Implementing ***social contagion*** *for the Dutch* ***neighborhood approach*** *of the energy transition*

Collaboration of
Wijkkompas and ENRGISED

Master thesis
Rose Visser
November 2022

The hurrier I go, the behinder I get.
Lewis Carroll - Alice in Wonderland

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Master thesis

Msc. Strategic Product Design
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Preface

When I started my master's Strategic Product Design I hoped to find a way to combine the analytical perspective many businesses have in the social sector. Throughout my master's, I explored this domain, but it was not until my internship at Zeewaardig that I found the niche I was looking for. My experiences in the neighborhood of Reyeroord, working together with the municipality of Rotterdam, and answering questions of residents on the streets have helped me to understand the importance of a fair, transparent but most of all active energy transition.

This thesis was an opportunity to combine my passion for diving deep into a topic together with the human perspectives and the insights only a ''on the ground/ getting your hands dirty'' approach can offer.

I want to thank Wijkkompas and Dieke and Yael for their open-minded attitude toward this project. Your enthusiasm has given me the confidence in this project to pitch out-of-the-box ideas. It has been truly fulfilling to see that my suggestions were embraced and are now implemented in Wijkkompas. Your expertise helped me to gain a broader perspective on the energy transition. Not only from the residents and municipalities but also from the broader transition in other fields that the energy transition is setting in motion.

I also want to thank all the municipalities, residents, and others that participated in the interviews, co-creation session, and prototype evaluation rounds. You have brought a perspective to this project I would have been able to find on my own.

Jotte, Jo, Sonja and Floris: my Tu team. Thank you for your support throughout this project. It has not always been easy to choose the right pace for this throughout this process. Your guidance has helped me, not only learn more about everything that is involved in executing such a project but also to make sure I take good care of myself.

Lastly, I want to thank my family team for their unconditional support and for all their lovely homemade lunches that have fuelled me in this process.

Lopend vuurtje

Executive summary

95 % of all the buildings in the Netherlands rely on natural gas for heat. But in just 30 years, all of these 7 million homes must have said goodbye to gas forever. A complex project, since the alternative to gas, is not a one size fits all solution. There are several options and their feasibility is highly dependent on the neighborhood context. Therefore, municipalities became responsible for the Dutch energy transition. In the earlier energy transition from coal to gas in the 1980s, there were clear economic benefits for residents. Now, despite the record-breaking gas prices, the long-term returns on investments are uncertain while there are many short-term inconveniences.

The technical side of the energy transition tends to overshadow the social dimension. The technical challenges are clear and the path to work on the viable solution is familiar since the municipalities have been in charge of similar infrastructure projects. The social transition, however, is highly dependent on the local situation and requires time. The municipalities have to become the spider that holds the web of stakeholders together to make this complex process work.
To help municipalities stay in charge of the energy transition, Stroomversnelling developed Wijkkompas: a process management tool that guides municipalities from 'Transitie Visie Warmte' to 'Wijk Uitvoerings Plan'. Wijkkompas helps municipalities balance the social and technical side of the transition.

On the social side of the transition, participation is a well-known factor that municipalities already take into account. The goal of participation is to make informed decisions together with residents through representation. However, through participation alone municipalities will not be able to reach all seven million households. Therefore the goal of this thesis is to effectively apply the social contagion method to the Wijkkompas tool since social contagion is a process in which the network in the neighborhood will take on the task of activating residents themselves.

Social contagion theory teaches us both information and behavior can be transmitted in a network. Each has its optimal way of traveling through the network and thus has an optimal seeding strategy. For the energy transition, the transmitting behavior with the snowball strategy can be very valuable. Holistically it would be best to separate the participation from the social contagion approach and run a parallel process. However, for the social transition, we rely on volunteers who are busy and scarce. Therefore we propose a six-step model that adequately combines both techniques for a successful neighborhood transition.

The biggest impact can be made when municipalities find the courage to try out this new activation method. The Lopend vuurtje box, designed in this project, uses the principles of social contagion to spread the method through the inter-municipal network. The box invites its receivers to try out the method for themselves through personal assignment, a small experiment, an educational flyer, and by becoming part of the Lopend vuurtje network by sending the box further along its journey through the Dutch municipal network.

Table of Content

Chapter 1

Project introduction

This thesis focuses on the application of the (complex) social contagion method for the energy transition, specifically the Dutch neighborhood approach. Commissioned by the research group ENRGISED, this thesis zooms in on the application of the social contagion method to a specific instrument: Wijkkompas. Wijkkompas aims to help municipalities navigate the process of executing the energy transition at the neighborhood (wijk) level in the Netherlands. First, the grander context of the Dutch energy is explored after which the scope of this project is defined.

1.1 The energy transition

Climate Agreement

In the Paris Climate agreement of 2015, countries agreed to reduce global warming. The accord states that all 195 participating countries aim to reduce global warming to 2 degrees Celsius, compared to pre-industrial levels (UNFCCC). To realize this goal it is crucial to reduce our CO2 emissions and ensure we are energy neutral by 2050 (Bodansky, 2016). Each country can decide for themselves how to realize this goal, hence the international agreement is translated into national laws. In the Netherlands, this is the 'Klimaatwet' ("Klimaatwet," 2020). This law ensures citizens and companies of the Netherlands specifically that we:

-will reduce our CO2 emission by 49% in 2030, compared to 1990

-will reduce our CO2 emission by 95% in 2050, compared to 1990.

While this law provides citizens and companies with the security of a fixed goal, the actual approach to tackle the problem is captured in the national Climate agreement. In 2019 150 parties joined the Dutch government at 5 climate tables to formulate the approach for their respective sector. The 5 sectors are Electricity, Industry, Build Environment, Agriculture, and mobility ("Klimaatakkoord", 2019). The 7 million gas connections of the homes and houses of citizens fall under the built environment sector.

Germany subsidizes gas

A question many Dutch citizens have is: why are we focussing on discontinuing the use of gas when our neighbor Germany is subsidizing citizens who want to switch towards it? First and foremost we need to acknowledge that the long-term goal of discontinuing the use of natural gas by 2050 is a shared one. The difference lies in the starting position both countries have. As mentioned in the Netherlands virtually all homes and buildings are heated using gas, in Germany only 50% of households use gas while 25% percent still use oil to heat their homes (BMWI, 2019). Oil-based heating produces more CO2 emissions compared to the use of gas. To achieve the sustainability goals of 2030 Germany has decided to (under certain conditions) subsidize the switch from oil to gas (Brinck, 2021).

Besides the different starting positions the sentiment in the two countries used to differ. In The Netherlands, the earthquakes in Groningen due to the gas extraction have shaped public opinion more negatively toward the use of gas (Hulsbeek, 2019). Due to the war in Ukraine, we see this paradigm shift. The EU delayed its publication on the switch to sustainable energy sources to include more far-reaching plans to advance the discontinuation of the use of Russian gas (NOS, 2022).

Built environment

When we zoom in on the built environment in the Netherlands specifically, it becomes clear that 95% of buildings rely on natural gas to be heated. Burning natural gas releases CO2 into the air and thus contributes to global warming. That is why the Netherlands is committed to discontinuing the use of natural gas by 2050 (“Klimaatakkoord”, 2019).

For the Netherlands, this means that by 2050 7 million homes and 1 million buildings (e.g. business premises) must have transitioned from natural gas use to sustainable energy resources. The first step to achieving this goal will be to transition the first 1,5 million homes before 2030. The alternative to natural gas is not a one size fits all solution (“Klimaatakkoord”, 2019). There are several alternatives available e.g. all-electric, heat pumps, residual heat, and geothermal systems (Kieft et al., 2017).

The feasibility of each solution is highly dependent on the context of each home or neighborhood. For example, heat grids do not work in every neighborhood. It depends on the density of homes as well as the available heat source, see figure1. For example, in Rotterdam, the port industry provides the city with high-temperature water that can fuel the heat grid. The high temperature means homes do not need much insulation (Gemeente Rotterdam, 2021). But not every city has access to such a high-temperature solution. In some cities, a low-temperature heat grid might be feasible, but then houses cannot be spread out too far since the water will lose some its heat when transported to each home. Furthermore, the homes that will have to use this low-temperature solution need to be insulated very well to heat enough during winter. The wide variety of solutions and limitations makes for a puzzle that can only be solved locally. Therefore the Dutch national government has decided each neighborhood will get its proposal: Wijk Uitvoerings Plan (WUP) or neighborhood execution plan.

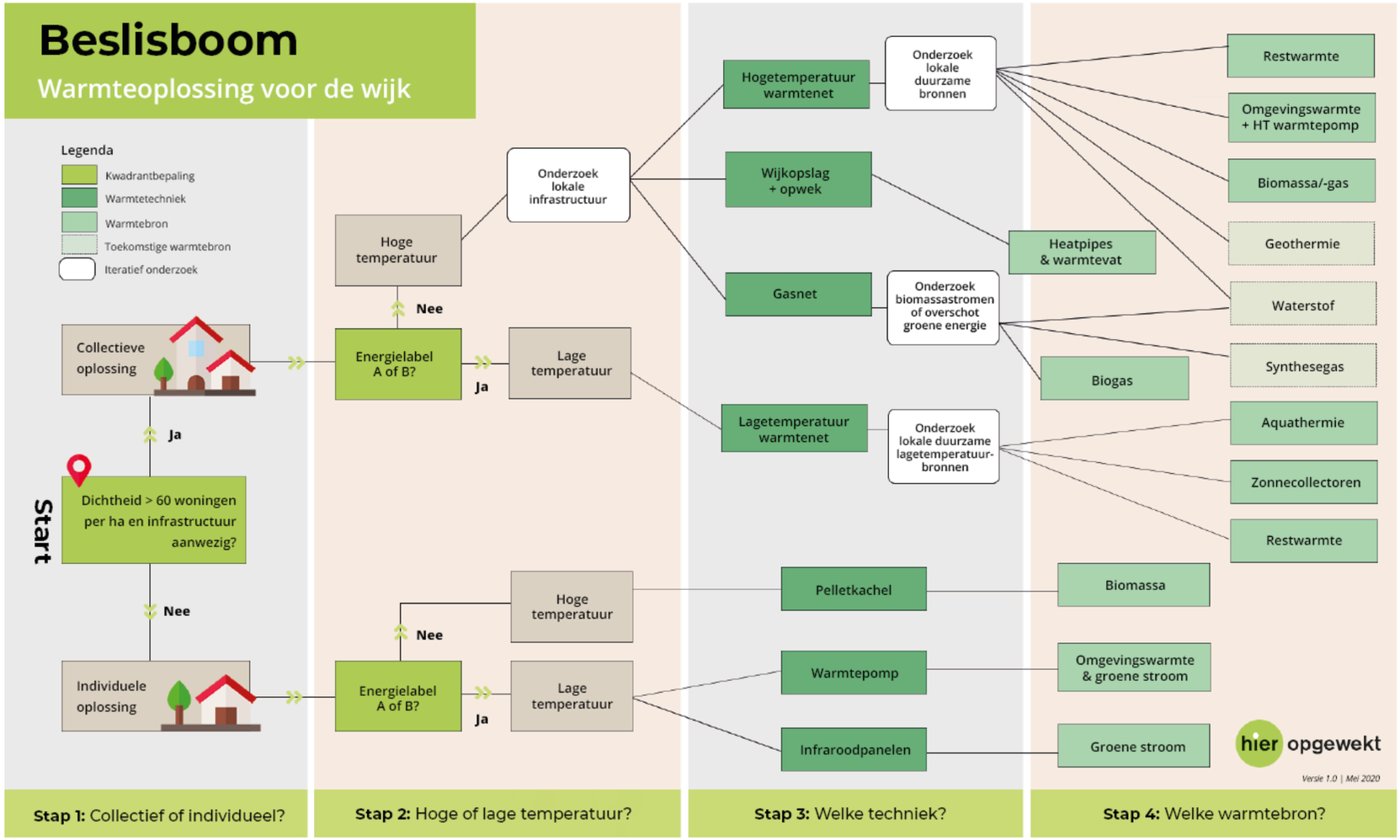


Figure 1 :Alternatives to natural gas

Local approach

Even though the solutions are locally dependendt, all solutions still benefit from a regional approach. Therefore the national government has decided that there will be 30 regions that work together to develop regional energy strategies (RES's). Even though the solution for each neighborhood can be different, some solutions benefit from regional collaboration. For example, a small municipality might want a heat grid but lacks sufficient ''customers'' to develop a viable business case. The RES facilitates collaborations in such cases and makes sure both small and big municipalities can benefit from working together (Beckman, 2019).

After the RES is developed, each municipality will translate the national policy combined with the regional strategy into their own Transitievisie Warmte (TvW) or transition vision on heating, see figure 2 (Rijksdienst voor Ondernemend Nederland, 2021). The TvW details the planning of the energy transition in that city. It explains which neighborhood will transition first and why. When a neighborhood transitions before 2030, possible solutions for switching from gas to more sustainable energy resources are also briefly explored and written down. The TvW should have been finished in December 2021.

After the TvW, municipalities start working on the WUP. The WUP is developed together with all involved parties in each neighborhood and will result in a final choice for the natural gas alternative, as well as concrete planning, contracts with contractors, financial offers for citizens, and a well-executed participation process (Hier opgewekt). Working towards this result is a long process that can take up to 7-10 years. Since the TvW was finalized last year and local governments held elections in March of 2022, formulation of the WUP has started after the summer holidays in most municipalities.

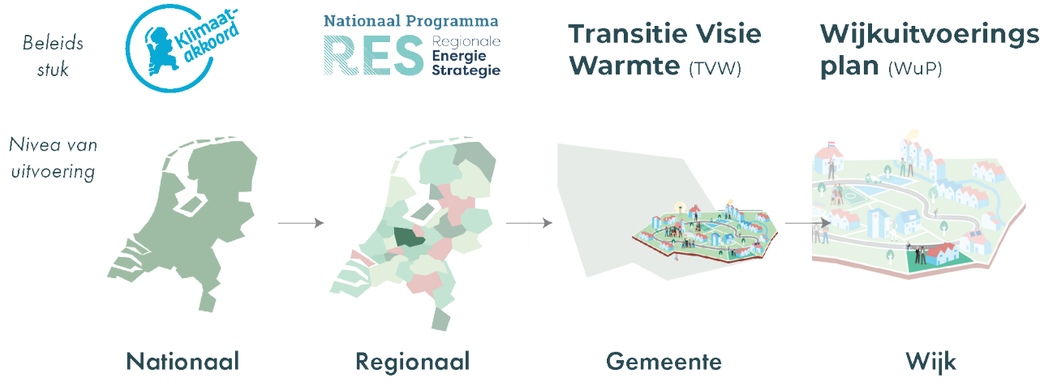


Figure2: Dutch policies for the energy transition

The task municipalities face

Municipalities in the Netherlands, until recently, have been responsible for the execution of the policies of the national government and their own policies (Rijksoverheid). For example, the city council decides whether or not to build a bike road, while distributing passports to its citizens. Of the governing bodies we have in the Netherlands, municipalities are the closest and most familiar with the local situation, both technically and socially. Therefore the national government decided they are the best equipped to tackle the complex and multifaceted challenge of the energy transition. Municipalities will execute the ''gebiedsgerichte aanpak '' (Neighborhood approach). They can guarantee the interest of the public whilst determining the tempo, framing the task, collaborating with market parties, and steering the policies in the right direction to come to the best local solution (Ebskamp & Verbraak, 2019).

Technically municipalities know the situation on the ground best. They are familiar with the underground facilities and planning, as well as the opportunities above ground. For example, some buildings or neighborhoods are designated areas of cultural significance. Therefore it is illegal to place solar panels on certain rooftops. Municipalities are best informed to deal with these local circumstances.

Policies concerning energy and climate change, however are currently traditionally written and executed on a European and national level. In the 1970s municipalities were responsible for the energy supply at the time, which was gas. However, with the privatization of many government services, companies are now responsible for this. Since this is so long ago, municipalities no longer have the internal expertise concerning energy networks and thus seek technical support from companies.

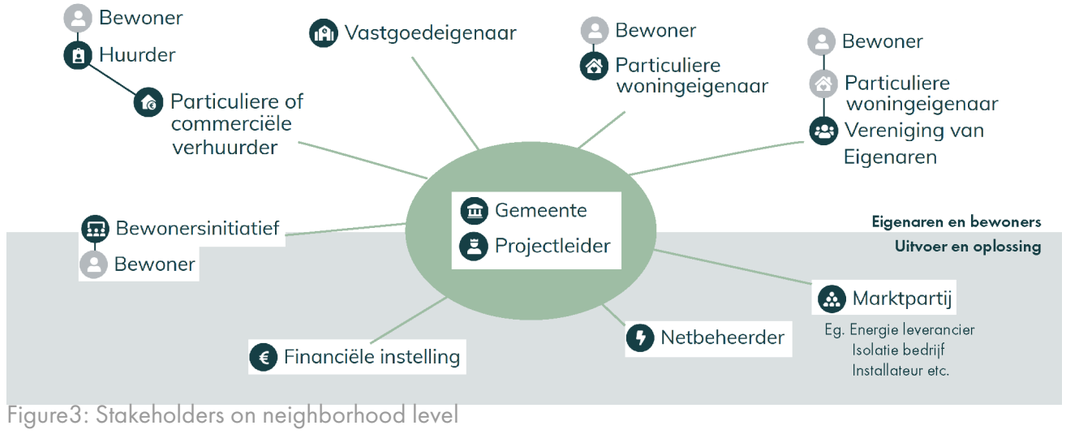


Figure3: Stakeholders on neighborhood level

Social perspective

The technical challenges municipalities face tend to overshadow the importance of the social dimension, which is just as, and arguably more important. The shift from coal in the 1960s was induced by the economic advantages of natural gas and the improvement of comfort for residents (Correljé et al., 2003). The current transition to move away from natural gas does not come with the same economical incentives or increases in comfort. The transition requires investments and causes short-term inconveniences, and long-term returns on investments, despite the record-breaking gas prices, are still uncertain (De Koning, 2019).

It is not feasible for the national government to finance a top-down approach. On the other hand, residents cannot be forced(yet) to switch from gas to alternatives. In 2026 the sale of fully gas-dependent CV heaters will be prohibited, for now residents are not yet obliged to discontinue their use of gas since this is a personal choice concerning private property. Municipalities will have to take on a new role in managing and incorporating the social side of the transition process. Expanding their role towards directing and orchestrating, they will be the spider that holds the web of parties together, see Figure 3.

For example, municipalities can explore ''koppelkansen'' (pairing opportunities). The energy transition policies could be combined with neighborhood renewal, landscaping, or poverty improvement projects. The combination of these policies is new to the municipalities, and so is the activation of residents for a project they direct themselves.

