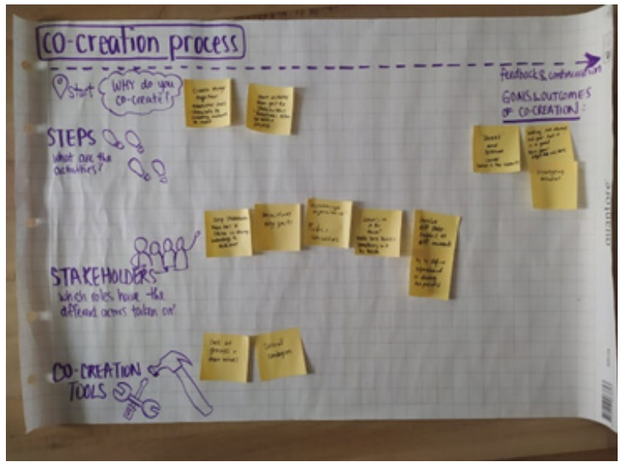
Theme 1: Organization
- Could you tell me about [design agency]?
- What kind of energy transition projects do you work on?
-
- What does your design process look like?
- Who are the stakeholders you work with when you design for energy transition?

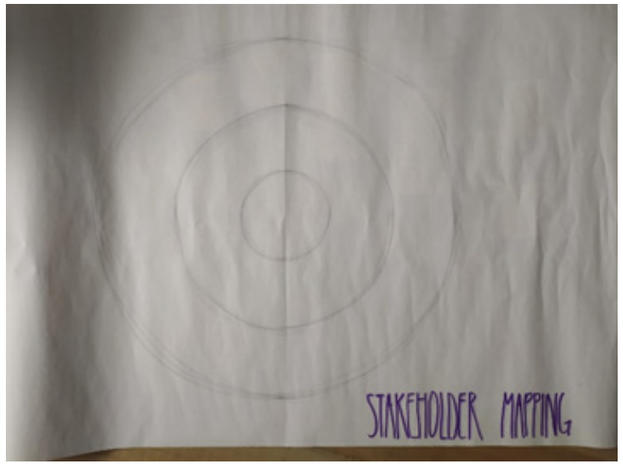
Theme 2: Example of co-creation
- What does co-creation mean to you?
- Think of a specific example of when you used co-creation in an (energy transition) project
- Could you walk me through the co-creation process in this project
  - Why do you co-create? What happened that made you want to co-create
  - What are the activities?
  - Which stakeholders have been involved in which phases?
  - Which roles have the different actors taken on?
  - What are the goals and outcomes of co-creation? And to what extent were they achieved?
  - Are there co-creation tools that you use?

Theme 3: Co-creation and the energy transition
- How do you design co-creation processes?
- What are some challenges of co-creation processes?

Theme 4:
- Are there other projects you've done around the Dutch energy transition that follow something really different?
- What kind of projects do you work on that have to do with energy transition?







These were the templates used for taking notes during the interviews.
1 Design process
2 Co-creation process (from start to feedback & continuation)
    Why do you co-create?
    Steps: what are the activities?
    Stakeholders: which roles have the different actors taken?
    Co-creation tools
    Goals & outcomes of co-creation
3 Stakeholder mapping

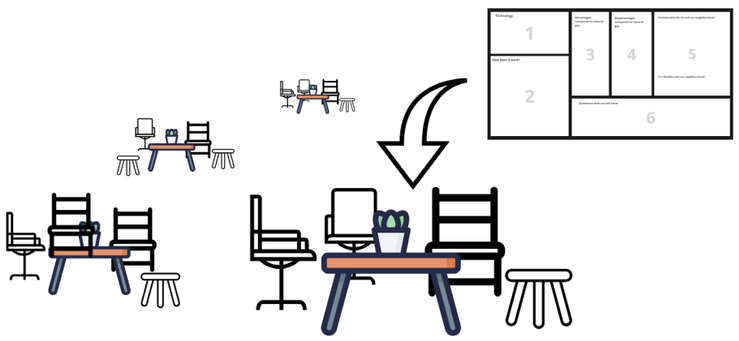
Appendix B.2: Exploratory interview with municipalities

Theme 1: Organization
Please tell me about your role and energy transition projects.
What kind of energy transition projects do you work on?
What are some challenges that they are facing with their communities?

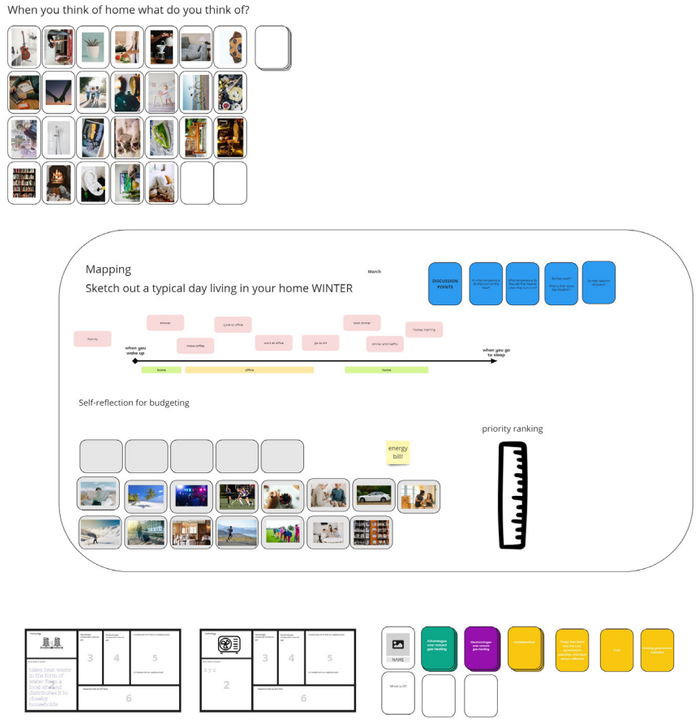
Theme 2: Feedback on co-creation ideas

Share Miro board with idea. Ask them to verbalize their thoughts about the idea.
Would this be something that would work? What aspects are interesting?
How might they see the idea work in their communities?

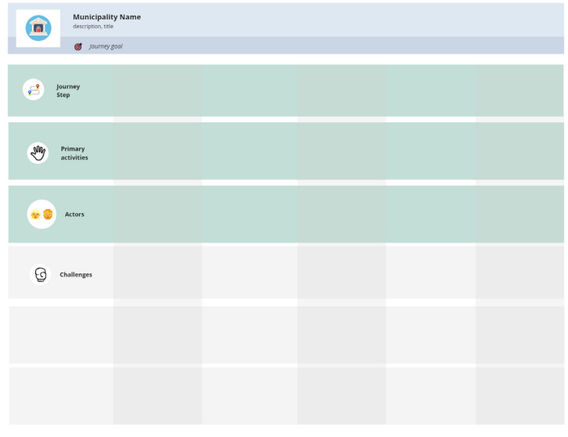
Design idea 1:

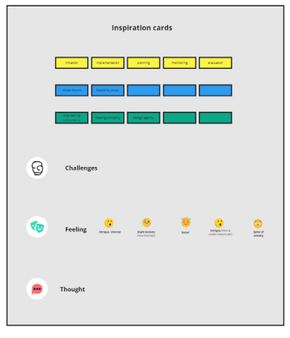


Design idea 2



Design idea 3





Appendix B.3: Exploratory interview with parent

Can you describe how you, as a parent, motivate your children to do things? (For example, when they are young and you want them to do their homework)

How do you feel about comparing the energy transition to this relationship (i.e. municipality as parent)?

Appendix B.4: Design concept testing with municipalities

Theme 1: introduction
Please describe your role and your experience with the energy transition

Theme 2: design concept
Share my screen with design concept. Go through the design in 4 sections, stop after each section and ask what do you think? Verbalize their reaction.

Theme 3: Questions about desirability, feasibility, and viability

Desirability
Does this solution solve the right problems?
Is this something the municipality wants or needs?

Feasiblity
Does this solution fit the capabilities and current resources of municipality?
Is this solution feasible?
Are there any foreseeable challenges in implementing a program like this? (technical, financial)

Viability
Does this solution fit with the way municipalities do things?
Does this solution fit into the long-term goals or strategy of the municipality?

Appendix B.5: Design concept testing with homeowners

Theme 1: introduction
What has been your experience with the energy transition?

Theme 2: design concept
Share my screen with design concept. Go through the design in 4 sections, stop after each section and ask what do you think? Verbalize their reaction. What is most interesting? What are some points of improvement?

Appendix B.6: Roadmap testing interview

Share my screen with roadmap in Miro. Go through the roadmap row by row from top to bottom, stop after each section and ask them to verbalize their reaction.

- What is most interesting? What are some points of improvement?
- What do you think about:
  - The vocabulary used to adapt the roadmap for commercial companies to public sector?
  - Time frame for the horizons?
  - Does it make sense to grow the program at this rate

Appendix B.7: Roadmap testing questionnaire

I would like to hear your comments about:

1. the terminology of the different rows (Typically this roadmap is for private sector, I have tried to change some of the headings to reflect the public sector since this roadmap is for municipalities)

2. the timing of the three horizons (does it make sense, do some horizons need more or less time?)

3. thoughts on the last row, does it makes sense to incorporate co-creation as a skill and competency that municipalities can develop and apply in different sectors/fields where citizen engagement is important?

4. Policy development

- Could the output of the program inform policies? and if so, what type of policies do you think would make the most sense?
- The following example is what I have thought of so far, but maybe you could let me know whether this sounds possible or if I am way off and I'm also very open to hearing other ideas.
- One example of how policy could change is perhaps the subsidies available for different technologies. There could be households clustered locally that have a similar socioeconomic level that might inform the types of financial assistance options. If there are many households with the same type of dwelling, they might have similar technical feasibility constraints, which may lead to similar technology chosen, which could inform the types of subsidies the municipality might work to make available for the community.
- The timing of policy in the roadmap
- Right now policy development is positioned in the third horizon + last row, but could this be something that happens right after the pilot? I am not really sure how long a policy development cycle is and how it typically is developed now. Below is a visual that I have found from some desktop research about the policy development process, but I would really love to hear your comments about this from your perspective and experience.

5. Cost and money sources:

- The cost is relatively straight forward (the costs of the mentorship program will include the workshop materials & spaces, potential compensation for mentors, municipality staff salaries), but it would be nice to hear your thoughts about **money sources**. I think that this could be a whole topic in itself, but I have listed some of the potential sources below, and based on your experience, what would be the best way to represent this in the roadmap? I'm sure you could go into lots of detail here, but perhaps you could give me an idea pragmatically what would make sense.