The approach to tackle this multifaceted problems is complex and not yet set. From the 342 municipalities in the Netherlands, the four big municipalities(4G: Rotterdam, Amsterdam, The Hague and Utrecht) are developing their approach internally since they have the scale to systematize the process. But smaller municipalities do not have the capacity and expertise to handle this by themselves. The national government in the form of Programma Aardgasvrije Wijken (PAW) or program natural gas-free neighborhoods is running trials in collaboration with 66 municipalities to learn and generate this expertise together. Still, many municipalities are consulting external agencies to help shape their process, both on the technical and social side. Other municipalities wait for clearency and concrete help from the national government.

Social Contagion

For homeowners, political uncertainty is not the only major influence on their individual decision to make. They are also strongly influenced by the action or lack of action of their neighbors. It often makes sense for one actor to start acting when others have started as well, creating a situation where residents wait on each other to adopt the alternatives. This interdependency of decision-making is the bottleneck for the energy transition according to ENRGISED (Centola & Macy, 2007; Cialdini & Trost, 1998).

1.2 Project scope

The project is complex with different actors involved. The client is Stroomversnelling and their tool Wijkkompas. Next to that, the ENRGISED research team is involved, consisting of researchers from TU-Delft and UU. Content-wise, the theory of social contagion clearly defines the scope of this project.

Stroomversnelling

Stroomversnelling is a non-profit organization founded in 2015 to speed up the energy transition. They are supported by 42 members and receive funding from the national government. The members range from municipalities to housing corporations and technical suppliers. Their team of 21 together aims to speed up the energy transition by creating innovations that help in practice, as well as lobbying for rules and regulations that facilitate the right conditions to speed up the process (Stroomversnelling, 2021). One of the tools they developed is Wijkkompas.

Wijkkompas

Wijkkompas guides municipalities through the 6 stages of transitioning a neighborhood. With a team of six, the tool is continuously improved. The aim is to fully develop the tool within the incubator of Stroomversnelling. After the development, the tool will be handed over to its final landing site. Which party will take on the tool has not been determined yet.

At its core, Wijkkompas helps municipalities to stay in control of the execution of their part in the energy transition. In most cases, the most important of a project team for a neighborhood is the municipality, but Wijkkompas also helps resident initiatives. The tool gives the project team an overview of the steps needed to go from TVW to WUP. The project team works together with different parties such as network operators. All parties involved can work together in the online Wijkkompas tool and see when and where their contribution is necessary. This shared understanding of their roles and helps the municipalities to focus on execution again rather than process management.

ENRGISED

The ENRGISED consortium aims to develop a tool or method that overcomes the interdependency of decision-making in the energy transition. Combining the knowledge of the complexity of the social network of the University of Utrecht and the design approach of the TU-Delft ensures a methodical yet practical approach for which they received an NWO grant. The consortium consists of the aforementioned TU Delft and UU but also financial advisors, energy expert organizations, and design agencies. Wijkkompas is also a member of ENRGISED.

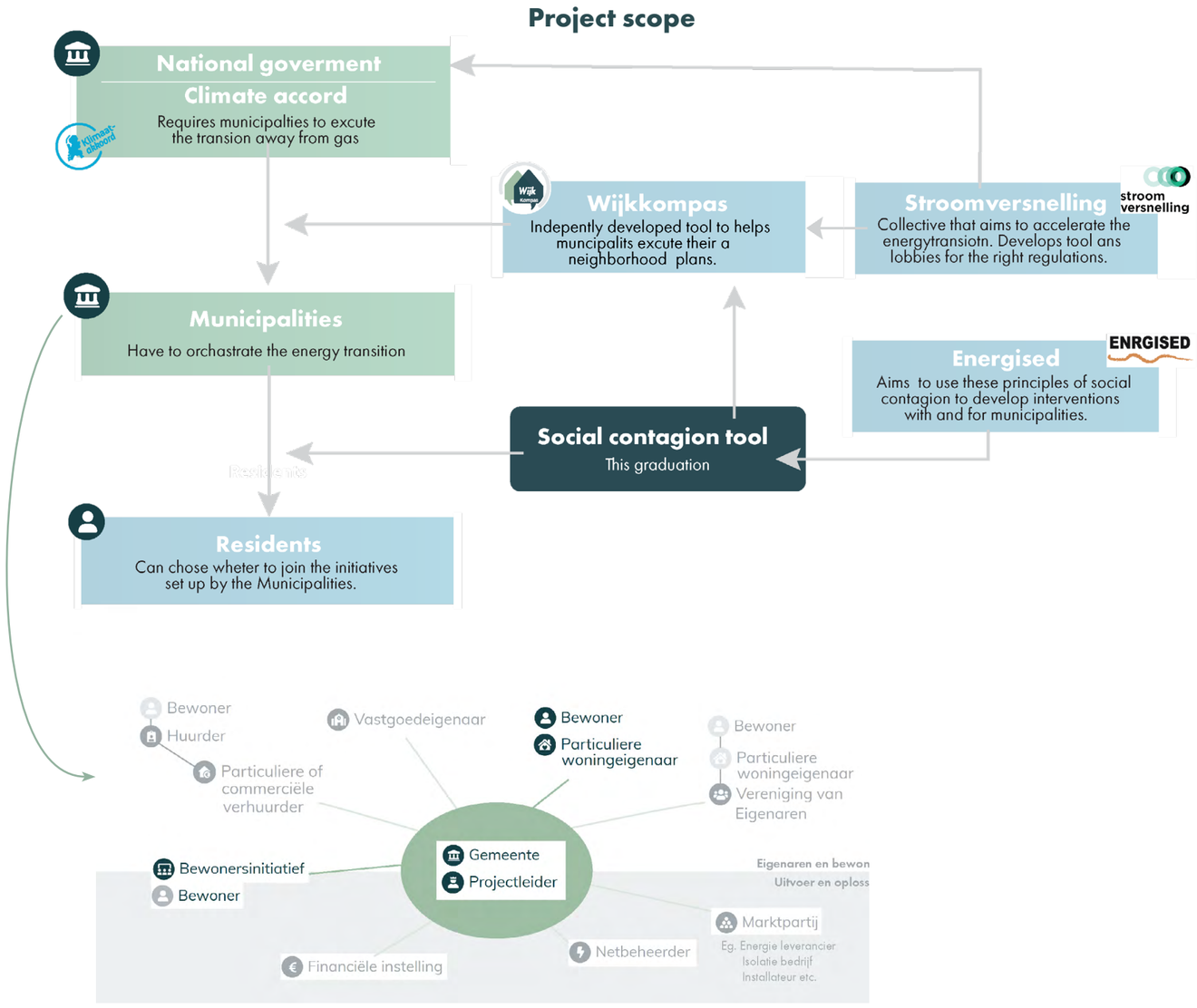


Figure4: Project scope

Graduation project

The municipalities face a big task to facilitate the energy transition. Wijkkompas helps them in their process every step of the way. This graduation will focus on the relationship of the municipality with its citizens and citizens' initiatives, as well as the relationship between citizens (see figure 4).

The Wijkkompas tool has yet to adopt a strategy for municipalities to overcome the interdependency bottleneck the energy transition faces. This interdependency is a well-known factor in the adoption of new technologies. For example, the first person to use a phone cannot call anyone. You need others with a phone to make it a useful product. The adoption of such new technologies is often seen as an effect
of the innovation itself. However, beneficial innovations like contraception or irrigation also face resistance when they disturb the current status quo or the routine people have now (Centola, 2021).

Centola suggests a different approach, not focussing on the innovation itself, but on the potential of the social network. Since the energy transition in the Netherlands is organized around neighborhoods, this approach is especially valuable. Households can be seen as nodes that are connected through a social network, the adoption of the transition is like a social influence making its way through this system. Theories on social contagion positively influence the interdependency of decision-making (De Koning, 2019).

Given the above opportunity, the design/ research question is defined as

How might we use social contagion effectively in Wijkkompas

to help municipalities positively influence

the interdependency of decision-making of residents

transitioning from natural gas to sustainable energy alternatives?

1.3 Project approach

In this project, the double diamond by the Design Council (2005) is used, see figure 5. This classic approach is supported by the principles of the systemic design methodology by Ryan(2014). Throughout the project, the aim is to keep reflecting on the process and the understanding gained of the system. Knowing that we cannot redesign the entire system, but that a strategically placed intervention does have an impact on all stakeholders.

Discover & Define

The first part of the report will focus on the research phase of the design process. The goal is to reframe the problem and come to a design direction that can be used as the start of the second phase of designing an intervention. The sub-questions below help answer de the design research question aforementioned.

RQ 1. What is the impact of the Wijkkompas tool?
In order to desgin a complementing social contagion tool, Wijkkompas is analaysed and its impact on the sytem and stakeholders is determind though Interviews with its various users (chapter 5).

RQ 2. What is the difference between participation compared to social contagion?
Participation is a key component of the Dutch energy transition. Since participation and social contagion both deal with activating citizens, it is important to understand the difference between these.

RQ 3. What is the current use of social contagion in the energy transition?
To find where the social contagion can make the most impact in the energy transition. First, its current use in practice has to be explored. Through desk research of the current tools available, expert interviews with both municipal and industry professionals the current use of the method is detemined. This informs the model proposed to apply the social contagion theory (chapter 6) in the context of the energy transition. By combining the context, theory, and the Wijkkompas instrument chapter 8 details the proposed model for the application of social contagions in the Wijkkompas tool.

Develop & Deliver

The start of the development phase will be the proposed design direction, detailed in the design brief ideas that can be accepted by the system, whilst challenging it at the same time. Through several brainstorming sessions with design students and key stakeholders, ideas are generated that lead to 3 concept directions, see chapter 9. A harris profile informs the final concept choice after which a creation session with key stakeholders helps to detail the design. The final design is detailed in chapter 11 and evaluated in chapter 12. At last, chapter 12 also details the recommendation and conclusions.

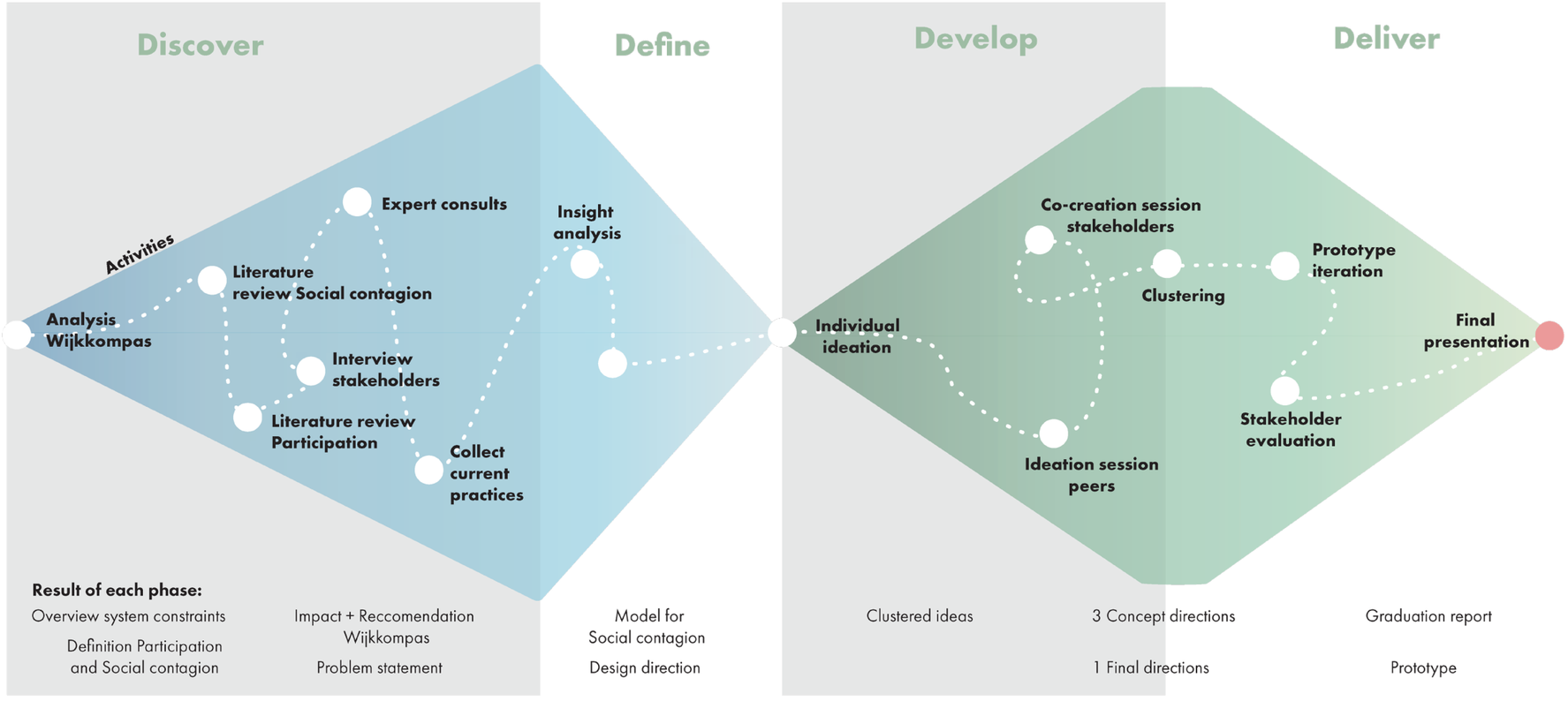


Figure5: Project approach

Part A

Theory

Chapter 2

Wijkkompas

To design a social contagion tool that complements Wijkkompas' strengths, Chapter 2 investigates what the Wijkkompas tool entails and who it is designed for. First, the tool, and its origin are depicted to explain the vision the team has on the energy transition and the role of the tool in this. Secondly, the tool itself and its various components are highlighted. Chapter 5 will zoom in the found the impact of the Wijkkompas tool.

2.1 The instrument

Origin of Wijkkompas

Wijkkompas is developed by Stroomversnelling in collaboration with 14 partner organizations. Stroomversnelling noticed municipalities are facing a big challenge in bringing together many different stakeholders. Transitioning a neighborhood can take up to 10 years and requires a wide variety of expertise and thus collaborations with many different parties.

Since Stroomversnelling is a collective built upon the collaboration of various parties, they saw an opportunity to provide municipalities with a tool that helps manage the energy transition. So that municipalities can take back control of their project and focus again on facilitating a collaborative working environment. Besides collaboration, Stroomversnelling believes the energy transition works best when stakeholders are part owners of the process. By creating a collaborative tool that every stakeholder can use they hope to create a universal language that fosters a better process that is faster or of better quality. On top of that, the parties involved will work together in many neighborhoods through the full energy transition. It would be beneficial if all parties could apply their learning from previous neighborhoods to new ones.

Stroomversnelling is pioneering this approach and continuously develops Wijkkompas to include their acquired expertise.

The instrument

Wijkkompas is a website (www.wijkkompas.nl) with an online environment. Since it is developed with subsidies, the information side of the tool is freely accessible. Municipalities can also choose to buy Wijkompas' service package. This package includes a start training, community days, and most importantly, access to the online collaboration environment of Wijkkompas. The tool is based on models of Energie Samen, Smart Energy Cities and helps municipalities to manage the process of transitioning their neighborhoods. The 3 main elements of the instrument are: phases, nodes, and tracks, see figure 6.

Preceding Wijkkompas, a reconnaissance of the neighborhood is executed to get a first image of the citizens, buildings, possible energy solutions, and other projects currently running. Informing the municipality's decision on the public administrative mandate. With the mandate municipalities can start with the approach and start with Wijkkompas effectively.

In Wijkkompas, the transition of one neighborhood is divided into consecutive 6 phases:

1. Starting together
The groundwork for the collaboration is built and the goals are set in a starting note (start notitie)

2. Characterizing the domain
Exploring the wishes of the stakeholders and a forst exploration on the social and technical potential in the neighborhood.

3. Identifying strategies
Before making choices, developing an assessment framework helps guide decisions later.

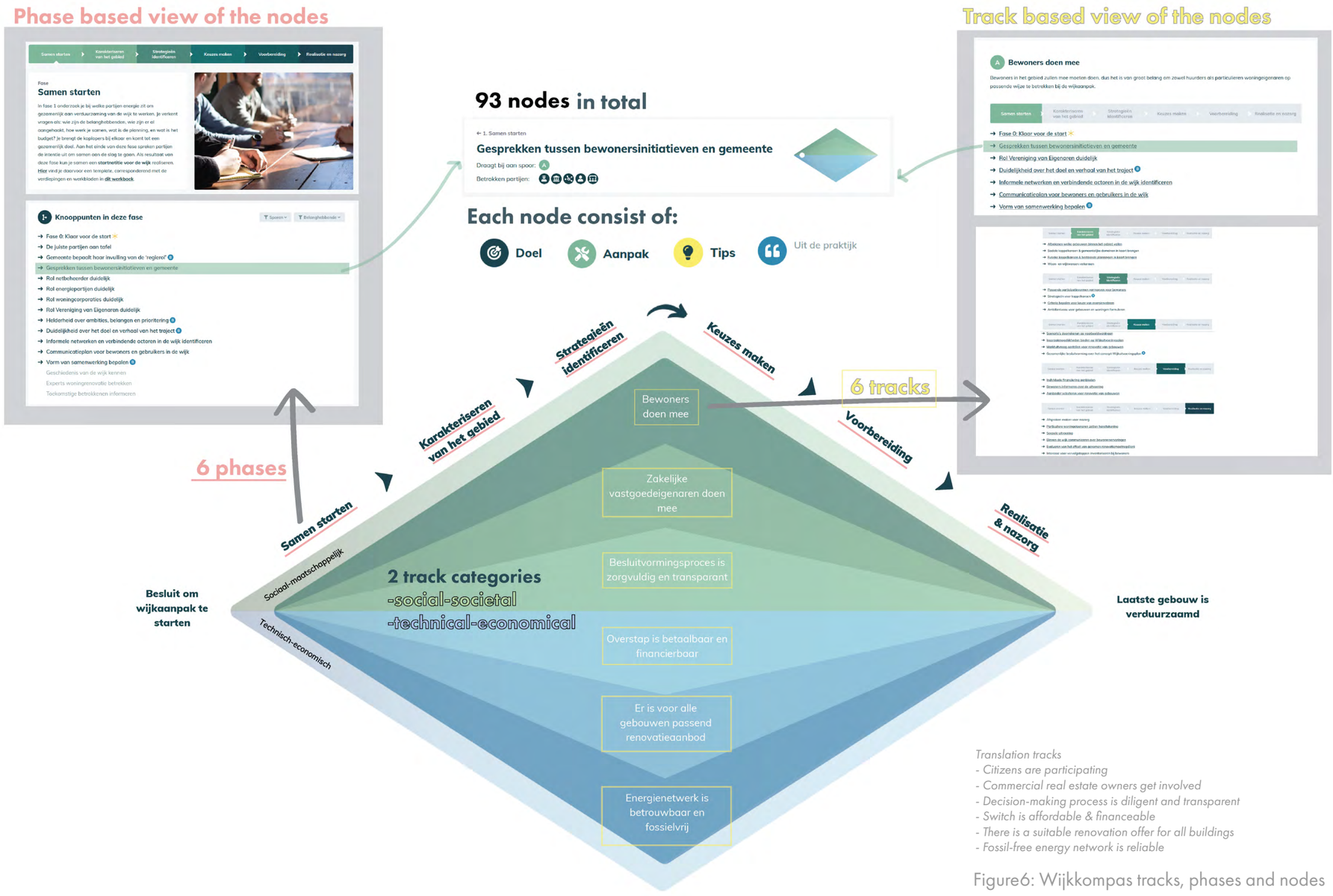
4. Making choices
By using the supported assessment framework a draft implementation plan is composed.