Different sources of money:

- Taxpayer's money: local and national
- Municipalities have some budget in the energy transition
- Municipalities can apply to national funding

6. From my previous research, I get the sense that neighbouring municipalities, especially smaller ones meet with each other to exchange practices.

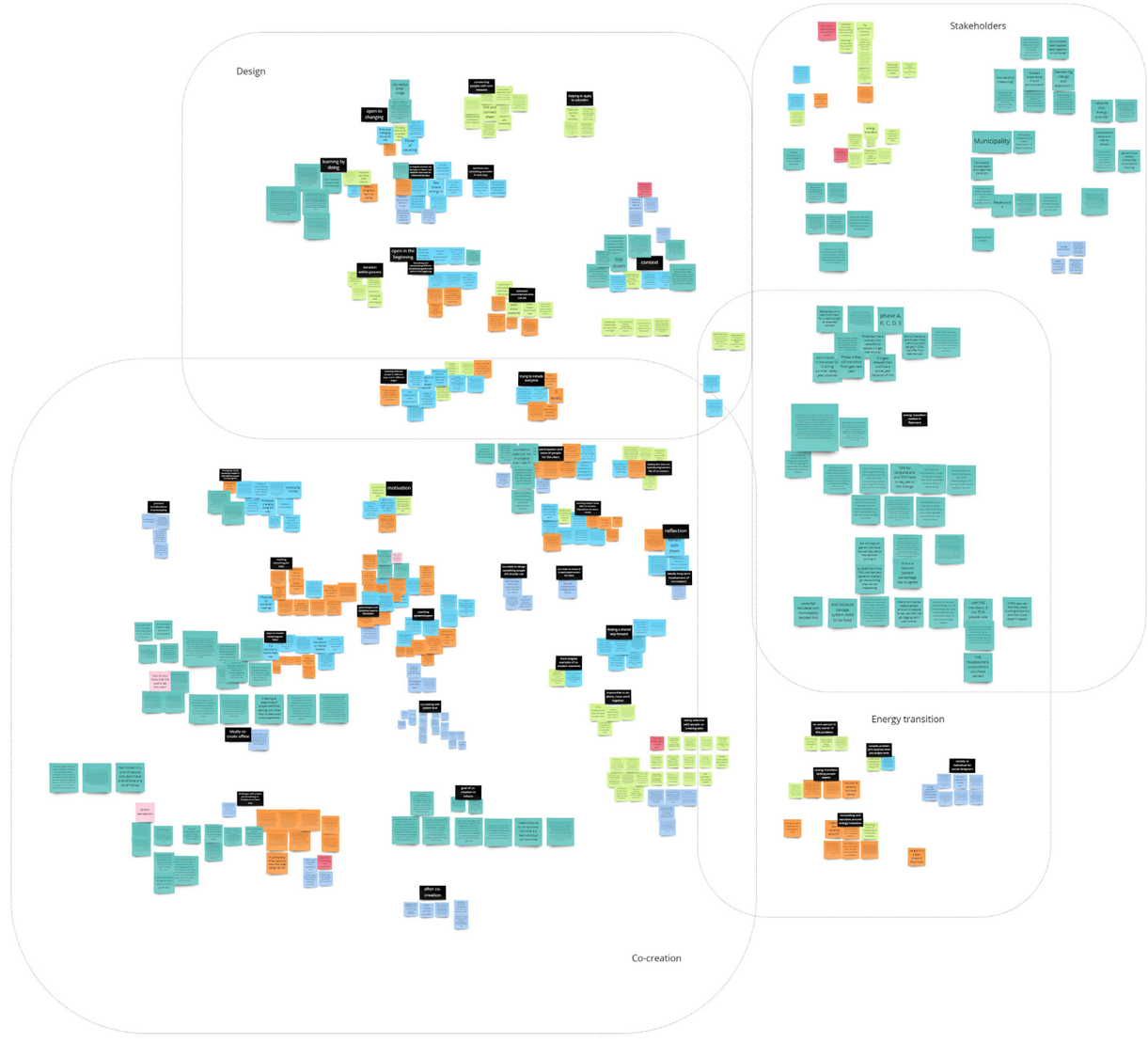
Do you think it would make sense if the program is being implemented, for it to be shared between municipalities (e.g. if it proves to work well or sharing their learnings from the running the program)? **Would this be something that could be shared through the Association of Dutch Municipalities (Vereniging van Nederlandse Gemeenten (VNG))?**

Appendix C:
Analysis of interviews with design agencies

Appendix C: Thematic analysis for interviews with design agencies

The aim of the analysis was to understand how co-creation is understood by design agencies, how they were implementing it in their projects, and the challenges that they face that make it difficult for them to implement co-creation ideally. Moreover, patterns that emerged across the different design agencies.

Using the interview transcripts and listening to the recordings again, I made notes of the interviews. I copied and pasted quotes as post-its on Miro and did a thematic analysis. Quotes were colour-coded; each interview was a different colour. I clustered the post-it's from all the interviews and clustered them. I labelled each cluster with a heading. In order to find patterns across the interviews, I focused on the clusters that had quotes from all the interviews.



Appendix D: Alternative sustainable technology information

Appendix D: Alternative sustainable technology information

Insulation
According to a report by the International Energy Agency Technology Collaboration Program on Heat Pumping Technologies (Technology Collaboration Programme on Heat Pumping Technologies (HPT TCP), 2020), the first step towards sustainability is reducing energy demand of a home with technologies such as HR ++ glass, cavity wall insulation, floor insulation, roof insulation or heat recovery. They state that “Irrespective of the heat source of the household (boiler, heat pump, hybrid heat pump or district heating network), reducing energy demand is the first step in reducing CO2 emissions and reducing energy bills.” (HPT TCP), 2020)

Heat pumps
Heat pumps extract heat from the environment — air, soil, water — using electricity and then the heat can be used for space and water heating. There are different types of heat pumps, which have different capacities such as heating a single household or an apartment complex (Zonnepanelen Planet, 2022). Heat pumps cannot produce high temperatures and the building structure needs to be well insulated. Heat pumps generally require electricity, but are very efficiency; “a leading edge (at present) residential heat pump can deliver heat at 600% efficiency, compared with a gas heater at 50% to 95% efficiency” (Pears & Andrews, 2015). There are different types of heat pumps, for example a hybrid or fully electric heat pump. A hybrid heat pump still requires gas supply in addition to electricity. There are also different types of heat pumps, that may be used for an individual household or multiple households.

District heating networks
District heating entails using heat sources already present around a customer area and transporting heated water over a network of pipes to a district heating customer area comprised of households (Accenture, 2020). An example of where heat can come from are power plants for electricity (that use biomass, gas, or coal).

There are conventional district heating systems and decentralized district heating systems. In the former, there are usually one or a limited number of centralized heat sources (fossil fuels or biomass). The distributed heat to consumers is at high temperature levels, typically above 65°C (Accenture, 2020). In a decentralized district heating system, there are multiple decentralized heat sources and the distributed heat is usually at lower temperature, typically between 25°C and 65°C (Accenture, 2020).

Most heat networks in the Netherlands are privately owned by companies and heat suppliers are vertically integrated. In 2015, 40% of all heat consumers were connected to a heat network from one of five players and these players are responsible for a third of all heat supplied to heat consumers (Vitéz & Lavrijssen, 2020). Electricity will still be supplied to these places for other uses that would typically use gas such as stove tops. From 2018, new homes will be built with no gas connection (CE Delft, 2022).

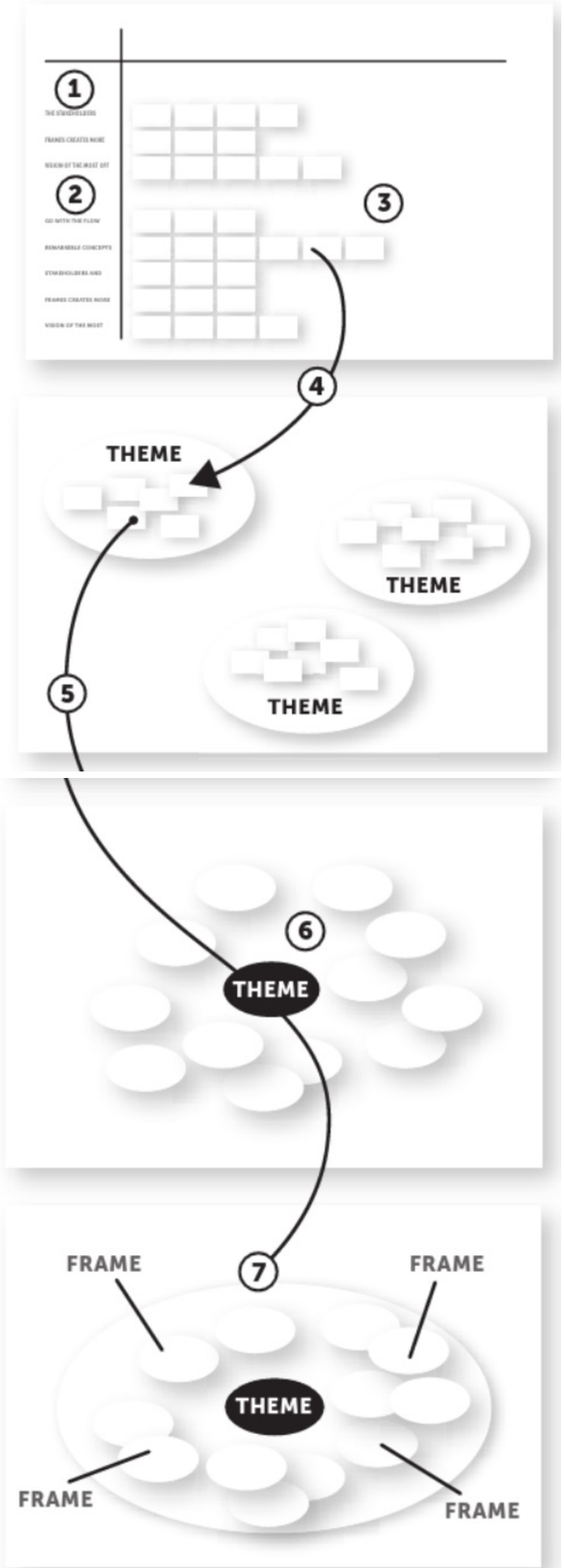
Heat waste production depends on other processes such as using heat waste that makes heat production more difficult to predict and be reliable. Heat networks are closed systems (so water is pumped around but does not leave and only heat is delivered to consumers), so it is challenging to add parties. Therefore the investment is more complicated than investing in a single production process. Heat demand fluctuates due to seasons and difficulty to store, therefore, it is important to have auxiliary heat sources available to deliver heat to the grid, especially if demand outgrows supply (Vitéz & Lavrijssen, 2020).