5. Preparation
Planning is finalized and residents are informed and are presented with the offer.

6. Realization and aftercare
Residents are signing the offer and the transition is executed.

Each of the six phases is a build-up of different nodes. These are moments of decisions that shape the project. For each node, the goal, approach, and tips are specified. Additionally, stories from practice are shared when a project team has already executed the node. Project teams can work on several nodes at the same time.

Within the energy transition different stakeholders have different interests. These interests lead to different perspectives on the Neighborhood transition and are represented by 6 tracks.These tracks can be divided into two main categories: technical-economical and social-societal.



Translation tracks
- Citizens are participating
- Commercial real estate owners get involved
- Decision-making process is diligent and transparent
- Switch is affordable & financeable
- There is a suitable renovation offer for all buildings
- Fossil-free energy network is reliable

Figure6: Wijkkompas tracks, phases and nodes

2.2 Additional features

Besides the main phases and tracks, Wijkkompas develops ''Kennisdossiers'' or Knowledge folders. Here topics are discussed transient the phases and need their separate explanation or approach. Like how to approach VvE's (owner associations), see figure 7. The info from the knowledge folders is also covered as much as possible in the nodes.

Next to Kennisdossiers, Wijkkomppas also offers a separate place for the tools mentioned in the instrument. These can be found in the nodes and are discussed separately. The tools range from video animations to PDFs and are usually often by other organizations like the national government.

Wijkkompas can be used for free when it is used like a Wikipedia of the energy transition. This is done by an unknown number of municipalities. Wijkkompas can also be used as a process management tool in which documents can be uploaded and progress can be tracked. Ultimately Wijkkompas is an instrument that helps municipalities or project teams manage the task of creating a WUP. It provides guidelines for the approach while offering the freedom of developing your approach. Some might use it to plan their approach, others might check if they do not miss a step. In any case, Wijkkompas helps the project team to keep an overview of all stakeholders and processes, and steps involved and needed for a successful transition in the neighborhood.

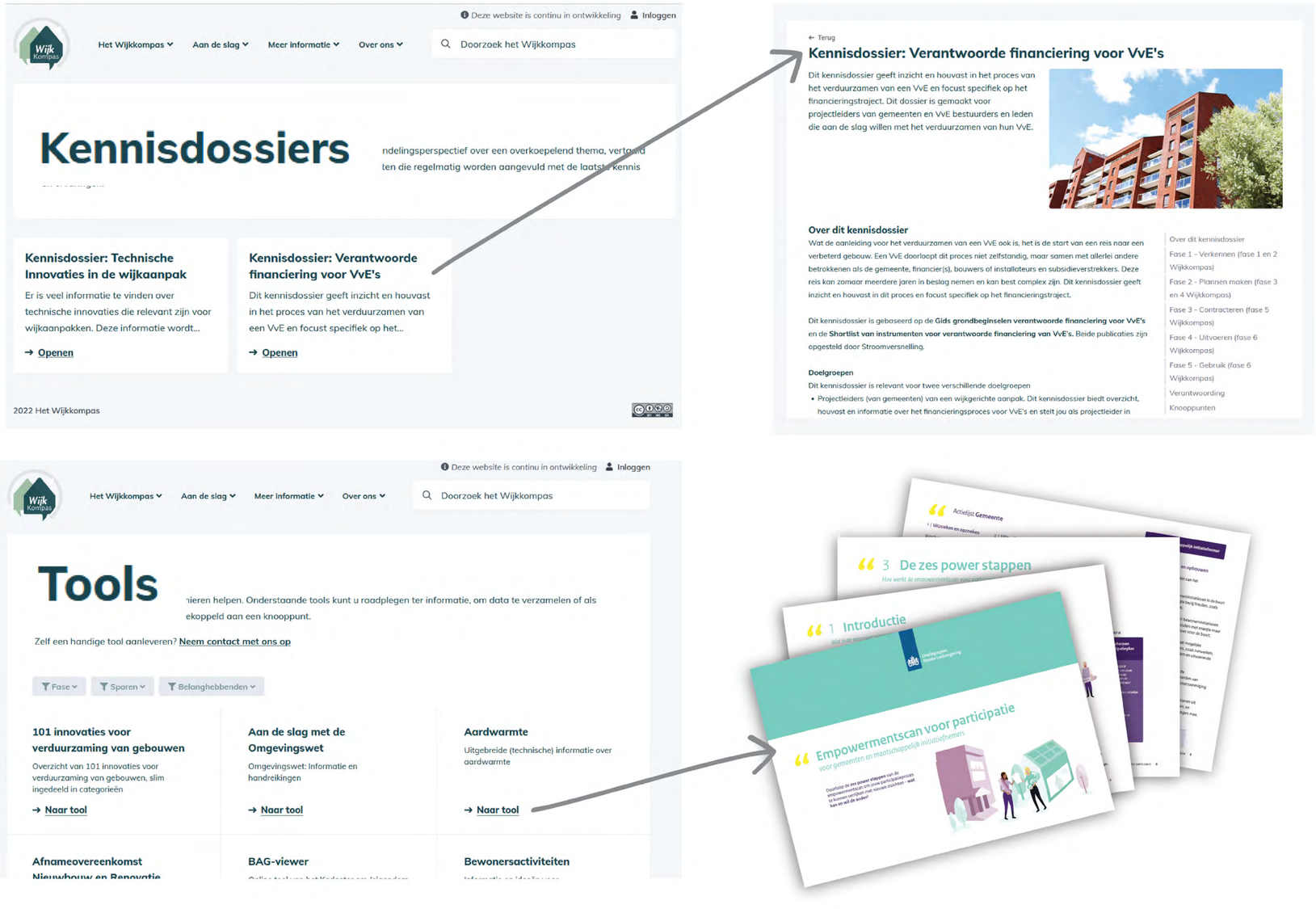


Figure7: Kennisdossier and tools

Chapter 3

Participation in the energy transition

Participation is one of the pillars of the energy transition and can easily be confused with Social contagion since they both revolve around citizens. To determine the influence of the participation strategy on the social contagion opportunities, this chapter dives deeper into the context of citizen participation in the Dutch Neighborhood approach.

3.1 Participation

Participation ladder

The goal of the national policies is to use participation actively in the local neighborhood approach. The participation ladder (Arnstein, 1969) is widely acknowledged as a tool to describe the level of participation that citizens have in a social project, see figure 9. It has been developed to create a more in-depth vocabulary to describe the almost ''popular'' term of participation. The ladder describes the context of a neighborhood or function as a mirror for municipalities to assess if they are using the potential a neighborhood might hold. This can be interpreted in two ways: optimizing for reach or representation.

Reach

Aiming to at least inform (level 3) for example 80% (see figure 8) of the neighborhood is the first way of interpreting the participation. This lies close to the core task of the local government i.e. providing a transparent process in which there is equal opportunity for everyone. It is something that is so at the core of the duty of the authorities they tend to forget it's possible to take a different approach.

But when looking at the private sector we do find a different approach. For example, when a new product is introduced, it is common practice to define a target group. This can either be a group you solely focus on, but in many cases, a target group is also defined as a group that is most likely to adopt your innovation. Leading to the initial success needed to keep your company and hence the adaptation growing. Translating this into the public sector would mean we might have to purposefully create ''a target or start group''. This approach might seem to create inequality, but as van Engelen explained to me ''The network is a self-organising entity. When you start at the right spot, the information, just like water, always finds its way down through all the little streams of the network.

Representation

On the other hand, representation is about finding active representatives for the groups you work together within your neighborhood. It connects back to the participation ladder: How much influence can these citizens employ on the policies of the government, or is the project even run by them, and are the local authorities there to merely facilitate?

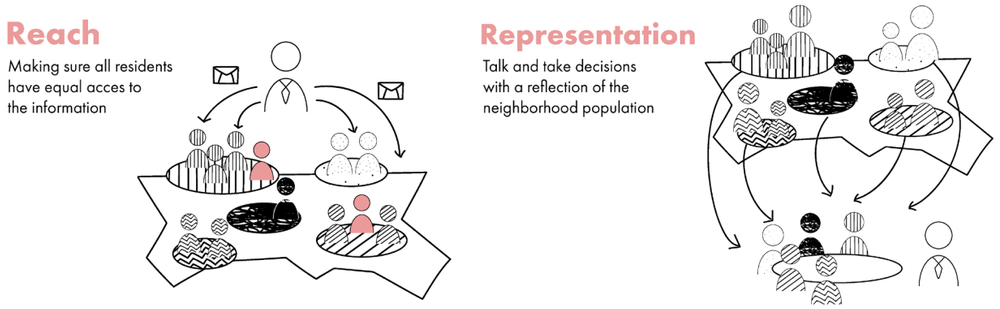
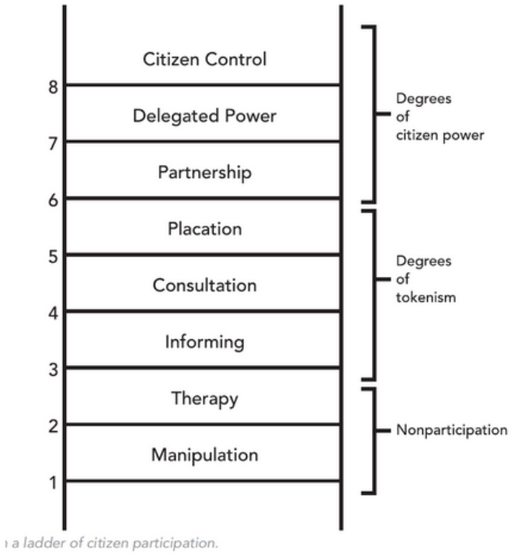


Figure8: Interpretation of participation

Representation and diversity

When zooming in on the second way of interpreting participation it is clear that representation and inclusion are topics of concern for municipalities. In a diverse neighborhood with e.g. 10 different social groups, it would be ideal to include 1 representative of each group in a sounding board group. In practice, this is not always possible. Municipalities are aware of this challenge and report that forming a sounding board group that is active and a good representation of the neighborhood they are working in is very difficult.

This can be further supported by Roger's innovation curve (1962), see figure 10. This model is usually applied to innovate the adoption of products and services but is also used by some municipalities and by PAW to explain the adoption of the energy transition. Looking at the curve we know early adopters and the early majority share some characteristics. They do not form a uniform reflection of society. For some products they might be the tech-savvy youngsters, for others it's the innovative moms. In the energy transition, we see that the early adopter generally consists of people with a higher income, who know their way around subsidies (Kraan, 2022). They, of course, do not represent the whole neighborhood, but can form an access point to start the transition and find the early majority and most importantly the late majority (Programma Aardgasvrije Wijken, 2022).



a ladder of citizen participation.

Figure9: Participation ladder (Arnstein, 1969)

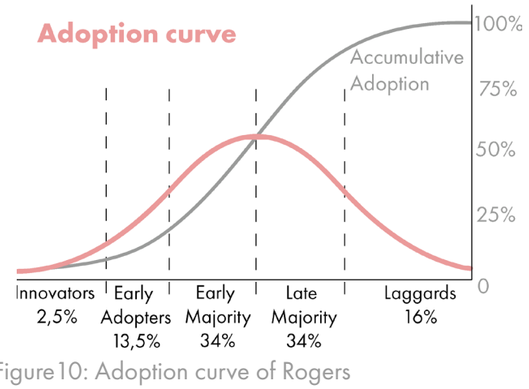


Figure10: Adoption curve of Rogers

3.2 Citizen initiatives

In several municipalities, we see neighborhoods where citizen initiatives are already active. This sounds like an ideal entry for the participation to take off. This group of citizens has formed a structure in which they can work together and have traction in the neighborhood. From the perspective of diversity, however, this poses a challenge. In some cases, the initiative is built from an interest in the technical developments in the energy transition. This comes with a certain target group closely related to the early adopters aforementioned, with of course some additions of interested citizens or otherwise active residents. When this initiative is mostly formed around such a homogenous group the challenge for the municipality is to keep both the initiative active and support them whilst still ensuring the representation of the neighborhood. They have to do this without ''going over the heads'' of the initiative and making sure they stay motivated and active.

In other cases when no initiative is present, the municipality can initiate the process of building an initiative. This can be quite time-consuming and requires some level of trust from the municipality that the neighborhood has enough internal capabilities to set this up. As researchers from Duneworks (2021) found this is largely dependent on the social structures present in the neighborhood and parallel to that how the municipalities have designed the participation process. In short, they say: ''The social structure determines the playing field of the energy transition.''

Participation trouhout the transition timeline

Representation and involvement of residents are most important in the orientation and development phase of the neighborhood approach It is impossible to involve 100% of the neighborhood in this decision-making process. Just like it is impossible to make day-to-day decisions in the Netherlands by voting with the whole country, hence we vote for representatives.
These representatives then make decisions on our behalf of us and are informed. Similarly in the energy transition, residents can look up the information surrounding the process in their neighborhood, but the final decisions are not made by everyone. Since in the first phase of the transition participation is focussed on representation and social contagion build around activating an entire network the two theoretically do not coincide.

In the later phases of the neighborhood energy transition concerning the execution and realization of the solution, participation is also important (Programma Aardgasvrije Wijken, 2022). The key difference is that in the later phase everyone will receive an offer. This time involving just the representative is not enough. The project team has to put in the effort to make everyone aware of their opportunities. The information distribution should be fair and equally distributed in the whole network. Thus social contagion will interact with participation in this part of the neighborhood energy transition. Chapter 6 will dive into the implications of the connection of participation and

even though participation in informing citizens does influence the application of social contagion, the level of participation does not change this influence. No matter what level of participation according to the ladder you are following, in all cases, all citizens need to be informed. It doesn't matter whether this is done by the government directly or by the project team led by a citizen initiative.

Energy transition and volunteers the Netherlands

The Netherlands are European champion when it comes to voluntary work (Schmeets et al., 2016). Not only in sports clubs and at schools but also in care, youth work, and other organizations (Arends, 2021). In the energy transition volunteers also play an important role, they perform a variety of tasks like organizing neighborhood gatherings, making heating images of houses, organizing energy markets, or organizing a collective purchasing action (Stokkom, 2021).
Besides helping in the execution, the Dutch energy transition with its neighborhood approach is also dependent on volunteers for participation. The participation process in the energy transition is a long-term project in which there is little freedom and there are many regulations to follow. Volunteers, however, tend to favor short-term projects, have feasible goals, and provide them with the freedom to form their path (Stokkom, 2021). This makes for a mismatch between the request the Dutch government makes on its volunteers and the offer they can give and thus making it hard for municipalities to find enough volunteers.

Time is scarce

On top of the mismatch between the preferred tasks for volunteers and the request of municipalities for the volunteers. The time volunteers can spend poses a second obstacle.

The time that people invest in voluntary work is economically speaking a scarce good. Volunteers can only spend their time once and have multiple places to do so. Using Lehman and Winters (2008) model for competition and applying it to the energy transition we see that there are many activities participation has to compete with on the scarce market. See figure 11. In practice, we see that all these levels of competition can form a bottleneck for participation. For example level 4 was a bottleneck for the volunteer in chapter 6. She decided that the energy transition was too time intensive and that she would rather focus on her family. Of course, this is true for every volunteering work and is hardy in the sphere of influence for project teams or municipalities.

However, the level 1 and 2 competitions are in the sphere of influence for the project team but are not viewed as competition by the project team. They form a blind spot. Municipalities are so happy they have found an access point in the neighborhood that they ask the same active group of citizens for multiple tasks. From participation in neighborhood markets or delivering newsletters, these tasks all compete on level one. For example, my Mentor Sonja is an energy coach in her hometown. Now that she is an active member she is being asked to also coordinate or even participate further in the transition in her town.

Since she does this voluntarily she will have to say no to one or the other.

For some this over-asking can even mean they stop participating altogether. It is important to keep in mind that the citizens participating have a lot on their plate and if we can, we should use their skills strategically. Both in terms of project goals as well as looking at what provides them with the most fitting tasks to complete. Both in the participation part of the transition process as well as in the social contagion part of the process.

Conclusion

The goal of participation is to make informed decisions through representation, as well as reach all residents to meet the equal information obligation municipalities have.

The energy transition is a big long project and thus does not appeal to volunteers typically. Therefore the active volunteers should be taken care of and should be put into their power. Either in the participation or in the activation process.

Levels of Competition

Figure 11: Application of levels of competition model (Lehman and Winter, 2008)

Chapter 4

Social contagion in the energy transition

To understand what social contagion can mean for the energy strantiosion, first we look as the application of the theory in other context. (4.1). Secondly we zoom in on the network thoery and this can be applied in the energy transition (4.2). Then we define the two types of contagion (4.3) and find out which strategy could be used best for eacht ype of caontagion in order to to start the actvation process best (4.4).

4.1 Why should we use social contagion?

Understanding social contagion

Transitioning from gas energy to a sustainable alternative requires residents to change their behaviour and their perspectives. Similarly, the adoption of new technologies also requires people to be persuaded to accept and use the alternatives. New technologies are often met with resistance since they are not familiar and at first, might not be as convenient or comfortable, or as cheap as the current status quo (Compagnone, 2014). When the adoption halts, the strategy has been to alter the innovation to fit the needs of the consumers (Centola, 2018). For example, Nest first showed people their heating, but upon disappointing initial sales, they switches towards a product that optimizes your energy routine for you.

When looking at the energy transition there are several alternatives to using gas, but often one of the alternatives is objectively the best option. We cannot change the technology of these alternatives. There is no quick fix to make them more user-friendly or desirable, in the short term it will cost consumers investments and will provide inconvenience. In the long term, the profitability of the alternatives is uncertain (Buskens & Raub, 2013; Enzler et al., 2014; Liebe et al., 2011; Ligterink et al., 2019; Poortinga et al., 2003; Schultz et al., 2007; Van Rijnsoever et al., 2015). That is why we have to look for other ways to strengthen adoption.

Centola (2018) offers a new approach to this problem in his book 'How behaviour spreads' What if we do not change the innovation but instead focus on the social network that is spreading the innovative behaviour? This approach could especially be beneficial to use in the energy transition in the Netherlands since the Dutch government has decided on a local neighborhood approach (Centraal Bureau voor de Statistiek, 2021). Municipalities are advised to focus on ''buurten'' which means the adoption of the alternative to gas will be presented to a group of around 500 households at a time. These ''wijken'' are an excellent example of a small social network. But before we might use social contagion as a strategy, we first need to understand its mechanisms and principles.

Social contagion uses social networks to analyse how things spread. We have become quite familiar with these models through the recent covid pandemic. When you are infected with covid the GGD calls you to question whom you have been in contact with. By collecting this data from all infected patients, the network becomes apparent and we can track the spread of the virus. Contagion might not be very beneficial to us in pandemics, but its principles can be used in other settings as well. For example when you want to spread the word about a new job opening up or when you want to increase the adoption speed in the energy transition.

Before we explore the two types of social contagion (simple and complex) we need to understand the basics of social network theory and sociology. We will explore what social identity, norms, ties, and cohesion mean and how they can be best applied to the context of the energy transition.

4.2 The theory of social networks

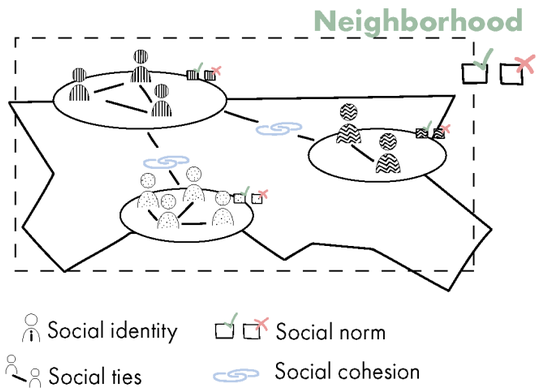


Figure 12: Social network neigborhood

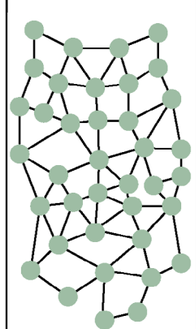
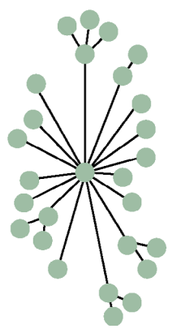
	Strong& Short tie	**Long & Weak tie**
Relational	-close friend -frequent interaction -increase trust	-aquaintances -less frequent -less readily influenced
Structural	Weak : -Information in closed triads tends to be redundant	Strong: -Provide shortcuts across the social topology -Access to new information
Visual		

Table 1 :Difference strong and weak ties

To understand social networks, we have to understand the lexicon socioligst use. We dive into the meaning of social ties, identity, norms and cohesion, see figure 12.

Social ties

A social network is made of nodes that are connected through ties; these social ''networks are the pathways along which these "social contagions" propagate'' (Centola & Macy, 2007). Within this network Granovetter found we have strong and weak ties (2006),see table 1.

Looking at the relational meaning of these ties, strong ties consist of bonds with people you interact with frequently, that you trust and those you might consider as close friends. These ties might be relationally strong but they do not facilitate us in spreading information. Strong ties tend to form closed triads (Granovetter, 2006), meaning that the friend of your friend is likely to be your own friend too. Chances are you will discuss similar topics and thus you will not get very different information from both friends.

Looking from a structural perspective at these strong ties, they end up weak and sometimes redundant since they do not provide you with new information. Contrariwise a relational weak tie could be a friend from a totally different friend group. You might not talk to each other very often, but when you do, the chance for you to receive new information is much higher. This makes these weak ties interesting and very valuable from a network perspective. They provide shortcuts across the network and thus speed up the contagion (Levin & Cross, 2004).

Social identity

How can we predict who will form a tie with whom and when can we speak of a group within a social network? This is where social identity comes into play. People have many different social identities, at work, you might define yourself as a guy from finance, who works on the third floor. But in football, you might be the defender or the bartender at the club. In general, geographical location plays an important role in how we form our social identity. This can be on a national scale where people feel they are Dutch for example or on a city scale where they feel for example a 'Rotterdammer'. Besides, close geographical location is a big convenience if you want to start a bond since you have to have contact for a bond to form.

Secondly, people tend to connect to people who are similar to them. It is easier to place yourself in the shoes of someone who might experience the same things as you do. ''Homofili creates empathy'' as Centola explains (Centola, 2018). The right type of homophily makes it easier for people to understand how the decisions of others might be beneficial to them. This is why defining the social identity in a neighborhood is very important since this will influence the adoption process of a new intervention (i.e. the decision to take part in the energy transition).

Defining the identities in a neighborhood and thus finding the social groups is not an exact science. As mentioned, there are many different social identities people have. Demographics will help you a little as well as ethnicity or income. For each of these factors, tools are developed to map them to the neighborhood. But it is important to state that there is not one single correct answer to this question. PAW developed a tool to help municipalities create neighborhood client profiles(Programma Aardgasvrije Wijken, 2020). Figure 14 shows the many levels on which people can relate to one another and thus form social Identities. Figure 13 shows an example of a final Neighborhood Profile.

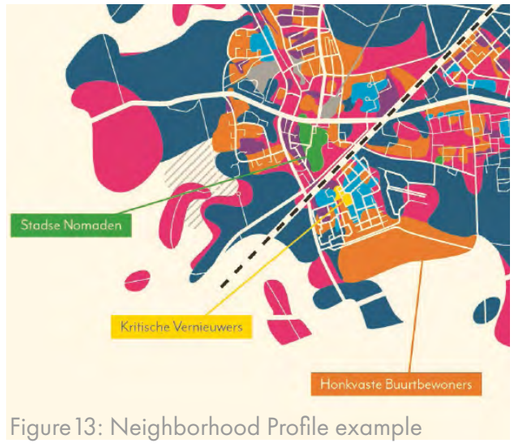


Figure 13: Neighborhood Profile example

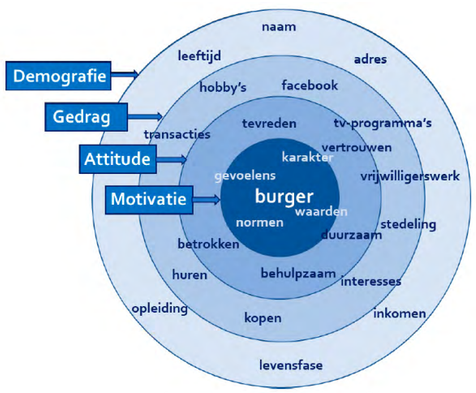


Figure 14: Layers of Neighborhood Profile

The client profile of PAW cannot be copied directly towards social identities since the client profile focuses on the adoption of the new product and reasons from there to make groups. Social identities should be formed separately from the energy transition. Another tool often used by municipalities is the BSR lifestyle tool see figure 15(Marketresponse, 2022). This tool maps the attitude of citizens towards the energy transition and connects them to postal codes.

It might seem logical to use this model and start with the idealistic pioneers. The only problem is that the attitude of citizens towards the energy transition does not predict or connect to the social identity of the same individual. The BSR tool can help to make a strategic decision on where to start in your neighborhood, but only once you have identified the different social groups in the smaller neighborhood.

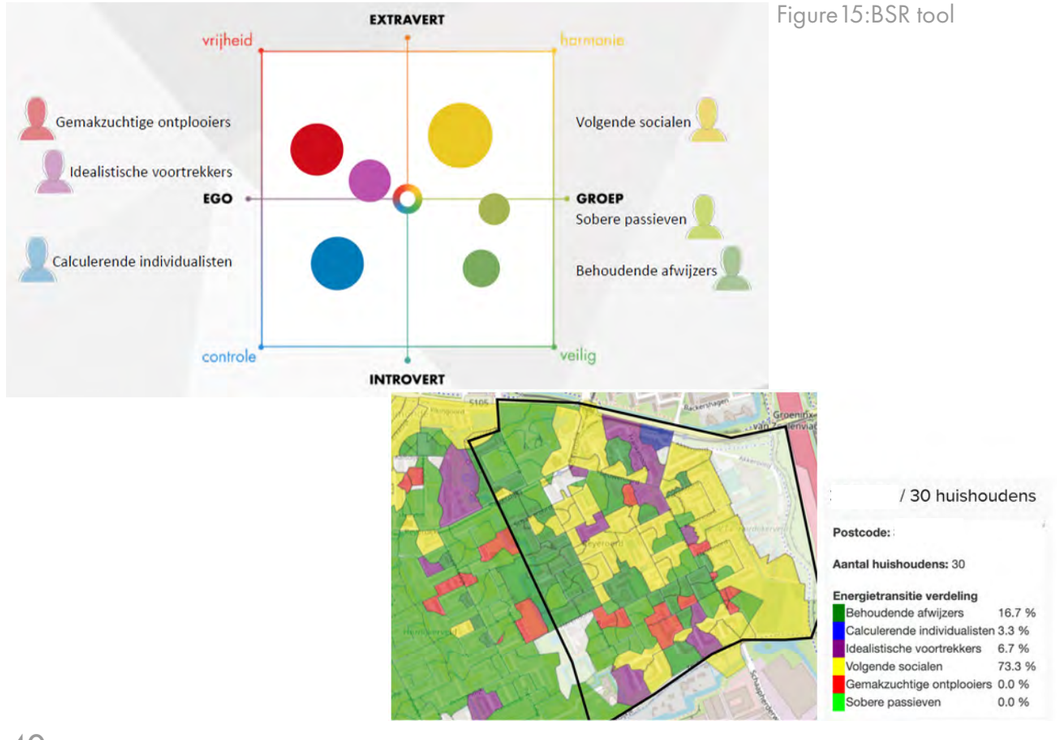


Figure 15:BSR tool

Social cohesion

So we have individuals who have a social identity, they connect and form ties with people who are similar to them. Together they form a social group. But what about the ties between these groups? These are called bridges, see figure 16.

Narrow bridges do not describe the strength of the personal tie, but rather the number of ties that connect different groups together. These bridges are crucial in the contagion process since this is where the information about behaviors can really travel across the network. The bridges are present in a sepcific network. For example your work relation network.

Social cohesion on the other hand describes the general connectedness of a specified group or community. Within the community several networks can be present since networks form around topics. e.g. the polotical, manger, and personal network all togehter. Social cohesion is defined as:

''Social cohesion refers to the extent of connectedness and solidarity among groups in society. It identifies two main dimensions: the sense of belonging of a community and the relationships among members within the community itself.''(Manca,2014)

So even though social cohesion is not the same concept as bridges, they are both important for the effectiveness of social contagion. When there is no or very little connection between social groups in all networks. The social cohesion is in

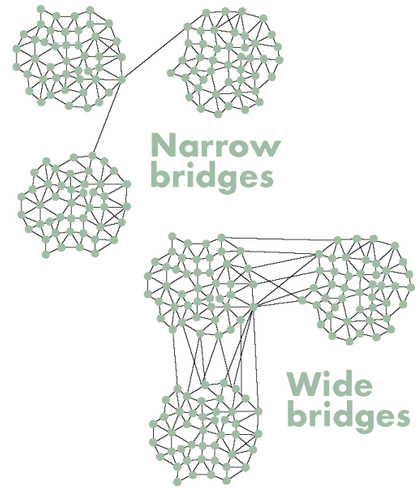


Figure 16:Types of bridges

the community also low and it becomes hard to start a little fire that keeps on developing on its own. You would have to start over again for each social group. This is important to realize: The current social network in the neighborhoods dictates the possibilities of the application of the social contagion theory. The social cohesion of the community is an indicator of this. But in a community with little social cohesion, there might be one specific network that is strong enough to work with.

Social norm

Cialdini and Trost (1998) define social norms as: constructs that are used to describe and explain (social) behaviors; and these arise out of cultures (societal-value perspective) or instincts of survival (of individuals or groups; functional perspective).

These norms can feel intangible or even non-existent, but when they change, that's when they become clear. For example, during the Covid-19 pandemic, it became un-accepted behavior to go into an elevator and look at someone. Before we would all look at the door and would kindly let as many people in as fit. During the pandemic, we would try to look at the wall and people all of a sudden waited for the next elevator. Social norms are like shortcuts for social behavior, they tell us what to do and what is right. This can be positive in the case of the pandemic and the changed social norm, but at the same time, separate water fountains were also the norm in the USA before segregation was removed.

Sometimes the social norm takes a long time to change, for example, smoking in the Netherlands. At first, smoking was normalized and even encouraged by doctors. Later we found the effects smoking has on our health and the social norm slowly started to change. At first, it was just okay, and later the campaign ''Roken kan echt niet meer'' (Smoking is not of this time), and soon cigarettes will be banned from supermarkets. This is a slow transition of a social norm, or so it seems. The Arab revolution is another example of a social norm that seems to flip very fast.

But that is exactly the catch, the norm seems to flip fast, but preliminary there was a consistent growth of a group that adopted the new norm slowly. Centola (2021) explains that he found the 25% rule. This means that when more than 25% of the network adopts a new social norm, the rest of the network will follow. But when 24% percent of the network adopts the new social norm, the norm is not changed yet. This does not mean the network has not changed, the change is just not visible and will slumber until a few more join and the 25% is reached once more, see figure 17.

Social norms can never be changed by an individual. People need to be protected from the current status quo to form new opinions together. So that as a group they change the social norm and push past the 25%.

The social norm around the Energy transition is changing, see figure 18. In most neighborhoods in the Netherlands, you are not ''frowned upon'' when you still use gas, contrary we still perceive it as normal. Some individuals might have altered their own perception but this does not mean the social norm has changed yet. In some new neighborhoods, all houses are built directly off the network but this still does not mean that public opinion has shifted. So whilst the national public opinion remains not highly in favor, we can focus on shifting more local social norms, from neighborhood to neighborhood and from social group to social group. The next paragraph will explain how this is done through social contagion.

Figure 17: News articles social norm in the Netherlands

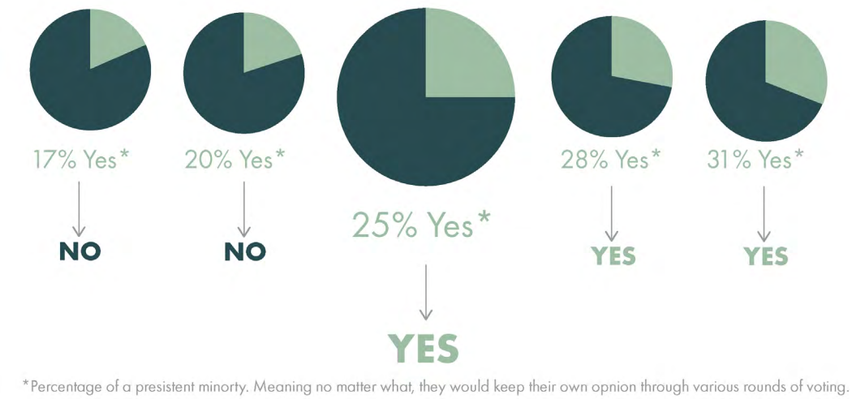


Figure 18: The 25% rule

4.3 Two Types of Social Contagion

Now that we understand how social networks are build-up, we can explore what might be diffused through these networks. Social contagion can be divided into two groups, simple and complex contagion. Simple contagion explains the spread of information, whilst complex contagion explains how behaviors travel throughout the network.

Simple contagion

Simple contagion explains how (simple) information dissipates through a network (Centola, 2007), see figure 19. Previously we saw the example of a virus spreading through a network, this is also simple contagion because you only need to be exposed to ''1 active'' member in the network to be activated yourself. This interaction can happen once and the virus will be transferred to the next person and so on. When we apply this example to the transfer of information within a social network, we can theorize what the optimal network for the spread of simple information would look like.

The optimal network for the spread via simple contagion would have many long (weak) ties. For the seeding, it would be best to start by activating key individuals in the network with a large reach and with many ties. Like the node in the middle of figure in table 1. These key individuals are defined as influentials (Watts & Dodds, 2007). Since they have maintained many ties, the width or strength of the ties is weak. For example, think of the canteen lady at a football club, she might speak to many players of the football club and have a very large reach. However, she is not capable of maintaining a solid relationship with all these people, there are just too many to stay in contact with. That is why we need average people to further spread the information through the network (Huang et al., 2016).

This second phase in the spread of the information, i.e. the word-of-mouth transmission of information, can still spread rapidly through a network, especially when regular nodes also have many long ties that connect otherwise distant networks.

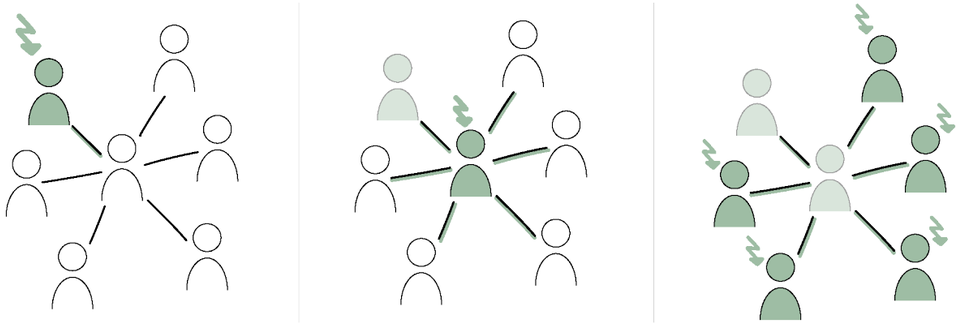


Figure 19: Simple contagion

As Granovetter puts it (1973, p. 1366), "whatever is to be diffused can reach a larger number of people, and traverse a greater social distance when passed through weak ties rather than strong." This is how in the ideal world simple contagion would move through an optimized social network.

It is important to realize that this ''whatever is to be diffused'' in this simple contagion theory is subject to a crucial assumption: an individual only needs 1 source of contact with an activated node to be activated themselves. This means that only simple information can spread like this. For example job information or the scores of a football match or a highly contagious rumor (Centola, 2007).

Simple contagion in the energy transition

The information about the energy transition that is circulating in networks is now often dominated by the national media. Local media are under pressure especially in smaller municipalities in the Netherlands there is less attention of local politics (Vereniging van Nederlandse Gemeenten, 2020). Journalism is not only important to inform, but also serves as a watchdog for the local democracy. This means citizens are more dependent on the national media. Here our own psychological negativity bias shapes the news we consume (Soroka et al., 2019), meaning it is harder for positive stories about e.g. the energy transition to find a wider audience, compared to stories of failures or mistakes. Local media do report on both the good and bad stories surrounding the energy transition, but the positive stories do not find their way into the national media.

Simple contagion explains the way information spreads through a network. It is crucial to realize this entails both positives, but maybe even more so regards negative information surrounding the energy transition.

So when the project team starts with a new neighborhood. We can assume there is already information circulating in the network. This might not be positive information and the information will travel fast. This can not be changed but can be taken into account by the project team.