Hydrogen
Hydrogen is briefly discussed here. This is because multiple interviews with the municipalities and design agencies have mentioned that there are hydrogen proponents in their citizen engagements, additionally, in the following sections, some stakeholders mention hydrogen as a new field of exploration for the future. Hydrogen is an energy carrier and a means of storage. Although it is not an energy source in itself, it can be used to move and store energy. There are some companies, especially gas grid operators that are interested in hydrogen gas as it will allow the existing gas infrastructure, which is vast. Moreover, it is very energy dense i.e. burning a kg provides 2.6 times more energy than burning a kg of natural gas. Having said this, there is no natural source of hydrogen, so it must be created and it requires putting in more energy in that you will get out. Hydrogen can be created in different ways, which also provides the different types of hydrogen (The Economist, 2021):

- grey hydrogen is made with natural gas
- black is made with coal
- blue is with the same technologies but in conjunction with added CCS
- green is product of electrolysers running off renewable energy
- pink is electrolysers which use nuclear power
- turquoise is heating methane until hydrogen and carbon is separated (pyrolysis)

Appendix E:
Frame Innovation step 5 themes & step 6 frames

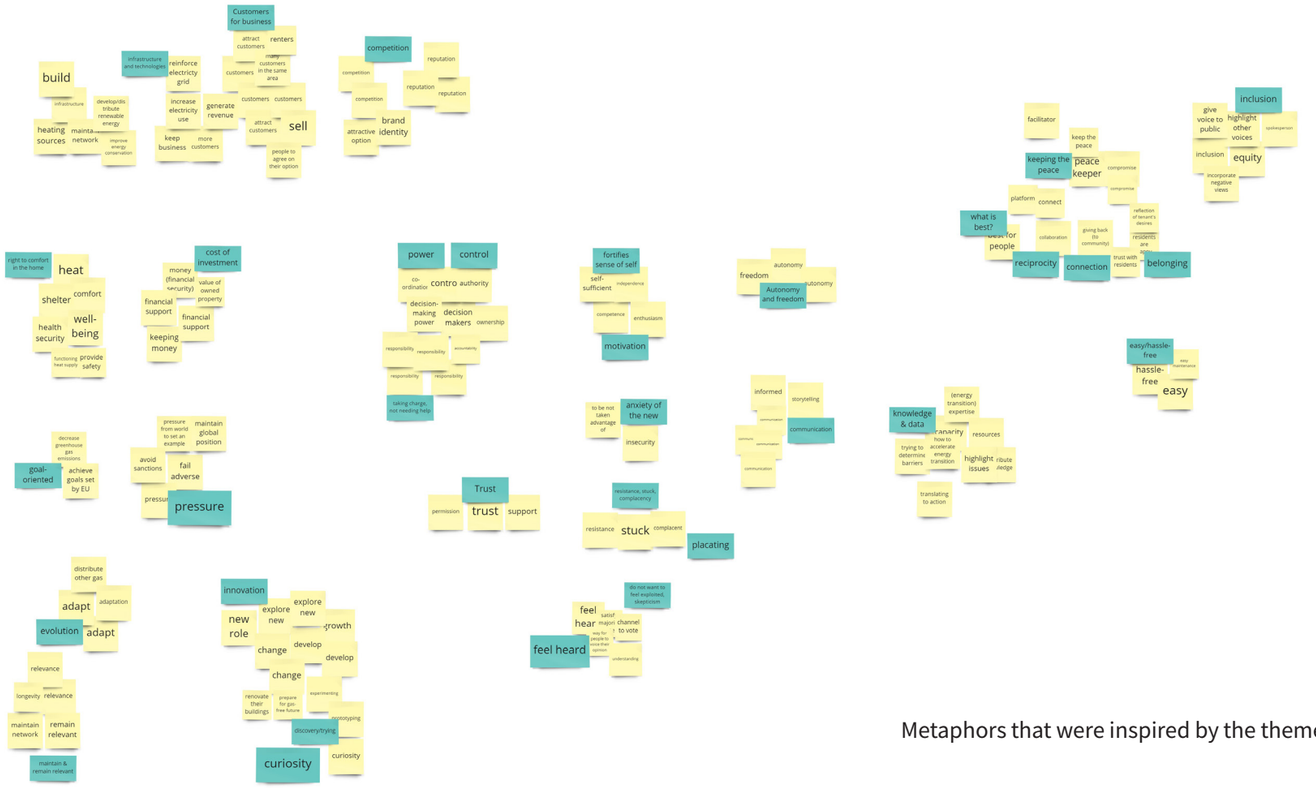
Appendix E: Frame Innovation step 5 themes & step 6 frames



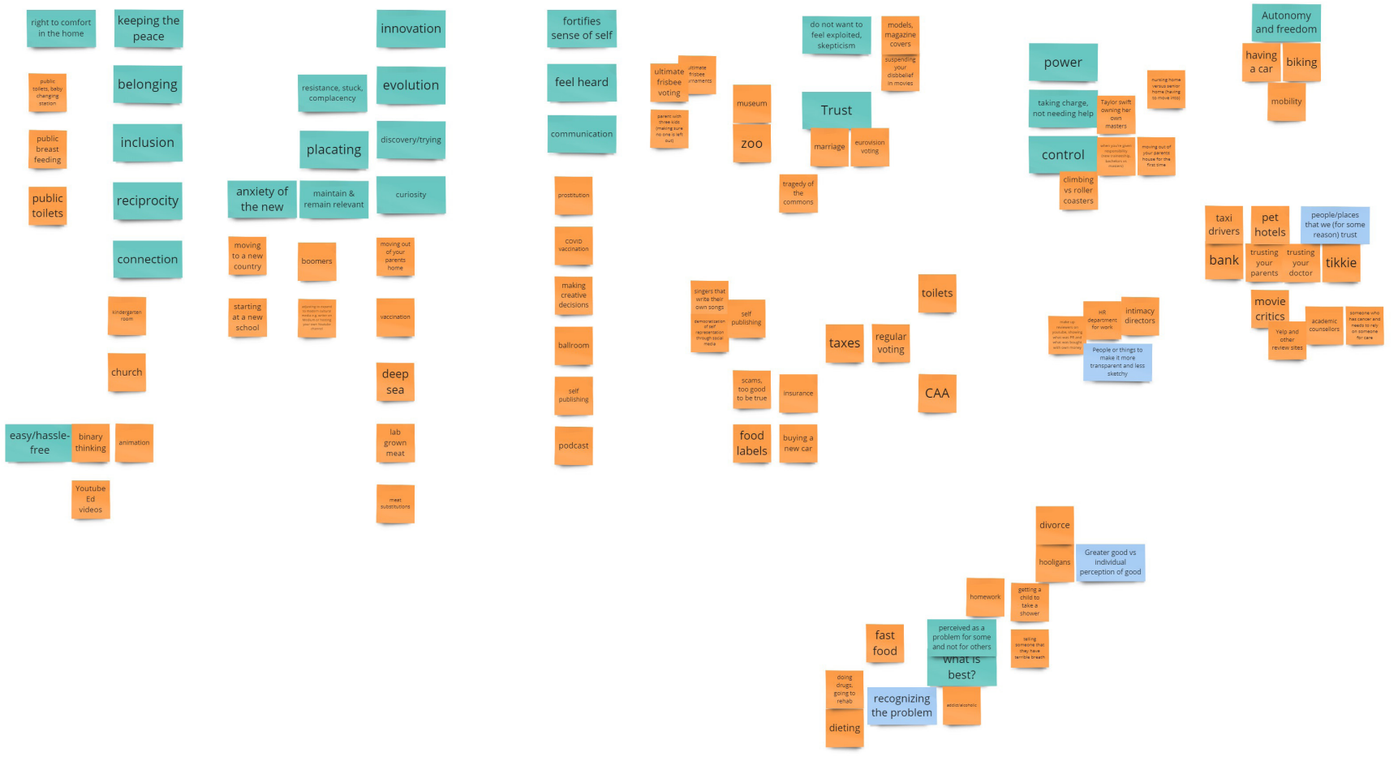
To go from context step to frame step, I followed a suggestion from Frame Innovation book. The figure to the left illustrates the different steps that I followed (Dorst, 2015, p.163):
1&2. create a list of core stakeholders (from context step) and players (from field step)
3. list what is important to each stakeholder, i.e. their needs, values, 'currency'
4. these note s (needs, values, currecy) are reclustered, irrespective of the stakeholder with which they were originally associated with
5. clusters are labelled and possible themes emerge
6. these clusters can relate to the label in various ways and can help define the central concept
7. these clusters can spark new frames

I listed the stakeholders (from context and field steps) and wrote their needs, motivations, experiences, and values based on what I gathered from research.

The needs, motivations, experiences, and values were clustered and labelled.



Metaphors that were inspired by the themes and clusters



Some examples of potential frames during this exploration phase include:

- Intimacy coordinators
- Moving to a new country
- Ballroom

Intimacy coordinators

Intimacy coordinators are a relatively new kind of role in the film industry where they hire a third person to help assist in filming intimate/sex scenes between actors - these could include working with anything to do with nudity, sexuality, sexual violence, sexual tension, hyper exposed depictions. They choreograph and specialize in how to stage these scenes. They act as a liaison between actors and production, act as an advocate for them and ensure their well-being. People usually made the move from working in fight and movement direction before training in intimacy. The result of having an intimacy director is positive for directors because it relieves pressure and frees people up to be in the moment and to focus on the acting (so maybe in this case free residents up to think about the future of their home and what this means). Ed Guiney, executive producer of Hulu's Normal People, which used an intimacy coordinator, says he was "concerned that an intimacy coordinator might interfere in the creative relationship between the cast and the director." But he came away from the experience pleasantly surprised. "It takes a lot of the awkwardness out of shooting these scenes and really frees the actors up to properly be in the moment," (Hilton, 2020).