Complex contagion

Complex contagion differs from simple contagion in that the threshold to adopt change is not 1 contact but 2 or more contacts with a tie who has been activated, see figure 20. In simple contagion the risk and costs of ''adopting'' and spreading messages or behaviors are low, so being in contact with one individual is enough to activate someone. However, when adopting a new behavior or spreading some information is costly or controversial, which is the case for complex contagion, individuals need to receive reinforcement from multiple independent sources. For example, spreading the news about new software being released is relatively risk-free and not costly so the news itself will spread with the principles of simple contagion. But adopting the new software requires more affirmation than just hearing about it once, it spread with the principles of complex contagion. (Centola 2007). Besides the example of the adoption of unproven new technologies (Georgopoulos, 1967), other examples of complex contagion are the credibility of a bizarre urban legend (Heath et al., 2001) or the development of social movements (Marwell & Oliver, 1993; McAdam & Paulsen, 1993; Opp & Gern, 1993).

It is important to notice the difference between the amount of exposure and the number of sources someone is exposed to. This might seem like a minor difference but is of great importance for the way behavior spreads through social networks. The once redundant strong ties in closed networks between for example friends from whom we hear the same story we already heard, are now of utmost importance to overcome the threshold for activation.

The network in which complex contagion travels best looks very different from the network for simple contagion. Whereas weak long ties offered a strategic advantage for simple contagion, for complex contagion these ties mean weak bonds without a big change of reinforcement. The earlier perceived redundant ties between already connected nodes are now valuable since they provide close reinforcement and thus a better chance at adoption. The once so important influentials are now alone in a network of not yet activated nodes. Before they were able to spread the information fast, now it is hard for them to break through the current social norm and activate others to adopt a new status quo. So Complex contagion, contrary to simple contagion works best in a network that is closely knit and has wide bridges (multiple connections between social groups).

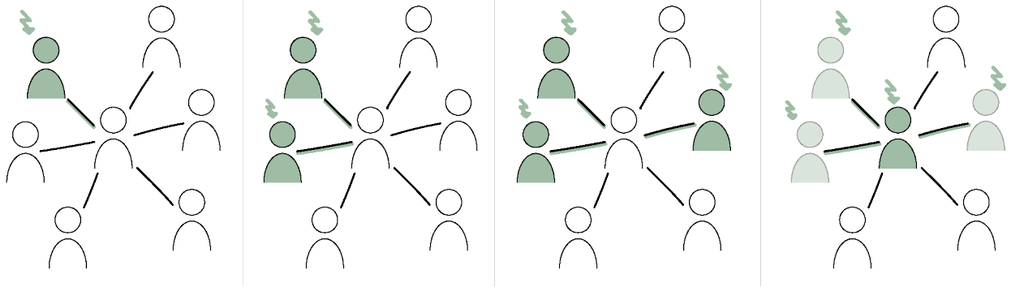


Figure20: Complex contagion

Complex contagion in the energy transition

Complex contagion uses the opposite strength of the network to flow through the already existing social network. Simple contagion spreads fast like a virus, behaviors travel via complex contagion and go slow and through, otherwise viewed as redundant ties. This difference in tempo makes it hard to apply complex contagion to the energy transition. Municipalities have deadlines which are written down in the TvW. So it can feel counterintuitive for municipalities to focus and aim for a process that is by nature slow and slower than the alternative of simple contagion. With simple contagion, you will reach all the residents fast, but they will only know about your actions. With complex contagion, you will reach them slowly, but they will be activated themselves.

There are ways we can speed up the spread of behaviors for example we can simulate the optimal network in which behavior or risky information is transmitted fastest. Centola performs some experiments in which a new network is formed, for example, an online health community. He deliberately decided how people are connected and with whom they can chat. A close-knit network works best for the spread through complex contagion, while a spread-out network sometimes does not work at all (Cetola, 2018). In this scenario, people will know about the innovation but will not adopt the innovation.

In the energy transition, we have a semi-fixed network. We can facilitate events in which people meet new neighbors, but other than that the network is already there and cannot be simulated as Centola did in his online experiments (2021). This means we have to deliberately change our approach from what we are used to eg. spreading the news as fast as possible, to an approach that suits complex contagion best. Chapter 4.4 will elaborate on which seedings strategies work best for both simple and complex contagion.

4.4 Seeding strategies

For the energy transition, complex contagion offers a solution to the activation problem municipalities face, see chapter 6. Muncipilaites are keen to know how they can start up and facilitate a successful adoption process. Many examples come to mind, like marketing via influencers or trying to create a viral campaign online. Centola (2021) describes 3 main types of seeding strategies: the hail shot, silver bullet, and snowball strategy, see figure 21,22,23.

The hail shot strategy is based on virality. You chose to have a wide but low-engagement deployment. The seeds will be spread out as much as possible so that you reach as many different social identity groups as possible. This would work to spread a virus (simple contagion), but for the adoption of risky new products or norms not so much. This method does not facilitate complex contagion since each seed will be alone in breaking the social norm. The starters of the process encounter a lot of resistance without having an ally. The seeds cannot increase the reliability or credibility of the new product/ service/norm. Therefore the desired change and adoption will most likely come to a halt and the seeds might even stop using the product. So for simple contagion, this strategy works well because there is no social norm to challenge. For complex contagion, this strategy could backfire and result in no adoption.

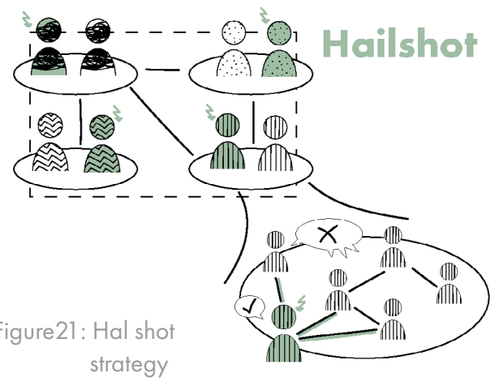


Figure21: Hal shot strategy

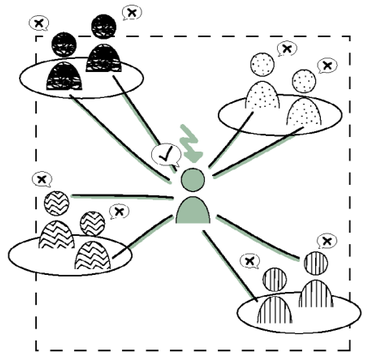


Figure22: Silver bullet strategy

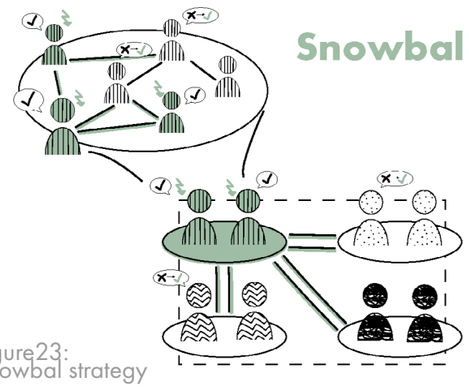


Figure23: Snowbal strategy

The silver bullet strategy is based on influentials in the network. Municipalities could try to convince that one person who is connected to everyone. This is a focused approach but one with high engagement. The central seed should start a chain reaction. For simple contagion, this is easily done. Only one active member is necessary to continue the activation chain reaction. Since this method works so well for simple contagion, people tend to use it for complex contagion as well and think this will work too because the image of the influencer is soo strong. Centola argues that this is the myth of the influencer. The influencer seed node is exposed to more counter influences than other average members. It is improbable that the influencer will change to the social norm. And even if this happens, the new frontline of the adoption will have the same problems as the last phase of the hail shot strategy. So again this strategy works well for simple contagion, but not for the intended complex contagion.

The snowball strategy is based on the strength of the network. Just like with the hail strategy you have a wide deployment. This time, however, you make sure (almost) all the seeds know each other. This might seem counterintuitive, why focus on connections of people who already know each other. When looking at viral simple contagion we would call these connections redundant. But facilitating the adoption of new social norms thrives well when people talk about it and most importantly are protected from negative influences. Seeds can now share their experience safely, slowly building on the credibility and reliability story of the change. It also helps the seeds to carry the change over longer periods of time. Wide bridges eventually facilitate the growth of the adoption of new social groups. In this strategy, it works best to start at the edge of a social group, because similarly to why the silver bullet strategy does not work with complex contagion, more central nodes have more connections that affirm the old social norm.

In conclusion, when using simple contagion, the hail or silver bullet strategy are both effective methods to spread information fast. However, when it comes to complex contagion and the adoption of risky behavior or new products, services, or social norms it is better to adopt a snowball seeding and spreading strategy. Thus for the activation of residents in the energy transition, the snowball strategy would be best.

Conclusion

The goal of social contagion is to activate the right network. The activation process is done by the network itself and it is a self-steering process. One community can have multiple networks. Network theory and its glossary helps to understand how a network function. Both information and behavior can be transmitted through the network, each has its optimal seeding strategy.
For the energy transition, the snowball strategy is beneficial since it transmits behavior best.

Part B

Practice

Chapter 5

The impact of Wijkkompas

The impact of the Wijkkompas tool is determined as means to understand the tool better. The impact is presented in a short list of strengths and weaknesses of the tool. These lead recommendation for Wijkkompas, outside of the scope of this graduation, to better algin their vision and strengths. Lastly, the current use of social contagion in the Wijkkompas tool is determined. This informs a first reccomendation as to how the soical contagion tool can complement the Wijkkompas tool best.

5.1Interview Set-up

We executed 13 interviews, first to determine the impact of the Wijkkompas tool on the work of municipalites and their project teams. Secondly, the later half of the interview focused on current use of social contagion in the project teams approach, see chapter 6. For the interviews, five Municipalities were approached via the project manager of Wijkkompas to create a trustworthy introduction to the project. Three municipalities agreed to be interviewed, all are starting with their first neighborhoods, or have started in 1 or 2 neighborhoods already. After the interview, the project managers were asked to contact resident initiatives and stakeholders in the energy transition who could be interviewed as well. This resulted in the respondents in table 2. The interviews were held in Dutch and lasted between 30-75 minutes in total , of which 13-30 min were speciafically reserverd for the impact measurement of the Wijkkomaps tool. The interviews with the municipalities and citizen initiatives were held physically, others were held online and all followed a semi-structured format, see appendix B for the interview guide.

NR.	Municipality (population)	Role
1.	Municipality 1 (120.00)	Project manager municipality
2.	Municipality 1 (120.00)	Housing corporation - communication
3.	Municipality 1 (120.00)	Energy corporation
4.	Municipality 1 (120.00)	Housing corporation - social work
5.	Municipality 2 (160.00)	Project manager municipality
6.	Municipality 2 (160.00)	Citizen initiative, Neighborhood 1
7.	Municipality 2 (160.00)	Citizen initiative, Neighborhood 2
8.	Municipality 2 (160.00)	Energy corporation / Citizen initiative
9.	Municipality 3 (30.00)	Project manager municipality
10.	Municipality 3 (30.00)	Citizen initiative, Neighborhood 3
11.	N.V.T	Consultancy agency Municipality/ Housing corporation
12.	N.V.T	Consultancy agency Housing corporation
13.	N.V.T	Consultant Municipality

Table2:Participants

For the impact analysis of Wijkkompas interviews were chosen as the main method since a quantitative analysis is not yet possible. Municipalities are only just starting the neighborhood process. The semi structered interview allowed us to zoom on the benefits each muncipality experienced whilst using the tool in the first stage of their transition process as well as whilst writing the overacrhing policies. The strentghs are discussed first.

The weaknesses were also investigated, since these show the oppertunities for Wijkkompas to make even more impact. They tell us a lot about what people view as the purpose of the tool and thus where they would like to make more impact.

The strengths and weakensses together inform the reccomendations. These were outside of the scope of the project, but are included since one the reccomendations is adopted by Wijkkompas.

5.2 Impact of Wijkkompas

The goal of this evaluation is to formulate recommendations for Wijkkompas to further improve the tool whilst gaining an understanding of how the tool is used and experienced in practice. This supports the process of including social contagion theory in the current Wijkkompas tool, but social contagion will not be implemented yet. The impact of Wijkkompas follows from the strengths we gathered from the interview insights. Secondly, the found weaknesses offer oppertunities to further imporve the Wijkkompas tool itself as well as the Social contagion tool that will be designed.

Strengths

1. The fases of Wijkkompas

Often mention ed, even by non-users but people who are acquainted with Wijkkompas is the overview it provides by splitting the complex transition up into 6 phases. Municipalities mention they include the phases in their policies and documentation. For external parties, the steps present a clear approach to a process that can feel messy and complicated.

''Maar om in die wijk uitvoeringsplannen beter vorm te kunnen geven, hebben we, volgens mij vorig jaar, ervoor gekozen om samen te gaan werken met het Wijkkompas. Omdat zij een instrument hebben waar al de stappen heel helder zijn weergegeven die je moet nemen.''
Housing Corporation Municipality 1

2. A tool that helps start and build conversation

Wijkkompas is a tool that helps municipalities to get everybody involved and work in the same direction. This can be with the housing corporations and energy providers, but also citizens initiatives can get a better picture of the approach when introduced to the method behind the Wijkkompsas instrument. When the instrument is used for a longer period of time it can help to create a universal language surrounding the neighborhood approach. But this has yet not happened in all neighborhoods.

''Dus wij gebruiken het dan wel als een soort praatprent en wij gaan dan het door hen (bewoners) ingebrachte initiatief op dit kompas zetten. Om het voor hunzelf duidelijk te maken hoe ze aan het werk zijn. Dat zijn leuke dingen.''
Project manager
Municipality 2

3. Wijkkompas sets an example for the social transition

Municipalities, as well as citizen initiatives and experts I talked to on the Energy-up congress of Squarwise all, have a similar story. They started with the technical challenges in mind but later realized that social transition is at the heart of the energy transition. Wijkkompas is a tool that can help facilitate a bottom-up approach instead of the often used top-down perspective on the transition. Their vision becomes very clear during the internal meetings and is a red thread thorugt their presentations with external parties.

''Ik denk zeker dat als je dat propageert, ook met allerlei goede voorbeelden in het Wijkkompas, dat het ook een ingang maakt voor bewoners. Dan kun je dat zeker vertellen aan andere bewoners''
Project manager
Municipality 3

4. Providing structure while facilitating the diversity of neighborhoods

The energy transition is a complex process and managing all stakeholders can be challenging. Wijkkompas shows the different routes a municipality can take and leaves enough space for a custom approach for each neighborhood. In some, the tool is used as a checklist to see if they are heading in the right direction, in others it is a tool for full collaboration. Some municipalities even use it as the Wikipedia for the energy transition to look up info fast and implement it in their own approach.

The use of Wijkkompas as Wikipedia is known by Wijkkompas but it is hard to track. Besides the online tool is now focused on comprehensive use rather than a quick look-up.

''Ja, ik wil niet gelijk weer, zeg maar, met oogkleppen op in een systeem zitten. Ik wil ruimte hebben om mijn eigen proces te ontwikkelen en niet weer vanuit allerlei lijntjes en paden te moeten lopen.''
Project manager
Municipality 2

Weaknesses

1. Intended Use of Wijkkompas ≠ actual use

The intended use of Wijkkompas differs on three point from its actual use:

a. No municipality uses the full online environment.
Wijkkompas can be used on various levels of intensity. Ranging from Wikipedia use to fully using the online environment with all stakeholders. The instrument is designed to be used online however of the 5 municipalities currently paying of the tool 3 municipalities are active participants but have not uploaded (all of their) documents and 2 municipalities are just started using it.

Most of the municipalities have not fully started the transition and thus cannot upload much yet. However, what can be uploaded is not always done since it's too time-intensive. Both for municipality and partner. If this is just a start-up problem or more long-term has yet to be determined.

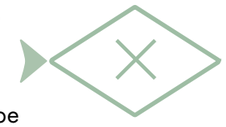
b. Tracks are not used by users and not mentioned by others
The 6 tracks of the instrument are not used by the interviewed municipalities and not mentioned by other stakeholders in the energy transition. The phases provide enough overview for the users. In my personal opinion, I think the tracks add more complexity rather than adding value. Besides some tracks are formulated around a user whilst others are common goals. This makes it hard to remember and use them.

c. The instrument is designed for and mostly used by municipalities
This contradicts the goals of Wijkkompas to engage all stakeholders in the energy transition. Partially this is due to the fact that big organizations have their own tooling and planning and using Wijkkomps is just too much of an extra burden. At the same time is this problem well known in the full transition. Municipalities have received the directing role of the national government but cannot do it by themselves. Activating all stakeholders is difficult, with or without using the Wijkkompas tool.

Municipalities do see a role for Wijkkompas to take on a facilitating role in this process.

''Op moment dat ze een projectleider daarom vraagt: Zeg maar, gewoon er naastzittend en met partners Wijkkompas openen. Hoe ga je nou iets concreet doen? Praktisch zeg maar, dat ding gebruiken. En hoe ga je zorgen dat je als groep dit als een soort ja project management tool gaat gebruiken? ''
Project manager
Municipality 1

2. Has to be used at the start but the urgency to use comes later



Wijkkompas is designed to be used when there is (bestuurlijk mandaat) to start the energy transition in a neighborhood. When project teams start with this local and detailed process, the need for a process management instrument becomes apparent. However, to achieve the goal of cross-neighborhood learning Wijkkompas needs to be adopted earlier on in the preparation phase. Municipalities tend to develop a general approach to the transition. Adopting the Wijkkompas instrument once the approach has been decided seems unrealistic. This is partly due to the fact that changing methods midway is always difficult, but also because Wijkkompas is now positioned as a tool with an online environment that is quite use intensive. The Wikipedia function of the Wijkkompas instrument could be beneficial also to Municiplaites who might not fully adopt the method connected to the instrument.

''Maar in 2 wijken waren we al een eind onderweg en daar kostte het invoegen van het Wijkkompas en het implementeren daarvan gewoon te veel energie en paste dat ook niet helemaal meer in hoe die aanpak zich daar had ontwikkeld.''
Project manager
Municipality 2

3. Focussing too much on the technical transition rather than the social transition

Even though Wijkkompas clearly aims to combine the social and technical challenges of the energy transition. All municipalities and also stakeholders point out that the technical challenges of the transitions are substantial, but that without the social support those challenges become irrelevant. Wijkkompas aims to support project teams in the social transition, whilst acknowledging that this can still be improved. Consequently, this graduation was initiated to do so.

The implementation of citizen initiatives into the instrument can be improved as well. This requires specialized knowledge which Wijkkompas is working on improving at the time of writing this report. Updates to the first phase are expected to incorporate the latest findings surrounding citizen initiatives into the instrument.

5.3 Recommendations

Based on the result of the interviews, five suggestions for improvement can be made right away theser are (1) adjusting the intended use, (2) simplifying the tool, (3) adding low-effort interactions, (4) make it possible to step in late and (5) adding visual aid. Chpater 5.4 dicusses the oppertunities to implementat social contagion in the Wijkkompas tool.