Ballroom

In the LGBTQ+ community, they have taken something where they are normally on the margins of and have created a space and community of acceptance. Underground ballroom first emerged in the United States, but has since been showing up all over the world. It comprises of a set of competitions that "consist of an entire language of concepts, categories, dances, and slang that are unique to the subculture" (Halliwell, 2021). Different houses compete against each other, and these houses are self-chosen queer families, usually with a house parent who are heads of the houses. The houses comprise of individuals who were not able to openly express their gender identity or sexuality with their biological families. This was in response to heteronormative and traditional gender roles. Ballroom culture emerged in and around New York City in the 1920s. At the time, it was mainly white people putting on fashion shows, and in response to the racist ball culture, in the 1960s the queer black community established their own underground culture.

Moving to a new country

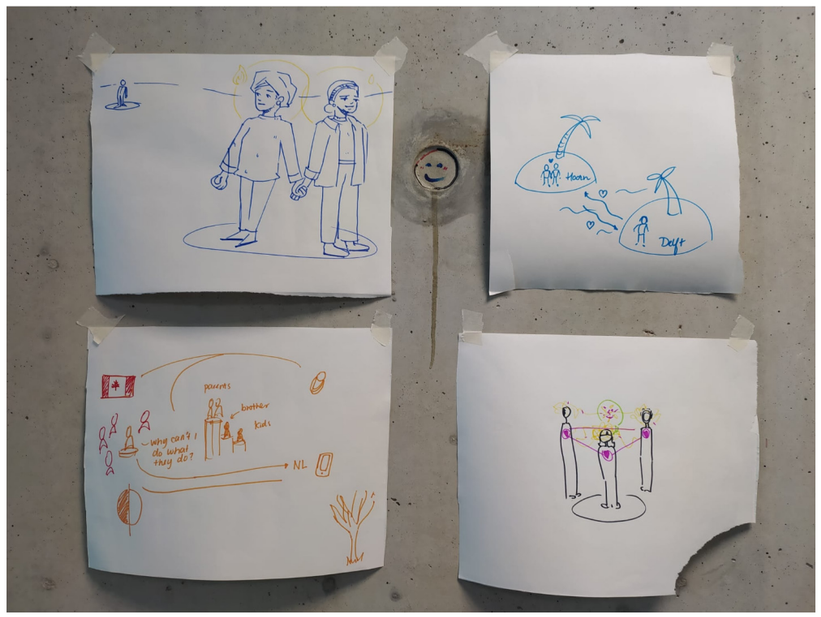
There are various situations that lead people to move. When I was two years old, my family immigrated to Canada from Hong Kong. My parents had a dream to provide their children with a better quality of life. When I decided to move to the Netherlands from Canada, I was in a situation where I did not have to move - I had a job, social network, and quality of life. But I chose to move for my boyfriend. This was very challenging because I had to consider what I was giving up and what I might gain. The metaphor for the energy transition fits better with the latter situation. The path of least resistance is to do nothing, but continue on the path one is on. In the case of moving, it took more effort and resources to make a change that was not necessary. In comparison to moving residential spaces away from natural gas, many people do not perceive natural gas heating as a problem. With the rise in gas prices, that has contributed to many people looking for alternatives, however, natural gas heating in itself fulfils its function and asking people to adopt an alternative heating solution will require them to move away from the path of least resistance and put in the effort and resources to make a change to something that is not perceived as a problem.

Moving to a new country, you have to get orientated. There are also lots of logistics for example arranging things like shelter, insurance, income, transportation, documentation, visas or resident permits. To feel more prepared, it would help to do research beforehand. There are also many different places to find information such as government websites, the consulate/embassy, Facebook expat groups, or seeking out previous friends or acquaintances that have made the same move. It could also help to meet up with people in a similar situation (language classes, expat meetups, people from the same country). After the move there are practical things like finding the supermarket, checking out what kind of food there is or there isn't. There are also other things in addition to the practicalities such as building your own personal network, finding things you like to do, and learning the language if you don't know it.

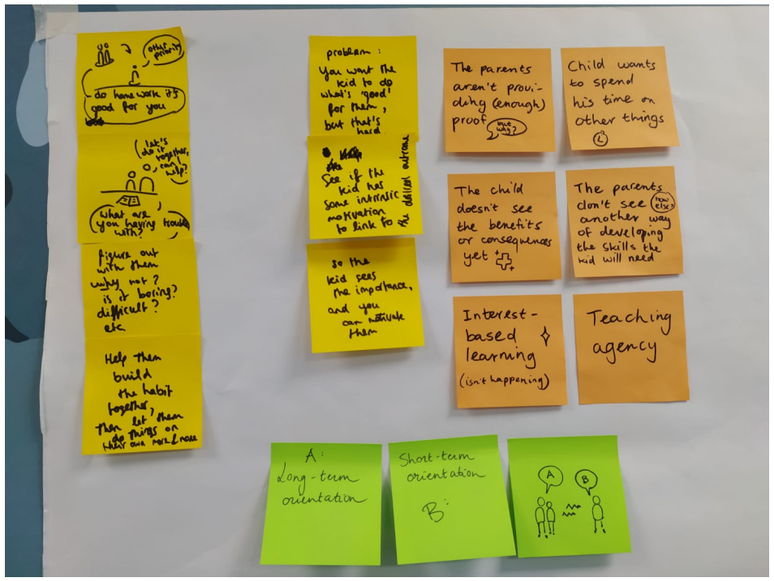
Appendix F: Ideation

F.1 Output from group brainstorming session
F.2 Design ideas

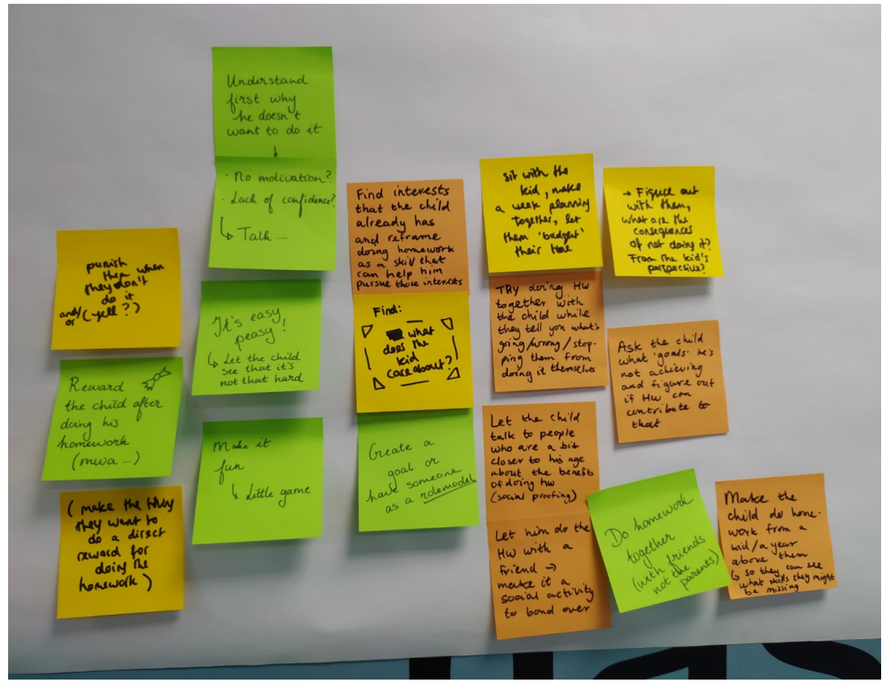
1 Sketch your relationship with your parents



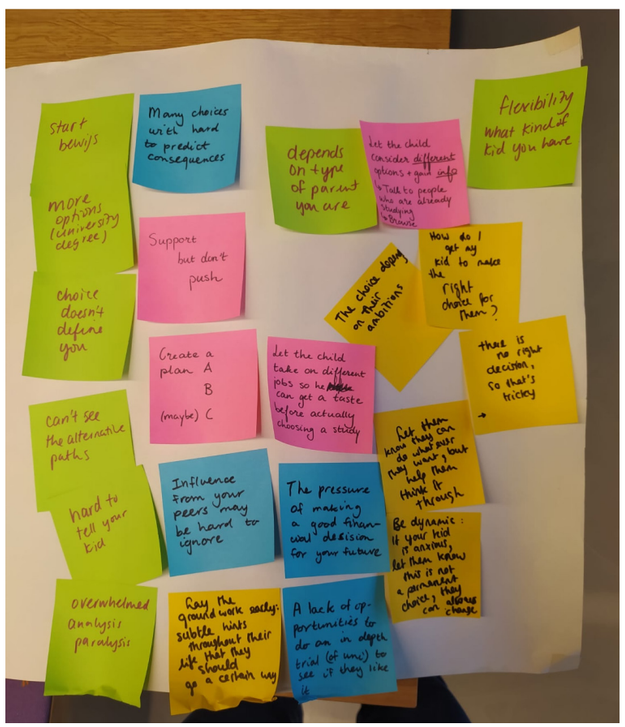
2a Brainstorm about problem situation 1: Parent trying to get their child to do their homework



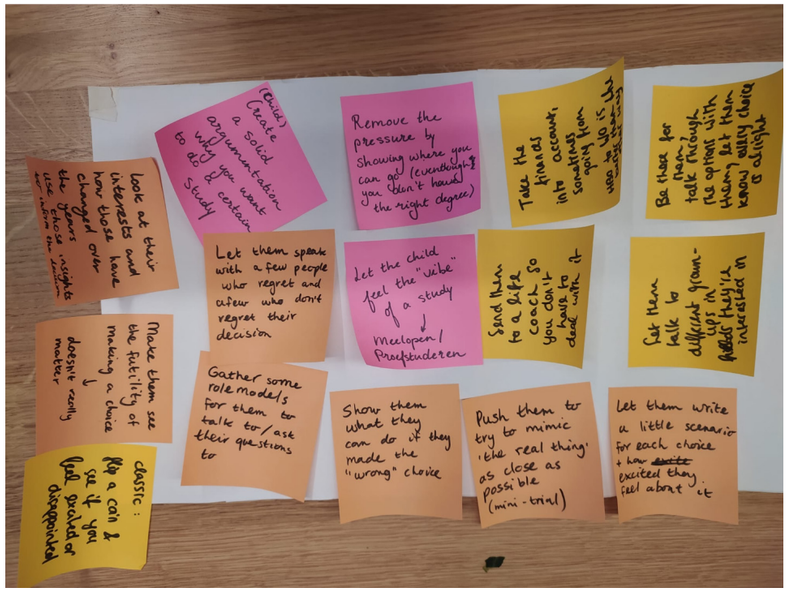
2b Brainstorm potential solutions for problem situation 1