-Adjusting the intended use

The current online environment does not seem to function fully. Two alternative or additional uses of Wijkkompas can be a.becoming a facilitating agency and extending the service provided alongside the instrument. or b. focussing or more widespread but low-intensity adoption of the instrument (like Wikipedia). Both options could be executed in parallel, however, the Wijkkompas team is looking for a landing site for the instrument. Stroomversnelling was only responsible for the development of the tool and not for its further execution. Therefore option a does not seem viable. When focussing on becoming the ''Wikipedia'' of the energy transition two recommendations can be made.

-Simplifying the tool

Currently, even intense users of Wijkkompas do not seem to value the tracks built in the system. On the contrary the difference between the technical and the social side is mentioned as valuable, but not represented visually in to the Wijkkompas instrument. It is recommended to lose the 6 tracks of Wijkkompas and instead alter the representation and focus of the technical and social transition. It is too difficult to start to use the tool when it's new. This can be solved by losing the tracks. Consequently, it is recommended to emphasize the importance of starting with the social transition before working out the technical details. This would result in a slight redesign of the Wijkkompas tool which emphasizes the 6 phases of Wijkkompas and the relationship between social and technical, see figure 24.

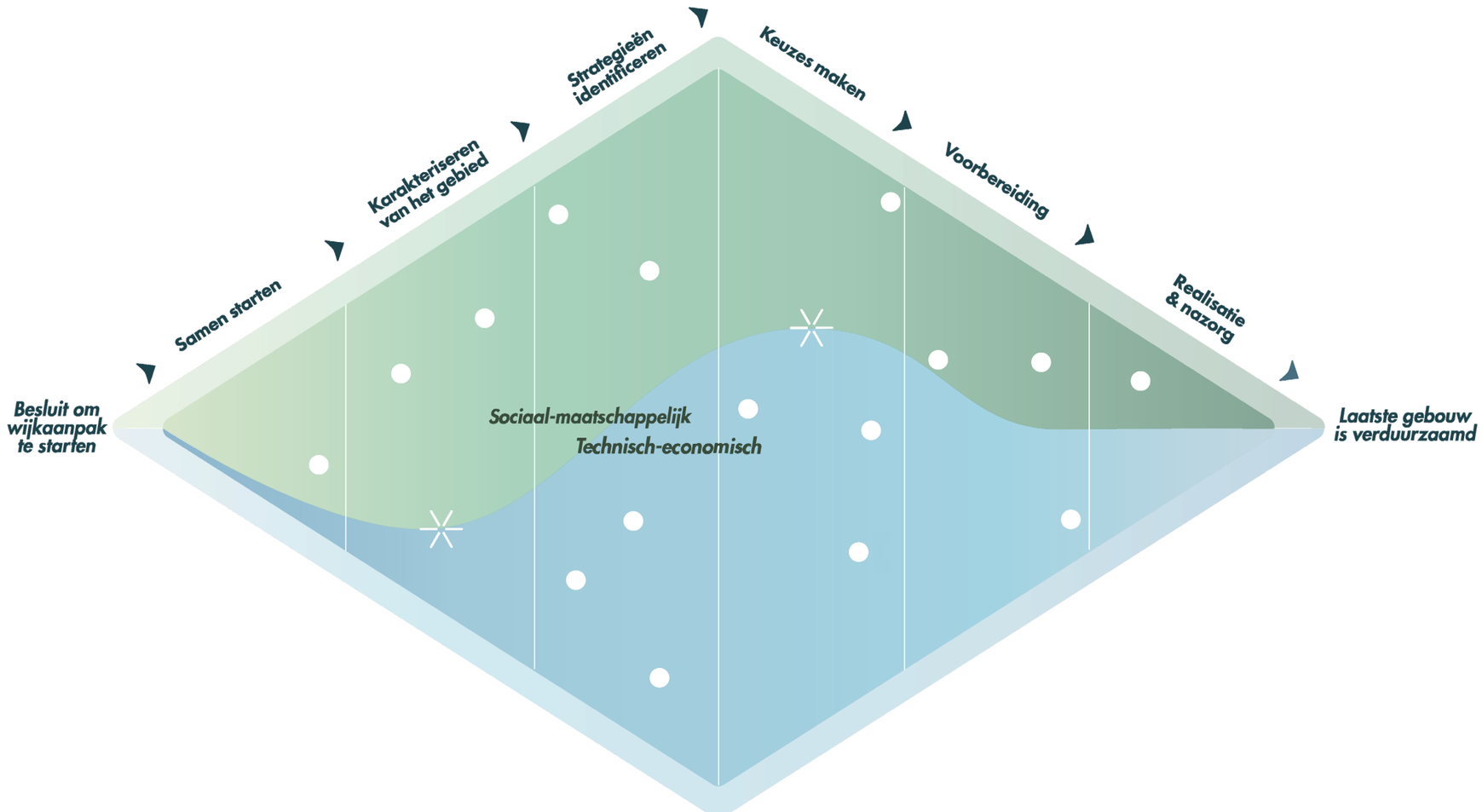


Figure24: Recommendation, simplify tracks

- Adding low-effort interactions
Municipalities and project teams are tasked with a big project and do not have unlimited time to invest in learning or sharing their findings. Currently, the community based on Wijkkompas requires time investments of its members. It is recommended, also when not choosing or the focus on the Wikipedia direction, to include options for members and non-members of Wijkkompas to interact and discuss their experience directly on the website, see figure 25. Wijkkompas would not become a forum per se, but tips and experiences could be shared after being evaluated by the Wijkkompas team on a publish-after-check basis. This would not only be a valuable feature for users and would provide Wijkkompas with a better view of the actual use of the tool.

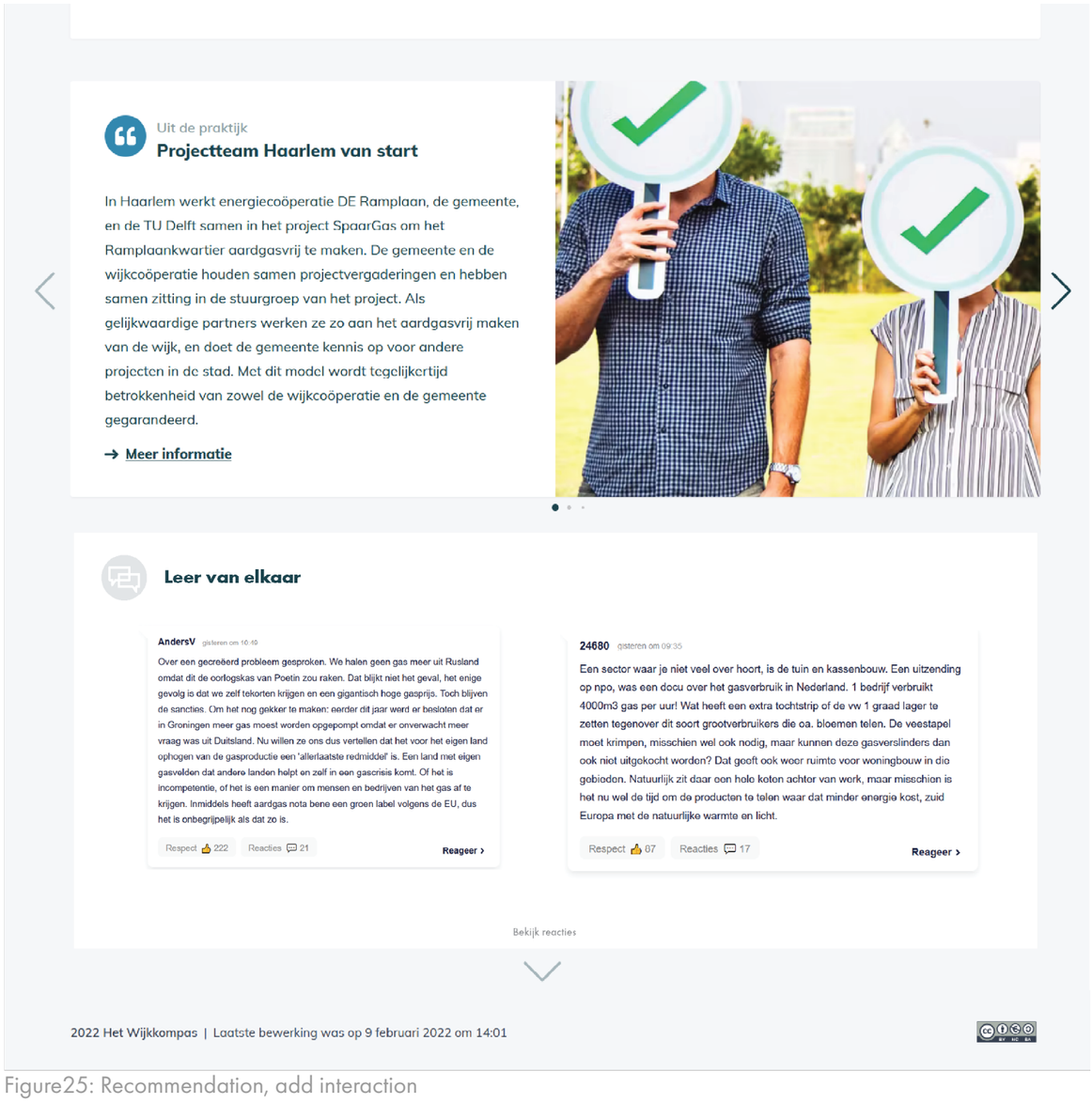


Figure25: Recommendation, add interaction

- Make it possible to step in late
By focusing on Wikipedia like the structure of Wijkkompas it might become easier for municipalities to use Wijkkompas when they have already started with the neighborhood approach. The importance of facilitating late step-in depends on the success of the tool in 2022. In December 2021 all municipalities had to hand in their Transitie Visie Warmte and thus have to get started with the transition this year. Whilst writing this report municipalities are developing their approach to the task at hand. When Wijkkompas find enough users the need for late step-in is not as urgent. However looking at the current speed of adoption and the speed at which municipalities are finalizing their approaches, it is recommended to start focussing on the late step in as an alternative use for Wijkkompas. By doing so impact still be guaranteed for the energy transition. What other adjustments have to be made to facilitate or design for the last step needs to be further investigated.

- Adding visual aid

Wijkkompas looks like a very language-based tool. From experience and throughout my design education I learned the added value of adding visuals. The Wijkkompas diamond is a great example. It is recommended to further use this visual on the website. For example by adding a homepage in which the visual is showcased and can be used to go to different nodes and phases, see figure 26. Now users can only find the visual when looking up the explanation.

Besides, it is recommended to shorten the name of the nodes or add some kind of system to refer to them more efficiently. This helps in getting an overview and improves the way people can communicate and talk about the nodes in practice.

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Figure26: Recommendation, add interaction

Final application

These recommendations were presented to Wijkkompas and discussed during the internal kick-off meeting for the second half year. Wijkkompas decided to adopt the new visualisation of the diamond (Wieber). As a result, Wijkkompas has let go of the 6 tracks in their model and brought them back to the two main tracks of the societal and technical perspective. Additionally, the 'wave' recommendation in figure 24 is adopted as well. Wijkkompas found that the visual captures their vision very well. It helps translate their values visually compellingly and simply.

The changed vidual was then discussed with the current users of Wijkkompas who all were very enthusiastic. They found it difficult to explain the tool with 6 phases and 6 tracks to collueges. Now that the 6 tracks are reduced to two they found it easier to explain the tool and found it easier to connect their vision on the energy transition to the tool.

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5.4 Opportunities for social contagion

The use of Wijkkompas in theory and in practice clearly allows us to identify opportunities for social contagion to play a part in the tool.

First, we find that social contagion could be implemented into individual nodes on the Wijkkompas webstie. The nodes would logically fall in the Citizen track of Wijkkompas. Figure 27 details which nodes in the citizen trakc could be used to do so. The figure showe that phase 1 offers the best opportunity for adding social contagion, since 4 out of the 7 nodes in the citizen track contain a hook for social contagion. This hook could be the mention of collaboration with citizen initiatives or communication tworads residents.

Secondly, Wijkkompas also creates ''Kennis dossiers'' or knowledge files (see chapter 2). The files are not incorprated into the Wijkkompas nodes since they require continous involvement of the project team. They cannot be dialed down to single moments of decisions, but rather explian a process that need to be maintained. Since Social contagion is also a process that need to be maintained, the Knowledge files are a suitbale location for the contagion tool.

Lastly, Social contagion could be developed into a tool on its own. Wijkkompas could be the owner of the tool and presedent in on their tools page. This could be a viable option, but depend on the outcomes and the form of the final design.

Conclusion

In conclusion, with the change of the visual Wijkompas' vision of first focussing on the social side of the transtion and taking the time to start this proces, before undertaking major technical stepps is now well aligned with their visualisation of the tool. The social contagion tool could further expand this strentgh since this focus on participation is an ideal stepping stone to implent Social contagion as well.

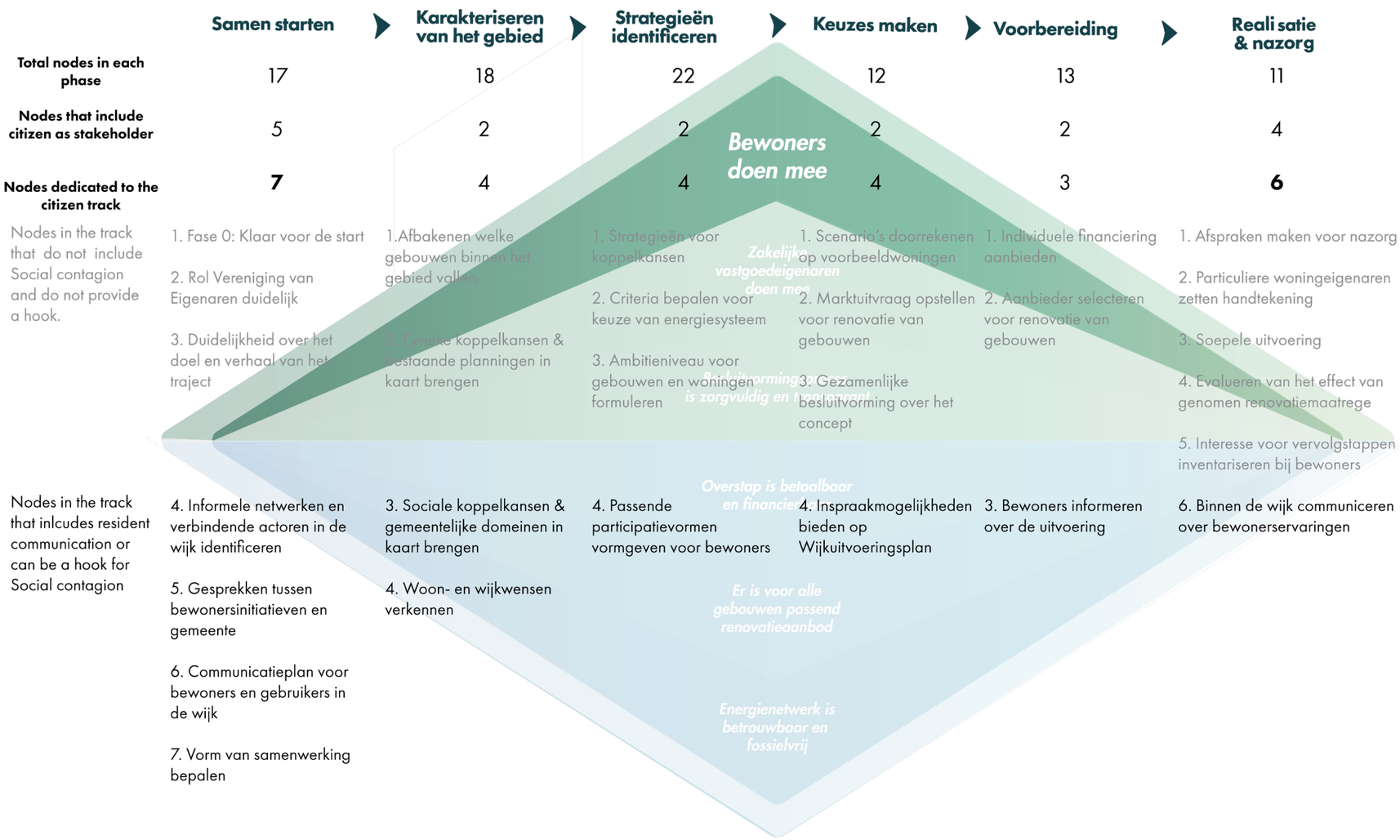


Figure27: Wijkkompas analysis social contagion

Chapter 6

Understanding the energy transition in practice

Previously we explored the theory of the energy transition, participation in that transition, and social contagion. This chapter focuses on the implications that follow when theory meets practice. What are the problems the stakeholders face and what processes or boundaries are present that were not captured through literary research? This chapter shows the practical findings and connects them to the theoretical chapter presented before.

6.1 Interview Set-up

The interviews mentioned in chapter 5 were also used to attain an understanding of the energy transition in practice. The first 15-30 minutes were dedicated to determining the impact of Wijkkompas, whilst the last 15-45 minutes were used to explore the context of the energy transition.

We executed 13 interviews, for further details on the interview setup see chapter 5.1. For the practice of the energy transition, semi-structured interviews were chosen as the main method since it can be hard to predict what the main concerns are for each stakholder. It was important to cover the three main topics of the energy transition as a whole, participation in the energy transition, and the current use of social contagion in the energy transition.

The insights gained from analyzing the interviews are structured around the theory chapters so that it is easy to learn what implications have to be taken into account when applying social contagion in practice and to Wijkkompas. The quotes from the interviews are added to show that the constraint in practice is a shared one.
Lastly, the problem the municipality and the resident initiatives face are highlighted. This informs the design brief in chapter 9.

6.2 Interview insights concerning the Energy transition

Different approaches to individual and collective solutions

Residents point out that a collective solution comes with some barriers compared to an individual solution. First of all, the adoption of the technology has to be synchronized to come to a valuable business case. This means residents can no longer follow their own tempo in transitioning off natural gas. They have to jump in or they will miss the boat. Secondly, from the sociological point of view,it is harder to move a big group into action than a small group. With a collective solution, the adoption group becomes bigger and individual households have to identify or connect to a bigger group of people to see what the new consensus on this new technology is. Individually these might be their direct neighbors, but for a collective solution, they are dependent on residents in different neighborhoods, possibly even cities for the success of the approach.

'Die langdurige concessies, dan kan je lang wachten als je iets groots neer wil zetten. Ik denk dat je veel beter klein kan beginnen om ook mensen ertoe te bewegen.'
Resident Initiative contacted

Besides the social problem municipalities experience problems with the attitude towards heating networks:

'Ik laat het woord warmtenet maar even weg, want dat valt op het moment gewoon echt niet lekker in buurten en in wijken. Mensen hebben daar echt een aversie tegen. Hoe de koppeling met de gasprijzen gemaakt is, maar ook hoe de businesscases zijn opgezet en waar met name grote partijen aan het stuur zitten. Er is gewoon meer behoefte aan publieke samenwerking daarin en dit zit in die grote warmtenetten van nu er nog niet echt in.' Municipality 1, project manager

The negative attitudes and the information concerning the heating networks most likely travels with simple contagion. While the adoption of the heating network travels via complex contagion and thus succeeds in the simple ''negative'' contagion. This makes it harder to successfully execute a complex contagion strategy for a collective solution. But it is not impossible.