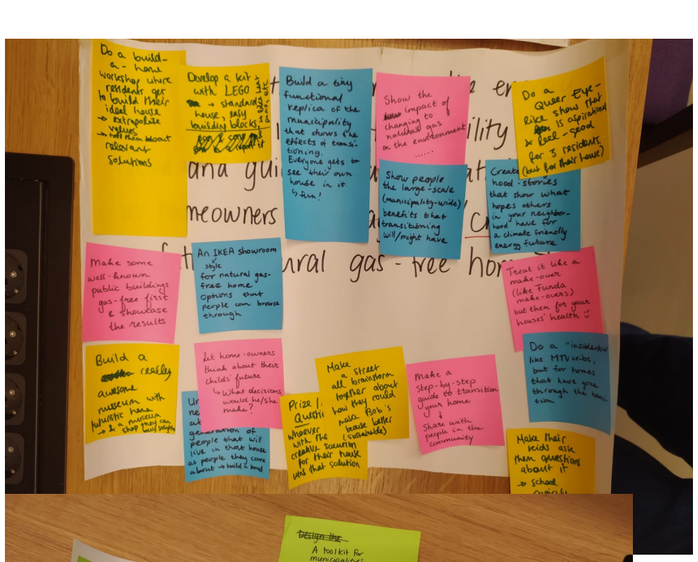


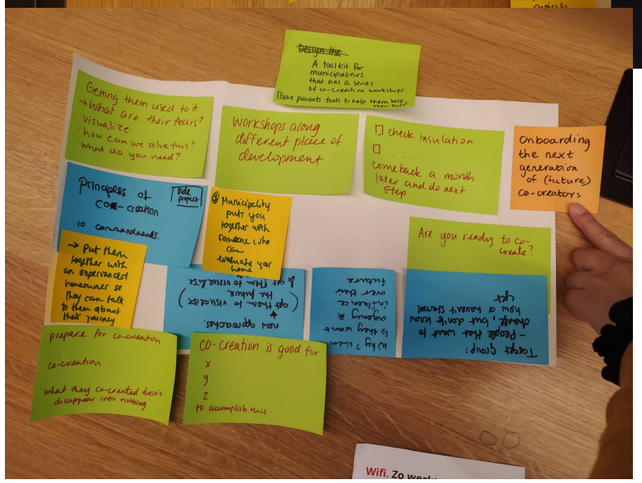
3a Brainstorm about problem situation 2: Parent helping their child make a decision about what their child wants to do after high school



3b Brainstorm potential solutions for problem situation 2







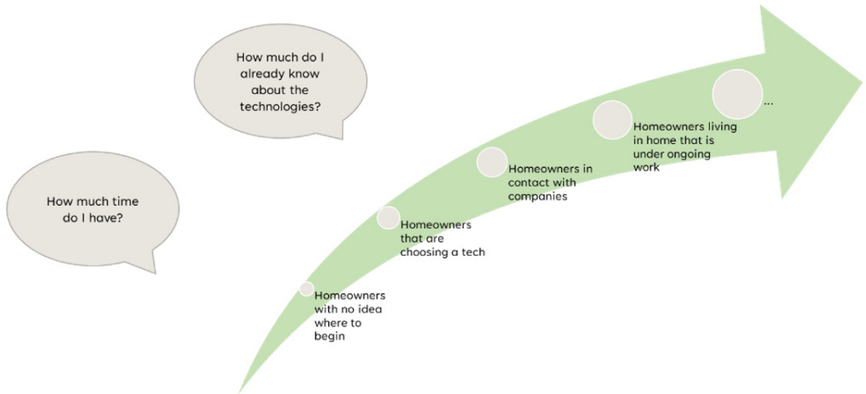
Apply metaphor to project context and brainstorm ideas

Appendix F.2: Design ideas

From the overall brainstorming, three ideas were selected to develop further. Brief descriptions of these three ideas can be found below.

Design idea 1 Assessing readiness of homeowners
A tool that helps municipalities assess and homeowners reflect on their current situation. Depending on this you could categorize/group the residents into people in a similar stage and there could be different type of co-creation tool/session that will help them achieve what they want.
What it will achieve:

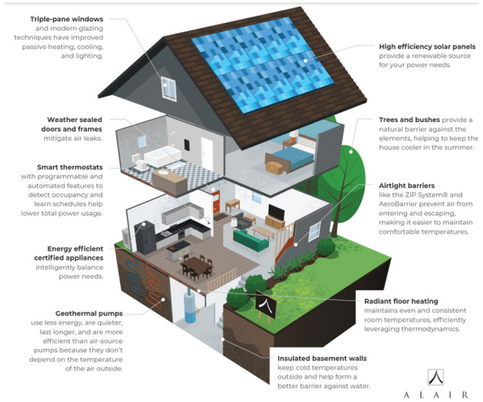
- For municipalities: help municipalities know what resources to target to which people, municipalities can determine what co-creation approach is best for which groups of people.
- For homeowners: people in the same group can support each other, better grasp of their situation and what they need



The homeowner's journey towards a gas-free home and some factors that might influence this, such as, time and knowledge.

Design idea 2 ‘Build a home’ paper prototype
A kit with modular blocks, could be LEGO or digitally or paper prototyping, where participants can build their ideal house with standard technologies and see how it changes your house. Homeowners can imagine what their home could look like with the different options.
What it will achieve:

- Help homeowners make decisions about their homes
- Interactive and fun way for homeowners to learn about the different technologies and what the advantages or disadvantages are for their home



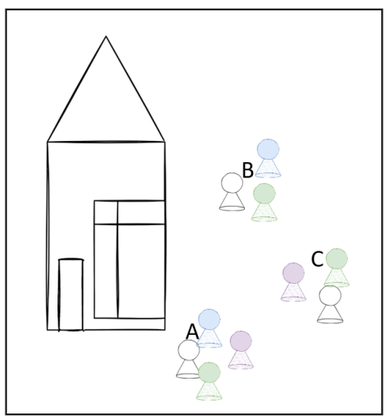
Google search image to help explain Build a Home idea
(Alair Enterprises Canada Ltd, 2021)

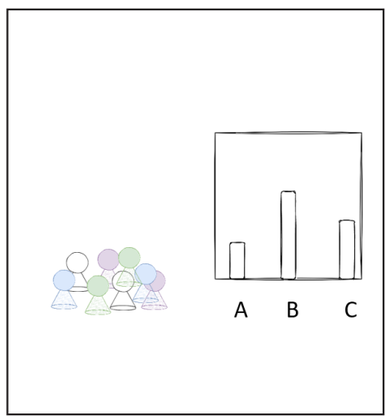
Design idea 3 Design a house contest (hackathon)
A community hackathon:

- Someone submits their natural gas house for the competition
- Community members sign up for hackathon
- Small teams to brainstorm best way to discontinue natural gas for the house
- Neighbourhood-wide vote for the best idea

What it will achieve for homeowners:

- Increase motivation in community
- Inspire others with ideas for their own home
- Familiarize people with technologies
- Make new connections between people in the groups





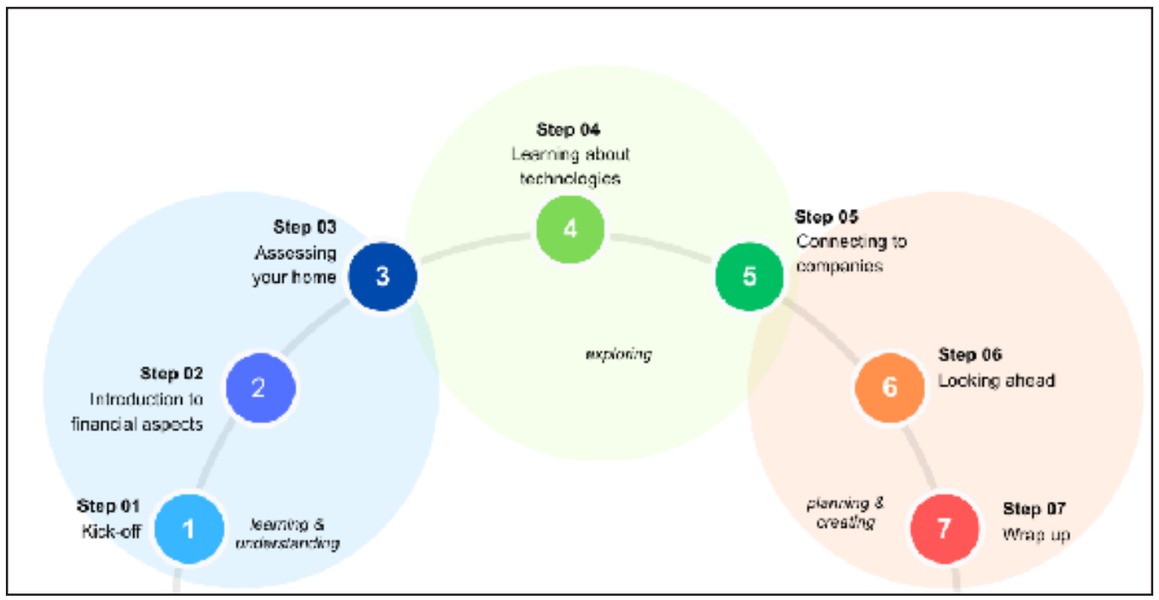
Appendix G: Final toolkit

Appendix G:
Final toolkit

The toolkit is complementary to the different workshops. These tools are inspired by co-creative practices from the field of design. These aim to help program participants express their creativity and facilitate collaboration. It is likely that the municipality is already addressing the workshop topics with existing initiatives, so think of this toolkit as a way to complement those.

The tools are:
1. Kick- Off:
    - **Mentor journey mapping**
2. Introduction to financial aspects:
    - **Reflection on home heating and budgeting**
3. Assessing your home:
    - **Home Energy Assessment Self-Guide**
4. Learning about technologies:
    - **Tiny Tech Cards**
5. Connecting to companies
    - **Question brainstorming template**
6 .Looking ahead:
    - F**uture planning template**

The goal, description, and value added of each tool will be presented, followed by the templates for the tool.