Project with a longhaul

One citizen initiative has been active for 7 years, one for 3 years, and the other for 5. All point out that the process of creating awareness alone can take a couple of years. People are not obliged to do anything since warmth is a private matter when you are a homeowner. This makes the transition slow since earlier there was no incentive to think about your personal heating. This changed this year with the increase in gas prices, but when the prices are lower the incentive might be gone again. Besides one of the residents pointed out:

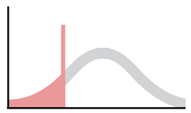
'Wat heb ik over de portemonnee van mijn buurvrouw te zeggen? Helemaal niks hè, dus je moet in zo'n wijk zoals deze, die moet je masseren, vriendelijk en begripvol. ... Je moet het eigenlijk een stukjes hakken, hè.' Municipality 1, neighborhood 1, Resident initiative

For the project team, the challenge then arises on how to stay relevant. Transitioning one neighborhood can take up to 7-10 years and keeping the topic in the field of view of residents is a challenge. Decisions are slow, but not hearing something from the project team can be experienced as alarming for citizens(Programma Aardgasvrije Wijken, 2022a). The project team will have to balance remaining relevant without becoming too bothersome or absent.

'Het zaadje is geplant. Maar nu moet het een paar maanden lang gewoon water krijgen. Geen strakke agenda opstellen. En anders in gedachte hebben van 'nou als we dan ergens een keer na de zomer in september een partij daar tegenaan kunnen gaan zetten' Want je moet die mensen ook tijd geven om erin te groeien.' Municipality 1, project manager

6.3 Interview insights concerning Participation

Roger curve



Early adopters are not that diverse

In chapter 3.1 it was already concluded that the early adopters do not always represent the full adoption group best. In the energy transition residents, municipalities and consultancies mention that the early adopter group often primarily consists of retired caucasian males with a passion for engineering.

'Het zijn name techneuten, dit waren allemaal mannen. Natuurlijk, en ik was enige vrouw met nog een 'Pilates' vriendin van mij.' Municipality 1, neighborhood 1, Resident initiative

This in itself is not a problem, however, these groups tend to focus on advising municipalities or other residents about the technical options and solutions. They do not focus or sometimes even do not want to focus on activating their fellow residents. This poses a challenge for the application of the social contagion theory. It is therefore important for the project team to phrase the invitation question properly. Moving away from technical terms and focussing on enthusiasm, sustainability, and care for your own home or comfort for example.

'De kern van die groep. De voorzitter zegt elke keer dat zijn de witte blanke mannen met een ingenieurs achtergrond. Die zitten het liefst eigenlijk een beetje op het vinkentouw om de gemeente eigenlijk op de vingers te tikken waar het op de techniek allemaal net niet goed gaat volgens hen.' Municipality 1, project manager

Citizen initiative

The struggle of representation and taking decisions is a shared one

Achieving representation and activating enough citizens for the energy transition can be a challenge for municipalities. We might expect this would come easier for citizen initiatives since they are more connected to the local context. However, contrary to these expectations we see the same pattern for these initiatives as we have seen with municipalities. The initiatives struggle to be a fully representative organization since the group they represent is so diverse. A neighborhood as defined in the energy transition can consist of roughly 500 households. Additionally, when citizens start to formalize their organization, they can start to feel distant for residents:

'Het gaat best snel en wij weten lang niet alles. Ja, daarom moet ik ook steeds opnieuw gaan inventariseren. Ja, wat je denkt dat gezamenlijk is, hoeft nog niet voor iedereen zo te zijn. Dat maakt het moeilijk.' Municipality 1, neighborhood 2, resident initiative.

This does not mean municipalities should not work together with the initiatives, but they should not perceive these initiatives as the only voice of the neighborhood. Parallel to their collaborations, efforts are necessary to both activate and represent the rest of the neighborhood.

Volunteers

Limited volunteers available due to time constraints

As aforementioned much work in the energy transition concerning participation and social contagion has to be done by citizens which tend to be volunteers. The energy transition might be a long project, nevertheless, it is a time-intensive one. All of the interviewees we spoke to are either retired or in between jobs. They illustrate that this allows them to volunteer.

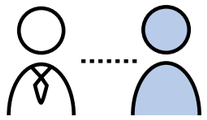
'Ja, weet je wat je ziet is het dat toch vaak dat het mensen zijn zoals ik, die gewoon net als ik niet meer fulltime werken en toch wel wat ouder zijn, want het vraagt gewoon, als je echt inzet, veel tijd.' Municipality 1, neighborhood 1, resident initiative.

These requirements mean the potential access points for the neighborhood or active participants in the energy transition are limited.

6.4 Interview insights concerning
Social contagion

Ties

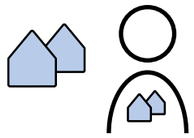
Ties between municipality and residents is a weak/no tie



Social ties are built on trust and interaction. The tie between the municipality and residents seemed to be affected by either the lack of personal interaction with the municipality or by the lack of trust from both sides (Lemmers, 2022). This results in the development of a weak tie. Since the project team of the municipality often is not able to build complementary wide bridges, the connection between the municipality and residents can only facilitate simple contagion, not complex contagion.

Identity

Social identity can be location bound



Finding the right framing of the social identity in the neighborhood can be tricky. When asked interviewees find it hard to identify whom they socialize with specifically. What all residents point out is the geographical border a neighborhood shapes. One of the interviewees even used this as a strategy to reach all segments of their neighborhood:

'Daarom heb ik ook voor die straten gekozen, omdat mensen daar vaak wel iets hebben met elkaar. Er zijn altijd mensen in de straten die niks willen, Maar dat ja, dat is altijd.' Municipality 1, neighborhood 1, Resident initiative

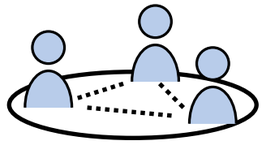
Another interviewee pointed out the shared public space also dictated where the social cohesion form and thus how and where groups are formed:

'Is gek genoeg, is het toch iets van wel afgescheidenheid? Tegelijkertijd is het ook open. De cohesie sowieso binnen een plein. Maar ook de wijk an sich ten opzichte van andere wijken... Deel je een gemeenschappelijke ruimten, als zo'n plein dan is dat toch anders.' Municipality 3, neighborhood 1, Resident initiative

This theory would need some more research but could pose an alternative and quicker method for municipalities to determine the social identity and groups necessary to successfully apply the complex contagion principles.

Cohesion

Social cohesion in low SES neighborhoods



The social identity and structures in the neighborhood determine the possibility and feasibility of implementing the social contagion approach. When there is no to little social cohesion it becomes impossible to successfully execute a complex contagion approach. Some might expect low SES neighborhoods to have little social cohesion. However, this is not the case:

Misschien wat sociaal achterstandswijken hebt, zou je zeggen, waar mensen ook waar ook sociale cohesie bestaat, maar gewoon omdat mensen in een soort van in hetzelfde schuitje zitten. Dat, zal ik maar zeggen, en dan niet de verbinding voelen. Niet in het verduurzamen van de wijk, maar in het daarbuiten tegenkomen en naar dezelfde supermarkt gaan.' Municipality 2, Project manager'

It is not that there is no social cohesion, the social cohesion and the social network that is present are already charged with the basic care for each other. The load of doing something extra like the energy transition cannot be beared by the network. Thus we still see that in these neighborhoods the application of the complex social contagion theory is often not possible. It could become possible when municipalities successfully apply the ''koppelkans'' (connection opportunity) strategy proposed in the energy transition. A ''koppelkans'' means that besides focusing on the energy transition, other departments or projects within the municipality can be connected to the transition. For example the sewer system or healthy living:

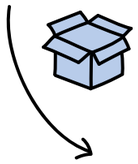
'.., vandaar ook die vitaliteits agenda. Die wordt vanuit een hele andere hoek binnen de gemeente ingestoken . En, nou ja, dan heb je de combinatie met revitalisering van de openbare ruimte, en daar is ook wel echt wat gaande in die wijk.' Municipality 1, Project manager

These connections provide another way into the network and help to lift some of the burdens of the network. This could make it possible to apply social contagion. However, municipalities point out that the energy transition itself can be so complex, that it becomes too difficult as of right now to also connect it to other projects:

'De opgave om aardgasvrij te worden is zo ingewikkeld met alle technieken dat het een uitdaging is om het aan het sociale te koppelen.' Municipality 2, Project manager

For the development of the social contagion tool, we still assume a situation in which enough social cohesion is present to use the snowbal strategy. .

Complex contagion



The fire of contagion needs wood to keep burning

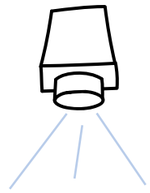
Even though social contagion is a 'natural process' interviewees point out that in the energy transition external input is needed to keep the process going. They explain you need to remain relevant:

'Dat is helemaal niet zo makkelijk om een beweging tot stand te brengen. Dat is continu actie, ja, steeds weer opnieuw. Het is nooit klaar.' Municipality 1, Neighborhood 2, Resident initiative

For volunteers keeping the process alive in such a long project is a big commitment. Over time support becomes necessary to keep the process going. This can be in the form of help with building a website, budget for a local neighborhood meeting but most importantly in the form of facilitative support, someone or some organization that can remain responsible for the process and is paid to do so. This provides the longevity and stability the initiatives needs and sets the volunteers and residents free to focus on the social interaction again:

'Dus gewoon van mond op mond is het verspreid, want een oproep plaatsen van wie wil contactpersoon zijn? Nul, echt nul!' Municipality 1, Neighborhood 1, Resident initiative

'En onze taak is dan om hun daarin te faciliteren beetje geld te geven per jaar, zodat ze hè dingen kunnen doen en organiseren. Buurtcafés bijeenkomsten, webinars etcetera.' Municipality 3, initiative



Extrapolating the network

The social network in the neighborhood is not a static one that can be immediately applied for the energy transition. For example, the information and activation surrounding the local soccer team travel differently compared to the information about the school renovation in the neighborhood. People have their connection, but do not use them all for the same purpose.

'Er is hier zo'n alert whatsapp groep gebeuren, weet je wel dat elke straat een groep heeft? Nou, dat bleek niet de weg te zijn.' Municipality 1, Neighborhood 1, Resident initiative

This might seem obvious, but also serves an important social goal: the social norm surrounding these topics is clear and thus you can have safe interaction with your network. It could for example be a bad idea to start a deep conversation about politics on your soccer team. The energy transition can cause heated debates, similar to politics.

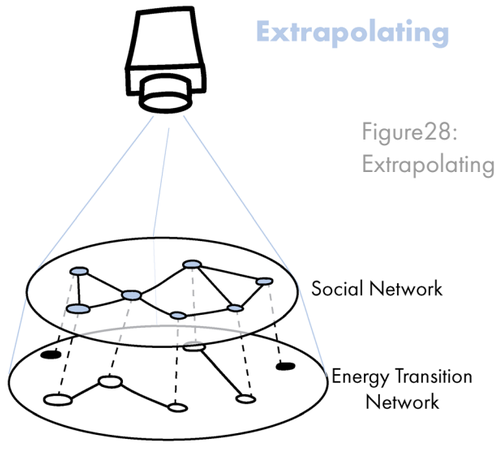


Figure28: Extrapolating

Every social connection relates differently to the energy transition and the social structures that are present can be altered when informal and formal rules and the communication around such a topic, i.e. the energy transition, change(Mourik & Boekelo, 2021) Therefore the social network present should not be unknowingly changed by introducing the topic or the energy transition.

'Mijn gevoel zegt nu, wij organiseren iets waar gezelligheid in moet zitten. Maar we gaan niet naar een plek waar de gezelligheid al was! Je moet ook voorzichtig zijn, misschien daarin dat je niet teveel opdringerig zijn, dat gaat hem denk ik niet worden. Er moet een balans in zitten.....' Municipality 3, Resident initiative

It is important to keep the current network intact whilst using its reach to start your movement of activation. You could see it as a filter in front of a lens, see figure 28 The present social network works like a template for the network surrounding the energy transition. Not all nodes will be copied, but they form the potential for the new network. As the interviewee said, you can look at the current social network and gathering and draw inspiration from it, but you should not try to intervene or compete with the current social gatherings.

Seeding

Find the energy rather than the strategic person

Since municipalities have a weak tie with residents, they can not activate residents by themselves. It is therefore more important you find the right people with intrinsic motivation, rather than people with a strategic position.

'En dus wij zitten een beetje hier waarbij de burgerparticipatie. Ja, dat is het wel. Het is ook een kwetsbaar punt hè? Want het kan zo wegzakken.' Municipality 1, Neighborhood 1, Resident initiative

Besides this strategic position can be hard to identify, and mapping a full social network in practice is not feasible yet. Some projects have tried to do this, but this requires much time and does not provide the full image of the network (Ligterink et al., 2019).

'En dat je altijd gatekeepers hebt van netwerk en dat je altijd mensen hebt die, zeg maar. Heel erg vooraan staan, maar waar je misschien eigenlijk eventjes omheen moet lopen. Dus al dat soort sociaal antropologische.' Consultancy bureau energy transition 1

After the project team has found the active residents in the neighborhood it can be strategic to choose a starting point for the complex contagion. Somewhere in the network where these people can reassure each other and have the same connections. This will provide the access point in the network with stability, and still allows for the snowball strategy to start unfolding.

6.5 Current use of Social contagion

Municipality

So the energy transition requires flexibility and the courage to try new things. All the while the approach is uncertain and so are the results:

'Dat is voor een gemeente best wel heel spannend. Wij zijn natuurlijk door de laatste jaren heen, altijd op de juridische laag gaan zitten waar je je precies aan de wet en regelgeving kunt houden en binnen de lijntjes kan kleuren. Precedentwerking, ja weet je, alles wordt onder een vergrootglas gelegd. Waar de ene het positief uitlegt legt, legt de andere het negatief uit. En daar moet je je nek durven uitsteken.'

The application of the complex contagion strategy is an example of when the municipalities ''have to stick their neck out''. Municipalities are used to applying simple contagion. For example, they look for social stars or use the hail strategy in a campaign form to reach as many people as possible:

'Sleutelfiguren in kaart brengen en daarmee het gesprek aangaan. Ja, als iedereen altijd bij de bakker komt, dan ga je proberen om de bakker erbij te betrekken.
Municipality 2, Project manager'

Applying (complex) social contagion to also the adoption process is perceived as risky or unsafe. At the same time, they do see the need for some approach to reach the middle group. Municipalities are aware they cannot talk to all residents and thus they realize some residents need to be reached via the social network:

'Ik denk dat eigenlijk dat de enige manier om die middengroep te bereiken, zeg maar om die 80%. Dat is wel die sociale besmetting, want je gaat ze niet allemaal spreken.' Municipality 2, Project manager

So, applying the complex contagion theory is something municipalities do not do yet, but it could provide municipalities with a solution to their activation problem. However, the approach is new and requires a leap of faith. Therefore, it is important that we consciously design the tool to be more than just theory, it should also build confidence.

Resident initiatives

Resident initiatives on the other hand do use the three seeing strategies concerning social contagion. They are often part of the network in which they try to spread information or behavior and thus instinctively know what methods to use. They do not have the vocabulary to call it specifically ''hail strategy' or ''silver bullet' but this does not mean it cannot be very effective. For example, this initiative is using the hail strategy to spread information:

"Toen dacht ik goh, dan moet je gewoon ook zo'n contactpersoon per staat krijgen voor het energieproject, want dan krijg je de informatie daar waar je het hebben wilt. "
Municipality 1, Resident initiative

This initiative is using the snowball strategy for the spread of behavior:

" Ik merkte als ik naar de tafeltennistafel ging op het plein hiernaast, dan had je een gevoel van anders zijn en tegelijkertijd vertrouwd. ...Daarom verschuift het buurtcafé nu ook over de pleinen heen." Municipality 3, Resident initiaive

These initiatives can benefit from knowing there is a theory behind their methods. However, for this project, it will be more impactful to use these practice stories to show municipalities social contagion is already used in practice and is working.

Conclusion

The energy transition process is long and requires flexibility from its stakeholders. Resident initiatives have to be flexible with the limited amount of volunteers, who are not as diverse or representative as they would maybe like. However, since they are close to the neighborhood network, they apply social contagion unconsciously.

Municipalities have to be flexible in that they have to cater their approach to the network of the neighborhood. They need to support the resident's initiatives in this long project and need to find the courage to try out new methods, such as the social contagion method.

Chapter 7

Scenario of Participation and Social contagion at the start

Now that we have explored the theory and practice of the energy transition, the different approaches to starting in a new neighborhood are explored. What is the difference between using participation as the main method in the neighborhood approach, compared to the main focus on social contagion?

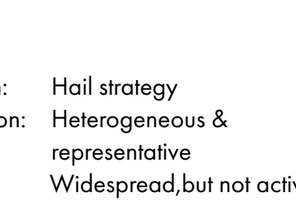
Start of Citizen interaction

As Chapter 6 explained, there is a limited amount of volunteers availabe for the energy transition. It is crucial to be strategical about whom you ask for what. Participation requires residents to think along with the municipalties, whilst social contagion focusses on activating the network in the neigborhood and guiding this activation process. Since participation is often of high priority for municipalities, participation now is often the start of their citizen interaction. Which unintentionally leads to a certain recruitement strategy.

Since there are the two interaction methods (participation and social contagion) we can sketch 2 scenarios to exemplify the effect of the access points on both the representation in the participation process and social contagion in one neighborhood.

The level of participation that is present in the neighborhood is left out of these scenarios since it does not influence the working of the social contagion process. The municipality can work together with neighborhood representatives on levels 1 through 7 of the participation ladder (1:manipulation-7:delegated power) or can even facilitate a citizen initiative(level: 8 citizen control); what matters is the approach of the project team towards the initial seeding. For these scenarios, we assume the social norm of natural gas-free living has not been adopted yet (see chapter 4), if this were to be the case the approach would differ or would not be necessary at all since the adoption and social contagion already started.

Scenario 1: Participation first



In the first scenario, the project team focuses on representation and diversity for participation, see figure 29. They try to reach out to all communities present (step 1) for example by sending out newsletters, going on house visit, or executing street interviews. From practice, we know not all groups will be reached, but let's assume a representative is found in 4 out of the 5 groups (step 2). These groups are defined by their social identity and thus the amount of groups and their clustering differs from neighborhood to neighborhood (see chapter 4). Whilst taking part in the participation process the group of seeds/ access points is protected from the social norm in the neighborhood (step 3). When going back to their social groups the seeds are not protected and most likely have an opinion contrary to the social norm of the group. It is implausible that the representatives will be able to sway the social norm of the group by themselves. The municipality has opted for a hail strategy and thus the complex contagion snowball will not be able to start rolling.