In the toolkit:
Stock photo images found via Pixabay
Icons made by Freepik from@flaticon

1. KICK-OFF

Tool name: Mentor journey mapping

Goal
This is a time to kick-off the program by introducing participants to the what they can expect from the program and to each other. After this session the homeowners should:

- be acquainted and have set expectations on how and how often they communicate with each other throughout the program
- an understanding of the program

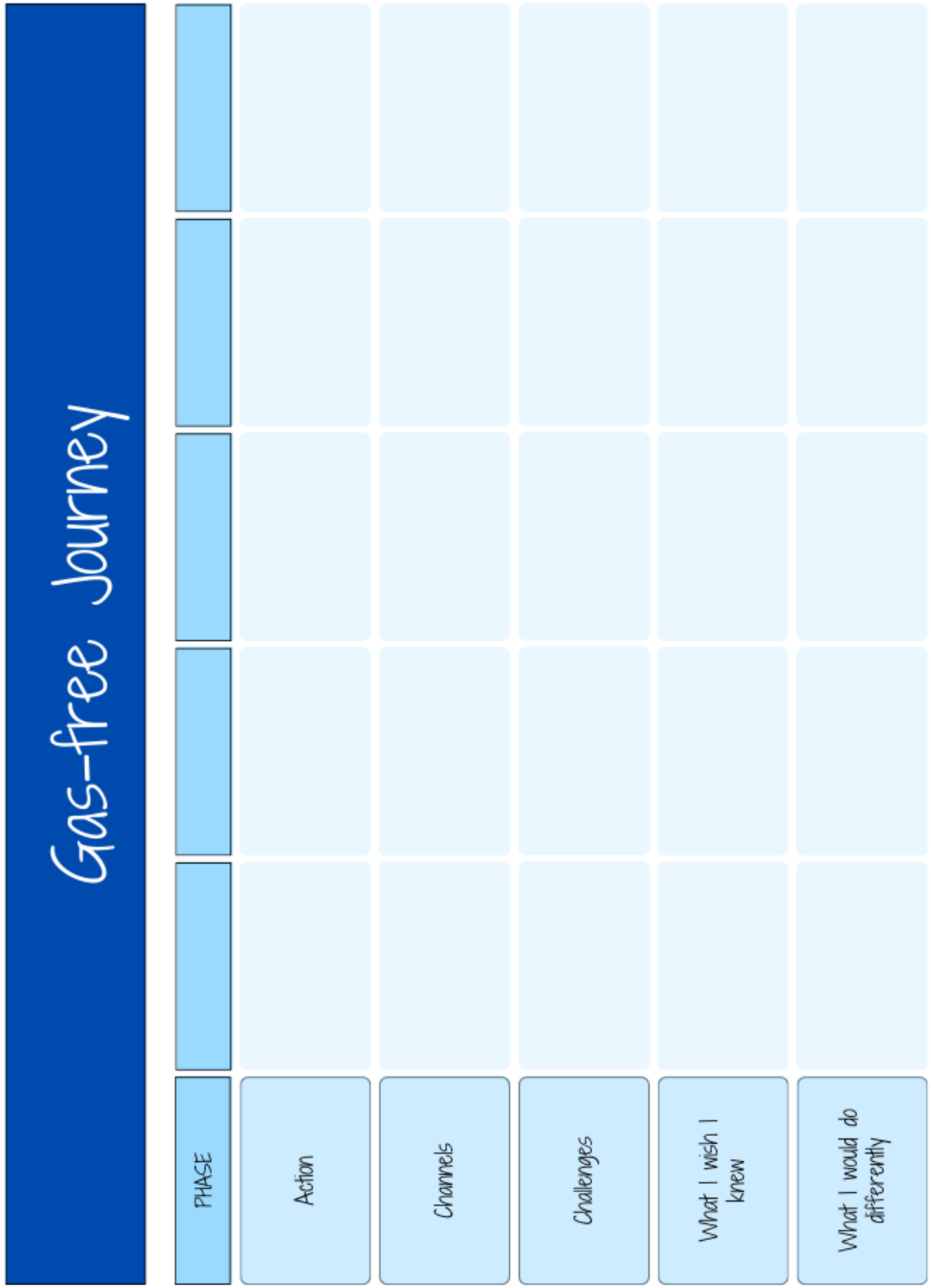
Description
Journey mapping is an interactive way for mentors to share what they did in to transition their homes away from gas with the mentees. It is recommended to fill out the template from left to right and top to bottom. Challenges, 'What I Wish I Knew', 'What I Would Do Differently' should correspond to a specific action. For example the Action: calling companies should have a corresponding challenge in the row below.

Value added

Visual template helps ground the journey, creates shared understanding among group members, is a reflection tool for mentors.

Insights shared, such as the 'Challenges', and 'What I Wish I Knew' are valuable because it is beyond the information that mentees can research online.

Journey mapping activity is flexible so that it can accurately reflect the personal journey of the individual.



Prompts for "Phases of the journey" and "Actions"

becoming aware of going gas-free

researching technology options

reaching out to companies

assessing my house

budgeting

insulation

talking to my neighbours

Prompts for channels

energy company

website

municipality

information session

family

neighbours

financial advisor

Example of a template partially filled out.

Gas-free Journey

mentor 1

mentor 2

Google technologies

PAW website

ask neighbours

paid company

do it myself

website

neighbours

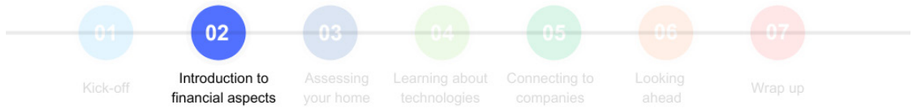
“x energy company name”

found info online

difficult to sift through all the info

neighbors have a different kind of house, so choices didn’t make sense for me

2. INTRODUCTION TO FINANCIAL ASPECTS



Tool name: Reflection on home heating and budgeting

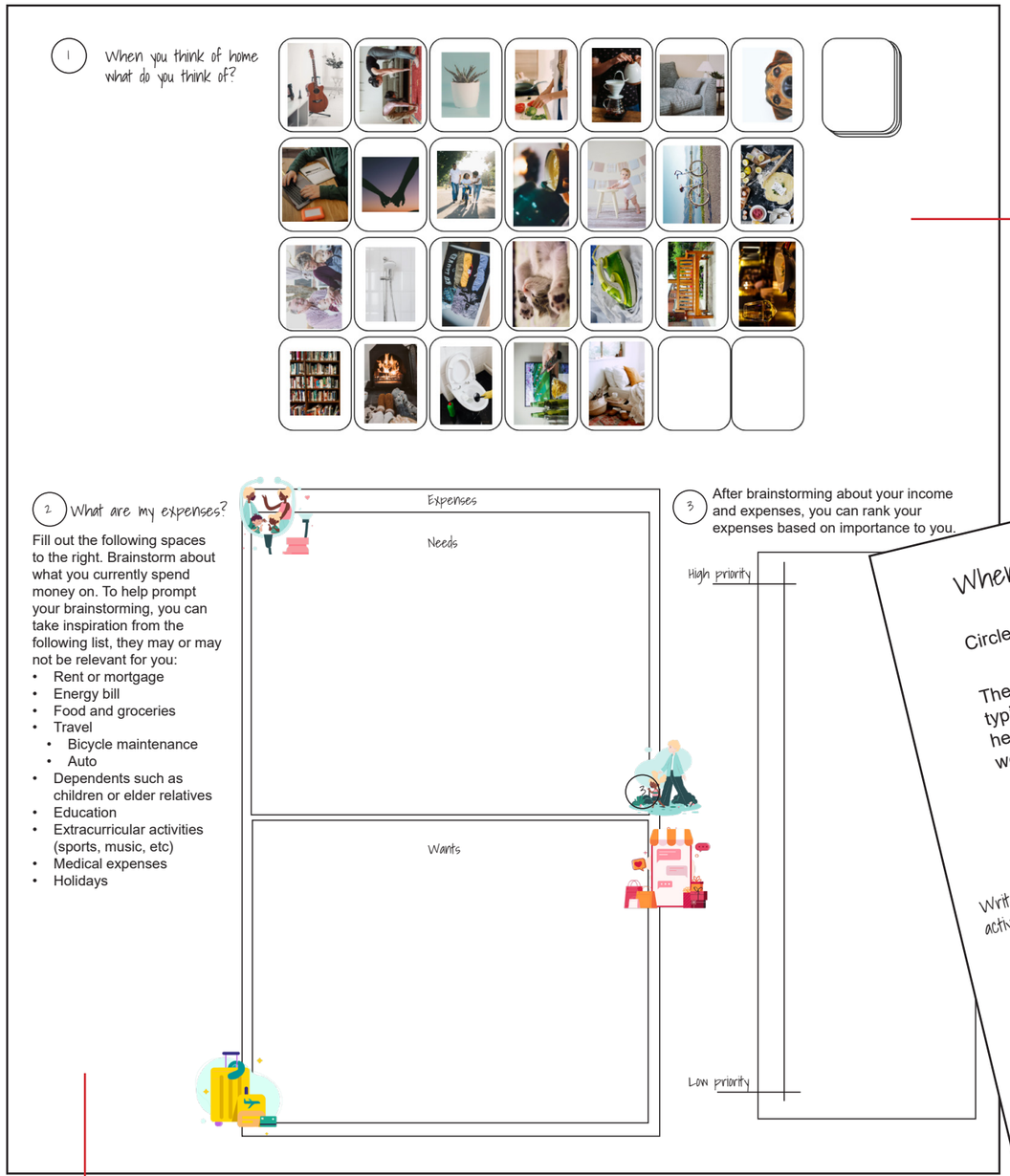
Goal

This is a time to kick-off the program by introducing participants to the what they can expect from the program and to each other. After this session the homeowners should:

- be acquainted and have set expectations on how and how often they communicate with each other throughout the program
- an understanding of the program

Description

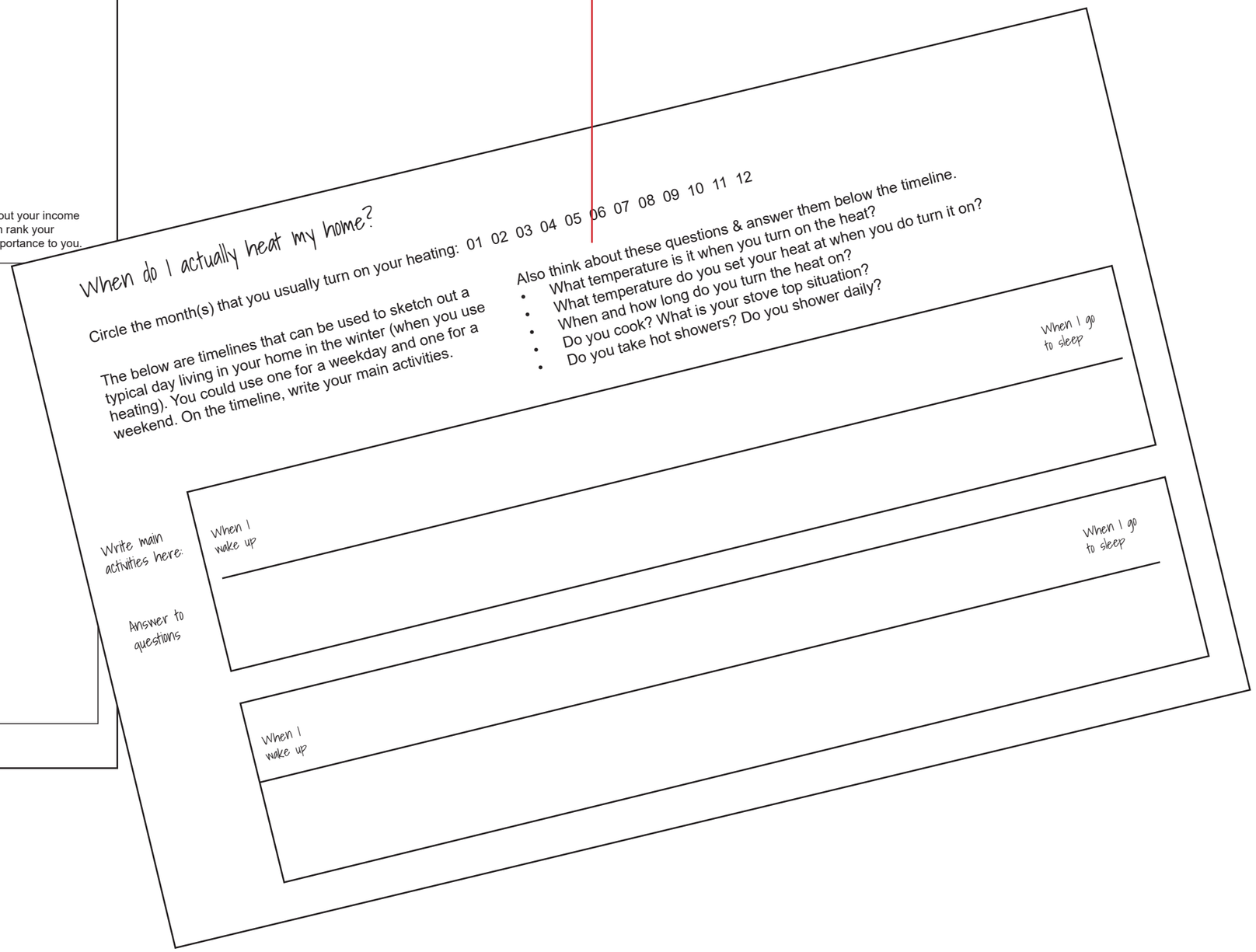
Journey mapping is an interactive way for mentors to share what they did in to transition their homes away from gas with the mentees. It is recommended to fill out the template from left to right and top to bottom. Challenges, 'What I Wish I Knew', 'What I Would Do Differently' should correspond to a specific action. For example the Action: calling companies should have a corresponding challenge in the row below.



Homeowners think about their homes not just relative to the energy transition, but to think about other values that their home provides for them.

Homeowners visualize their financial situation and reflect on what is important or imperative financial expense.

This part grounds the homeowner to their daily life.
Guides them in thinking about the role heating plays in their home.
Starting point to start thinking about other ways going gas-free might impact their home such as having to change their stove top or hot water.



1 When you think of home what do you think of?

2 What are my expenses?

Fill out the following spaces to the right. Brainstorm about what you currently spend money on. To help prompt your brainstorming, you can take inspiration from the following list, they may or may not be relevant for you:

- Rent or mortgage
- Energy bill
- Food and groceries
- Travel
  - Bicycle maintenance
  - Auto
- Dependents such as children or elder relatives
- Education
- Extracurricular activities (sports, music, etc)
- Medical expenses
- Holidays

Expenses

Needs

Wants

3 After brainstorming about your income and expenses, you can rank your expenses based on importance to you.

High priority

Low priority

4 When do I actually heat my home?

Circle the month(s) that you usually turn on your heating: 01 02 03 04 05 06 07 08 09 10 11 12

The below are timelines that can be used to sketch out a typical day living in your home in the winter (when you use heating). You could use one for a weekday and one for a weekend. On the timeline, write your main activities.

Also think about these questions & answer them below the timeline.

- What temperature is it when you turn on the heat?
- What temperature do you set your heat at when you do turn it on?
- When and how long do you turn the heat on?
- Do you cook? What is your stove top situation?
- Do you take hot showers? Do you shower daily?

Write main activities here:

When I wake up

When I go to sleep

Answer to questions

Write main activities here:

When I wake up

When I go to sleep

Answer to questions

3. ASSESSING YOUR HOME

01 Kick-off · 02 Introduction to financial aspects · 03 Assessing your home · 04 Learning about technologies · 05 Connecting to companies · 06 Looking ahead · 07 Wrap up

Tool name: SELF ASSESSMENT GUIDE

Costs are a big concern for homeowner's transitioning their homes. This stage is to introduce and get mentees acquainted with the basic financial aspects with respect to transitioning homes. Homeowners should have a better understanding and build their financial literacy.

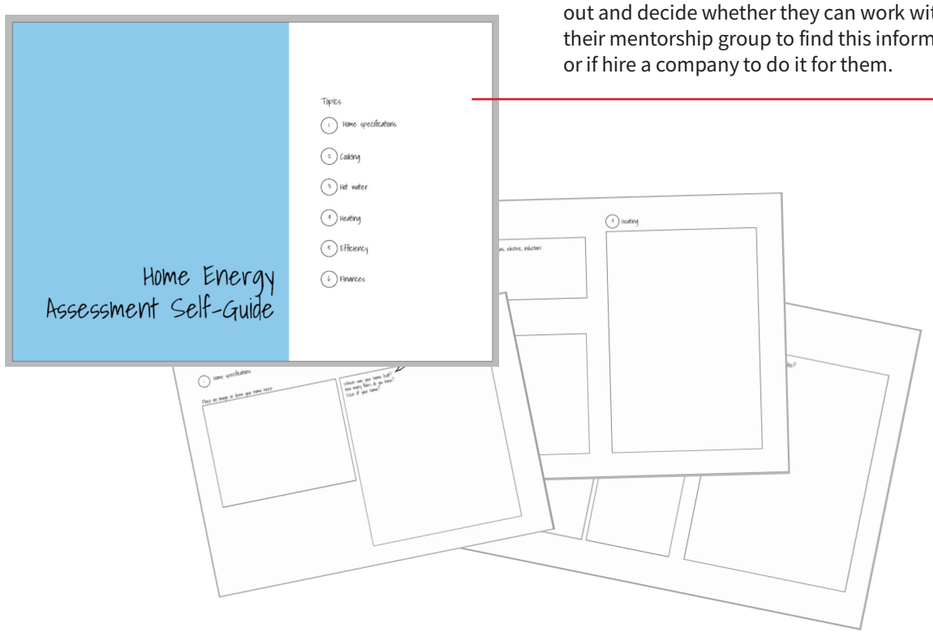
- What will save me on my energy bill?
- What am I investing in?
- What are the main costs?
- How can I finance this? Savings? Loans? Mortgage?

Goal
A Home Energy Self-Assessment guide is a way to organize information - to help homeowners orientate themselves in order to make subsequent decisions about transitioning their homes. Of course, there are many other home energy self-assessments that exist and there may be other ones the municipality can recommend for mentorship groups to use

Description of tool
A simple self assessment energy workbook with the following catego-ries: home specifications, cooking, hot water, heating, efficiency, and finances.

Value added

Homeowners discern what information they know or do not know about their current homes. This will provide more clarity about what information is missing. In this way, they can identify what information they need to find out and decide whether they can work with their mentorship group to find this information, or if hire a company to do it for them.



Topics
1 Home specifications
2 Cooking
3 Hot water
4 Heating
5 Efficiency
6 Finances

Home Energy
Assessment Self-Guide

1 Home specifications

Place an image or draw your home here:

When was your home built?
How many floors do you have?
Size of your home?

Knowing the exact year is not necessary, but if you do not know some information such as your insulation, knowing an approximate year could help answer this

2 Cooking

What kind of stove do you have? (Gas, electric, induction)

3 Hot water

4 Heating

5 Efficiency

Insulation

(1) Which part of house is insulated and (2) what type of insulation (air, foam)?

(1) ☐ roof (2) _____

☐ floors _____

☐ facade _____

☐ window frames _____

Windows

How many windows do I have?

I have windows that are...

☐ single pane

☐ double pane

☐ triple pane

☐ other

☐ don't know

Other

6 Finances

What is my energy bill like?

4. LEARNING ABOUT TECHNOLOGIES

Tool name: TINY TECH CARDS

Goal
The goal of this step is to help homeowners learn about the different technologies to natural gas heating.

After this session the homeowners should:
- be acquainted with the basic alternative heating solutions and other relevant technical aspects such as insulation

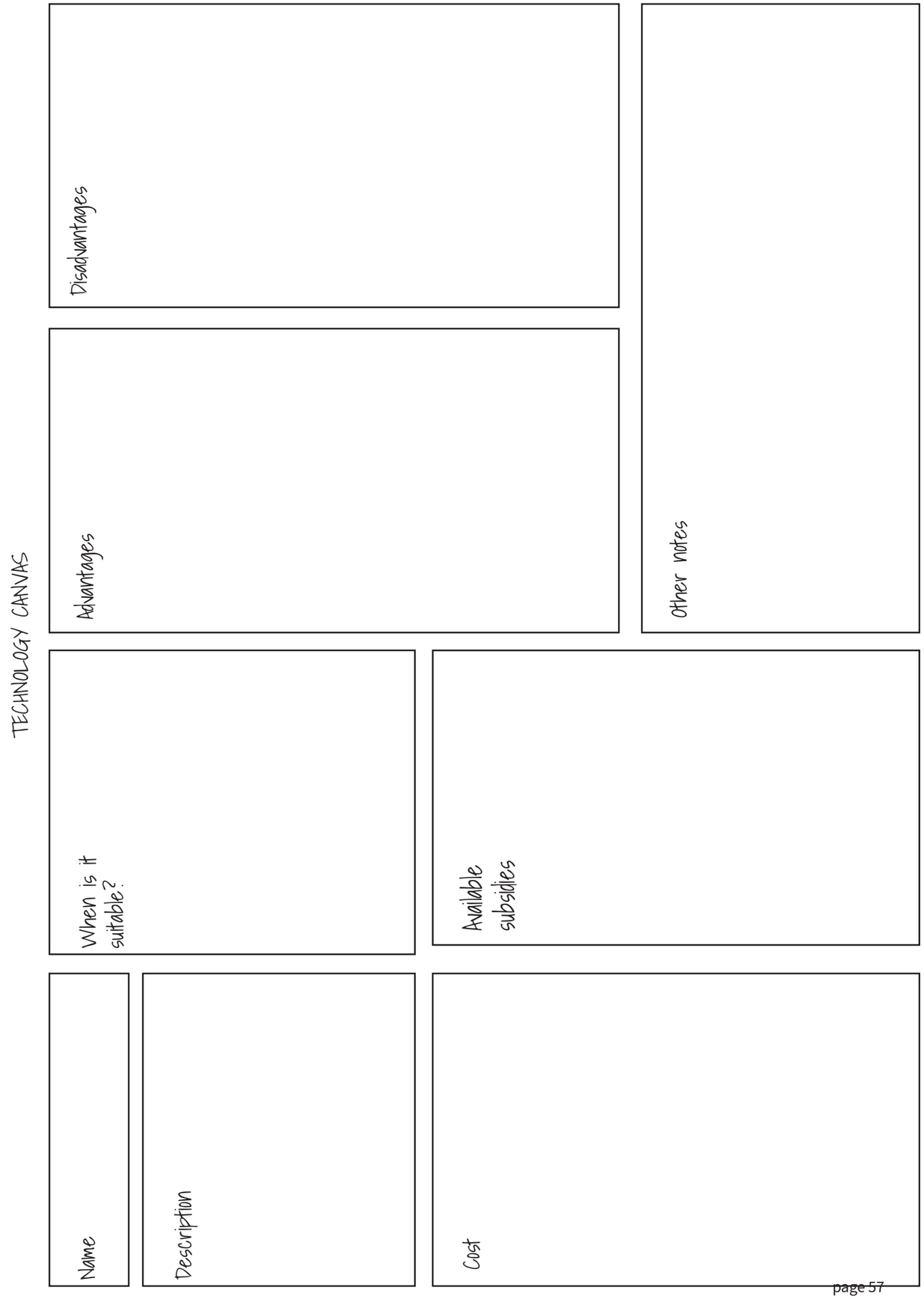
Description of tool
A tool is introduced here that can help homeowners learn and visualize the different types of heating technologies. The tool is called Tiny Tech Cards. The are included as templates for the cards included here, and are meant to be completed before use (could be co-created with community and municipality members).

Value added

The purpose of using the Tiny Tech Cards is to present technical information in a bite-sized and accessible way. By incorporating the mentee's specific home information, it makes it specific to their situation. The canvas and Technology makes information visual. The Technology Cards help facilitate the discussion and serve as a low-fidelity paper prototype for the homeowner's home.

Creating Tiny Tech Cards gathers technical knowledge and puts it in an accessible format so that the information can be used by people who find it inaccessible. The value of co-creating the Tiny Tech Cards with the community is that it is a bottom up way to collect information and gather knowledge from the community in order to build trust and transparency with community members, and also to acknowledge that they are being heard, that they are a valuable resource and experts. Moreover, inviting community members will help tailor the technology solutions to the community context, e.g. if people who have already made their homes sustainable via a particular heat pump + insulation combination. The small groups will help distribute the discussion space more equally so that loud opinions do not overpower others.

Participants will be guided through this process with visual props. There will be structure provided by templates to be filled out with some examples.



	Advantages		
Description		Description	Description
When is it suitable?	Disadvantages	When is it suitable?	When is it suitable?
Cost	Other notes	Cost	Cost
Available subsidies		Available subsidies	Available subsidies

Advantages	Advantages	Advantages	Advantages
Disadvantages	Disadvantages	Disadvantages	Disadvantages
Other notes	Other notes	Other notes	Other notes
Available subsidies			

Heat pump	All electric heat pump	Hybrid heat pump	High temperature heat pump
Description	Description	Description	Description
When is it suitable?	When is it suitable?	When is it suitable?	When is it suitable?
Cost	Cost	Cost	Cost
Available subsidies	Available subsidies	Available subsidies	Available subsidies

Insulate pitched roof	Insulate floors	Insulate windows and frames	Insulate facade
Description	Description	Description	Description
When is it suitable?	When is it suitable?	When is it suitable?	When is it suitable?
Cost	Cost	Cost	Cost
Available subsidies	Available subsidies	Available subsidies	Available subsidies

CURRENT

Cooking

Hot water

Heating

Efficiency

- Insulation
- Windows

Home visual + specifics

FUTURE

Cooking

Hot water

Heating

Renewable energy

Efficiency

- Insulation
- Windows

SUPPLEMENTARY MATERIAL

Example of typical dwellings in the Netherlands adapted from https://www.expertisecentrumwarmte.nl/

1910s & 1930s

1950s terraced house and 1950s apartments (brick)

1960s terraced house (stacked frame)

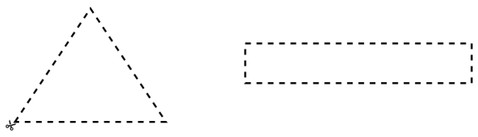
60s (flat roof) and 60s apartments

1970s (façade elements)

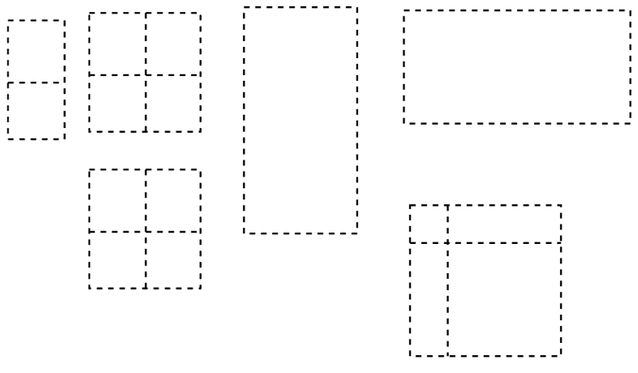
1980s (brick)

1990s (Building Decree)

Flat or pitched roof



House or apartment



Example of a template partially filled out.

CURRENT

Cooking

Cooking

Hot water

Gas boiler

Heating

Natural gas

Efficiency

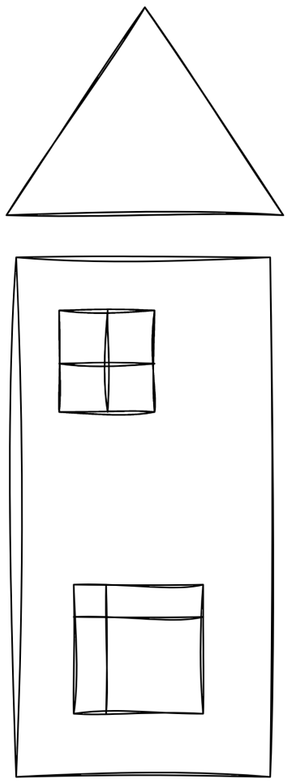
- Insulation

  Foam insulation in roof

- Windows

  single-pane windows

Home visual & specifics

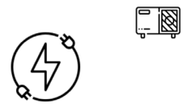


FUTURE

Cooking

Hot water

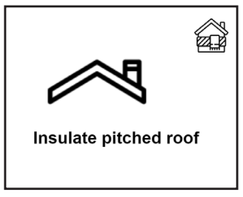
Heating



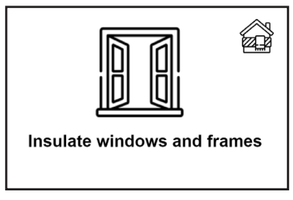
Renewable energy

Efficiency

- Insulation



- Windows



5. CONNECTING TO COMPANIES

Tool name: QUESTION BRAINSTORMING TEMPLATE

Goal
The goal of this step is to connect homeowners with the companies that can help translate their plan to transition their homes into action. This includes but may not be limited to:

- contractors
- heating companies
- installation companies
- insulation companies

Tool Description
Municipality can help mentees with what kind of information to look for and where to find it. They can do this by creating guidelines about what kind of information and what types of questions to ask companies when homeowners are reaching out to them to inquire about their services. They can direct them to resources such as online resources or calling their energy company and what to ask.

Mentors can brainstorm with their mentees different important questions to ask companies when they are contemplating whether or not to hire them. Having gone through the process before, mentors have good insight as to what they wish they knew or what they wish they asked about before hiring a company.

Value added

It can be daunting to go from plan to action. This stage will encourage homeowners to explore what is possible and to connect with people who will help them turn their theoretical plan into action. This stage is also really important because depending on what companies and services are available will influence what is possible for the homeowner. They can also leverage the connections they have with their mentors, and make use of their experience.

QUESTION BRAINSTORMING TEMPLATE

What do I want to know?

Questions to ask companies:

Where can I find this information? Who can I ask?

6. LOOKING AHEAD

Tool name: Future planning template

Goal
The goal of this step is to:
- help bring all the information from previous stages into a muti-year plan
- help understand different ways to finance their plan

Finances are revisited at this stage of the process. After learning more in-depth about the different aspects that are required to transition their home, including the technologies, ways to retrofit their home, and what is available in the market, homeowners make a financial plan to these specifications.

Description of tool
Fully transitioning a home could be a journey that takes years, depending on the starting point. This plan will spread out over multiple years and have different important factors depending on the individual's situation, so the different rows the template can be adapted to reflect this.

This plan will be constantly revisited by homeowners and evolving based on the various Building Blocks:
- the preferences of the homeowner
- what is possible for their home
- the homeowner's the financial situation
- what financial support there is
- what is available on the market

Value added

Year	1	2	3	4	5
CURRENT SITUATION					
Income					
Expenses					
PLAN FOR THE FUTURE					
Goals for going gas-free					
Costs					
Company options					
How to finance?					

Homeowners can combine all the different aspects and visualize their plan into the future. It provides some structure and will result in a less daunting and unknown future.

Homeowners can also refer back to the Kick-Off, and reflect on what kind of journey that they took and the advice they gave then.

Year	1	2	3	4	5
CURRENT SITUATION					
Income					
Expenses					
PLAN FOR THE FUTURE					
Goals for going gas-free					
Costs					
Company options					
How to finance?					

Year	6	7	8	9	10
CURRENT SITUATION					
Income					
Expenses					
PLAN FOR THE FUTURE					
Goals for going gas-free					
Costs					
Company options					
How to finance?					

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Appendix G: References

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