Contagion:	Hail strategy
Participation:	Heterogeneous & representative
Adoption:	Widespread,but not active
Information distribution:	Widespread and equal

Scenario 1: Participation first

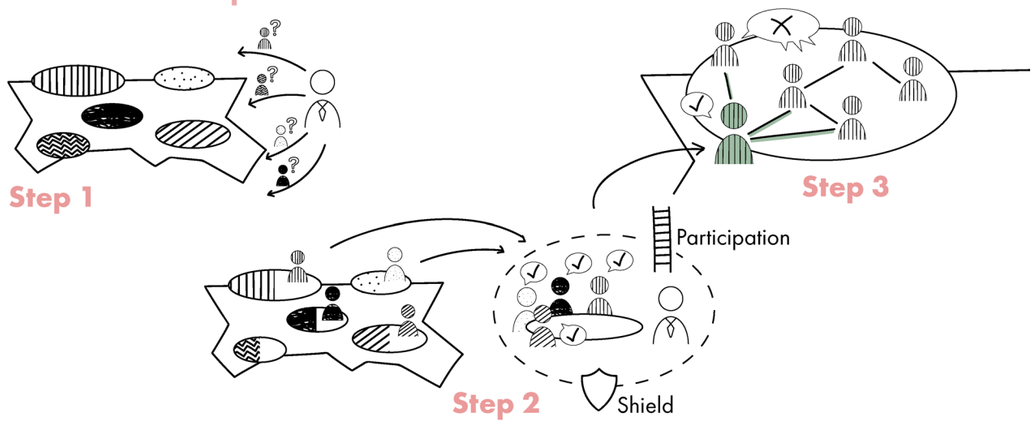


Figure29: Heterogeneous & Representative

Scenario 2: Social contagion first

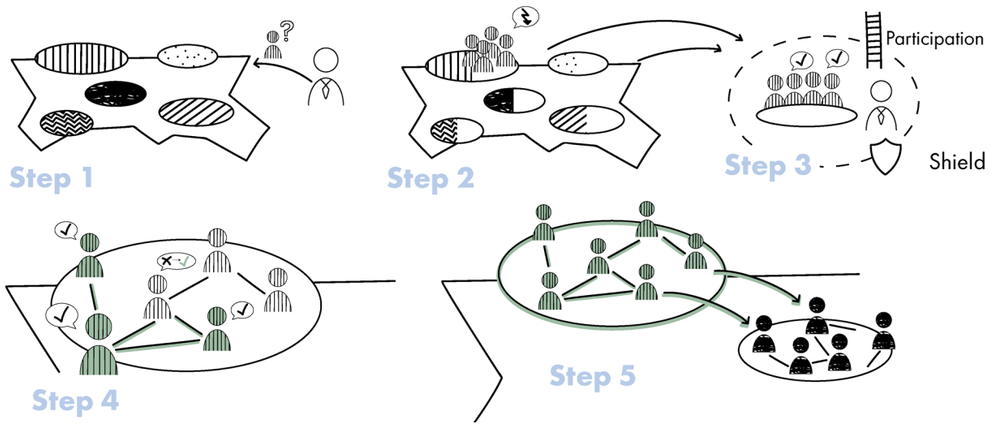
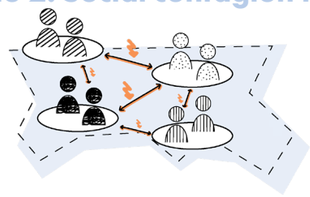


Figure30: Homogeneous & Not representative

Scenario 2: Social contagion first



In the second scenario, the approach of the project team is not centered around representation and thus participation, rather they focus on the complex social contagion theory and employ a snowball strategy, see figure 30. They focus their attention on a specific social group and try to find active members on the edge of the group (step 1). Even in a social group, there are social stars and just like for a social star with a connection to multiple groups, a star in one group will be unable to swift the social norm by themselves. As before, the group is brought in by the municipality for the participation process, and whilst being there the group is together they can be ''protected'' from the social norm of their social group in the neighborhood (step 3). This time when the seeds go back to their social network they are able to start the snowball contagion process because they are not alone. They can start to sway the social norm, one person at a time(step 4). Once the whole group is convinced the social norm will twist and this will help individuals to reach others in other social groups through wide bridges. Like a cascade, group by group the neighborhood will be able to transition to the new social norm of using natural gas alternatives (step 5).

Although the activation for the energy transition is a success, the participation process is not representative and might result in resistance in non-represented groups. It also goes against the information distribution obligation of the municipalities. They are obliged to provide all citizens with an equal chance to join the energy transition. But by applying the snowball strategy one group is deliberately chosen to be better informed than the rest. This is done to counteract the lock-in effect that Centola (2019) describes. When everyone knows about an innovation but nobody adopts it, the legitimacy of the innovation becomes so small no one will start adopting it. Furthermore, the outcome of the participation process might not be the best result for this neighborhood since not all social groups are consulted. Innovations get better when multiple perspectives are used to inform (design) decisions (Dunbar-Hester, 2019).

Contagion:	Snowball strategy
Participation:	Homogene & un-representative
Adoption:	Expanding,slow than fast, finally widespread
Information: distribution	Fragment and inconsistent

Conclusion

Holistically it would be best to separate the participation from the social contagion approach and run a parallel process. However, in chapter 6 we learned that we rely on the access point we can find in the neighborhood for the energy transition. You could argue that if you find enough representative/access points you could split up the process. However, in chapter 6 we also learned that citizens do not have the capacity or mandate to be involved in many processes. Their time is economically scarce, see chapter 3. Thus, we need to propose a model that adequately combines both techniques,see chapter 8.

Part C

Design Intervention

Chapter 8

Social contagion model for the energy transition

Since both participation and social contagion are beneficial and necessary in the energy transition, it is important to find a method in benefits both. This chapter will propose a model for the application of social contagion in the dutch energy transition, combining it with the current participation strategy present. This model is then applied to the instrument of Wijkkompas.

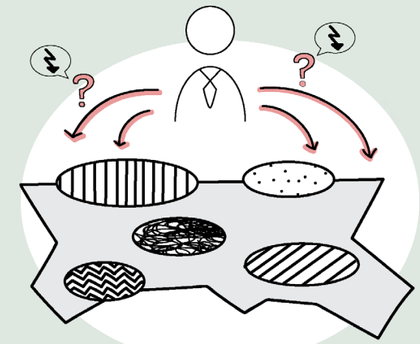
8.1 Six-step method for Social contagion

Before elaborating on the model, let us look at the final stage of the contagion process: the substitute for natural gas. In some municipalities, this will be an individual solution, in others a collective one. Even though the technical side of the transition does not influence the social contagion process, the form of the solution i.e. individual vs collective does, as chapter 6 explains. Whereas for an individual solution the activation can directly be with the goal of activating residents to opt-out of gas, for the collective solution a synchronized affirmation is necessary to kickstart the business case, for example, a heating network. This means that the network should be activated or as I propose to call it sensitized for this discussion. This sensitization should not be confused with simple contagion since what is to be distributed is not ''risk-free'' information. In order to activate a resident to be open to a heating network, multiple exposures are necessary and thus we talk about complex contagion.

Accordingly, the first 5 steps of the model are the same for both an individual and collective solution. But for the individual one, this is direct activation of the alternative, for the collective solution, this is an activation, for example, sustainability or the natural gas-free movement in general.

1. Find Access point

Hail strategy



Since the access points determine the diversity of the participation process, we will employ a hail strategy (e.g. simple contagion) to find as many people who are activated and motivated to participate within the participation process or can be part of the social contagion process. This could be supplemented with a silver bullet strategy if the municipality has found these nodes beforehand. Since volunteers and especially their time is scarce this will also improve our chances for a successful complex conation process.

2. Map & Start

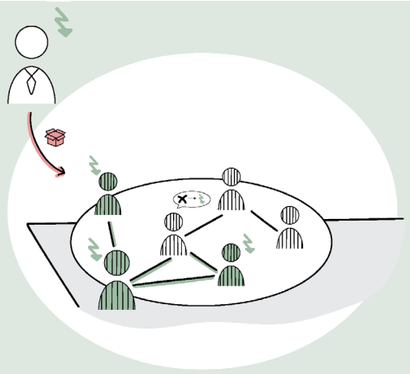
Determine social identity
& Contagion strategy

Now that we have found the access point, the municipality can start its participation process. For the complex contagion process, we will now have to determine the social groups. Unfortunately there this is not a one size fits all process. The ''optimal outcome'' is highly dependent on the size and diversity of the neighborhood. As a tip, we did find that shared common spaces often lead to a shared social identity in the neighborhood, see chapter 4. Another solution could be to execute a questionnaire in which the social identity of the access point is questioned (Ligterink et al., 2019).

With a rough overview of the location of the access point in the social network, we can still choose where to start with the snowball strategy i.e. in a network with multiple closely related access points.

3. Saturation & Strengthen

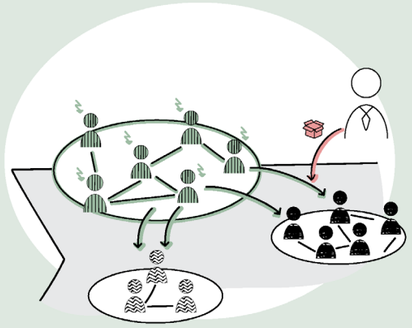
Snowball strategy



In step 3 it is important to provide the access points with the right resources to activate their network the way they see fit. This could be by helping them build a website or making an information folder that can help them explain the energy transition to neighbors. The focus is on slowly reaching the 25% percent in the social group so that the social norm of the group can be flipped. To do so, it is most important the access points are in a safe space within the network which has not transitioned yet.

4. Bridge & Expand

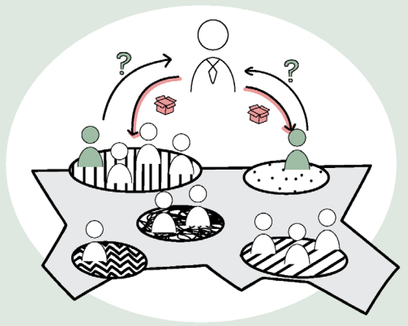
Snowball strategy



Now that the first social group is activated there is a safe space for the transition to growing. Now this group can start to bridge to other social groups. For example in municipality 3 the initiative started around a neigborhood square, later they started organizing neighborhood cafe's concerning a specific topic like the window frames of their homes. This ''attracted'' residents from the other square to join in. Again the way to execute this strategy is highly dependent on the context. For the municipality, it is most important to investigate the needs of residents at that moment in time, in terms of resources but also in terms of which message can connect or attract other groups to join in.

5. Keep the fire alive*

Trust the process



***Last stage for Individual solution**

Concurrent sensitizing and adoption

The bridge and expand phase will be repeated until the full network is activated. This does require the necessary resources and motivation. This again is context-dependent, for example in municipality 1 in neighborhood 2 the residents' initiative explained that after 2 years of individual effort they won a training to help design their own local energy supply system. You would expect this training is a necessary resource, however, this is a very short-term injection into the project. The leader of the initiative pointed out they would be better off if someone would support them consequently. For example, by a consultant hired by the municipality. This would lift a burden and provide them with the stability and the energy

6. Activate for Adoption**

Hail strategy for equal Informing
Second round of snowball for actual Adoption

***Last stage for Individual solution**

Concurrent sensitizing and adoption

Now that the full network is sensitized they can be activated to adopt the collective solution at the same time. In most cases, it is possible to use the same strategies as in step 1 to facilitate the information duties of the municipality. However, the actual activation will still follow the snowball principles. Since it is like that the social norm during sensitizing was changed but not directly in favor of a specific proposed solution i.e. people accept an alternative to natural gas but not yet the type of heating network the municipality will propose. Therefore it is still advised to start at the edges of the network again. This can be in one social group, but with adequate capacity could also happen in several social groups as long as you do not start with the social stars in that network.

Since some social norms already changed and a new network surrounding the energy transition is extrapolated (see chapter 6) is likely that the second time around the activation will move faster.

8.2 Six-step method and Wijkkompas

The proposed model is easily adapted to Wijkkompas, see figure 31 on the next page. Between steps 4 and 5 is the moment the gas alternative is chosen. In Wijkkompas this is aftser phase 4. This means that all the phases of Wijkkompas and the steps of the proposed contagion model align very well. The access points found in step 1 form the starting point for the participation, this is where the 2 processes crossroads, after which they go their separate ways. It should be mentioned that the transparency towards residents about the two parallel processes is crucial to main the trust in the municipalities.

One might wonder how a municipality has to deal with the difference between the collective and individual approach. First, one could follow the first five steps in a sensitization manner and then decide the solution is going to be individual. In this case, similar to the collective approach, the network should be activated at the edge with a new message whilst the whole network is informed about the decision on the energy transition in that neighborhood. The major difference is that this process is now not time bound and thus that residents can take longer to decide. This relieves the pressure on the contagion process and will feel less risky for municipalities.

On the other hand, most municipalities can estimate beforehand whether a collective solution is possible and somewhat feasible. Before Wijkkompas can be started, the neighborhood has been briefly analyzed on technical aspects to assess the feasibility of the energy transition in the neighborhood at that point in time. 70% of techniques to transition the Netherland away from natural gas still have to be invented before the deadline in 2050 (Nas, 2022), therefore municipalities strategically have to determine the sequence of the neighborhoods they are going to transition. This has been documented in the TvW in December of 2021. Consequently, most municipalities will know if they aim for a collective solution or an individual one when starting with Wijkkompas and thus when they will start with applying the social contagion approach.

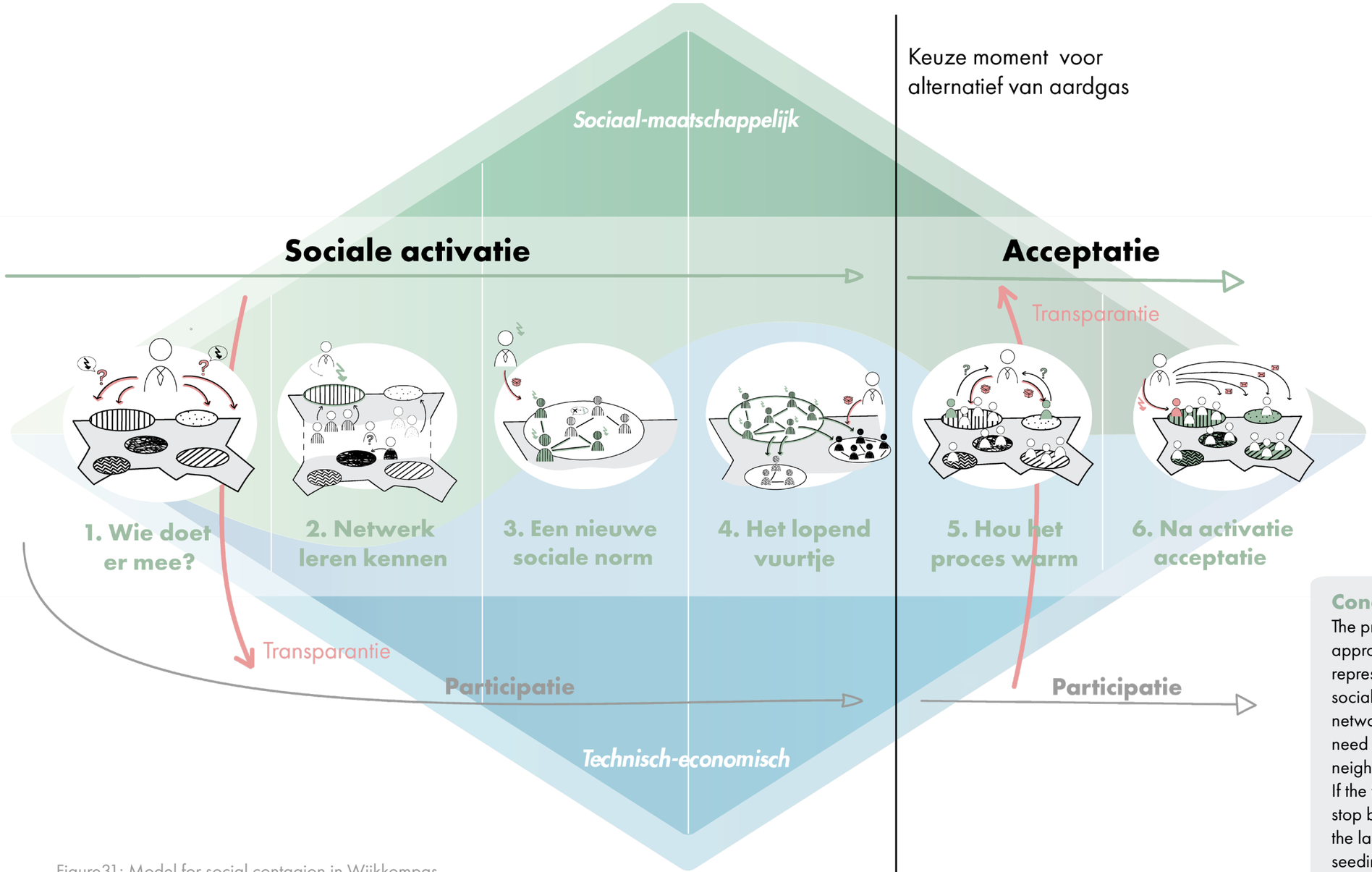


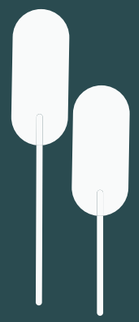
Figure31: Model for social contagion in Wijkkompas

Conclusion

The proposed six-step method combines the approach of participation and it goals of citiziten represenation and shred decision making wiht social contagion and its goals to activate the networks in the neigborhood. Their shared need for accespoints and volunteers in the neighborhood is combined in an effective method. If the final solution is individual, the process can stop by step 5, for an collective solution step 6 is the last one. The method is based on the snowball seeding strategy, since this is the most effective for behavior change and the least well known amongst municipalites.

Chapter 9

Design brief



Now that we have proposed a model for the application of the (complex) social contagion theory, we look at the research question. The answer to the research questions will help determine the design directions and will lead to the final design brief.

9.1 Research questions

RQ 1. What is the impact of the Wijkkompas tool ?

Wijkkompas helps municipalites to stay in control of the energy transition by providing a tool that helps them manage the process from TVW to WUP. Secondly, Wijkkompas has a clear vision on this process. They have learned that leading with the technical side of the transiotion and letting the social transition follow is often the easy way to tackle the transition process. However, these short term gains lead to long term dealys, as interviewees point out from experience. Therefore Wijkkompas advises municipalites to start with the social transition, which will speed up the process or will improve the quality of it. The technical transition is easier to speed up and has clearer boundaries. The social transision however, is highly dependen on the local situation and takes time to develop. Wijkkompas adopted one the recommendations from this project, implementing their their vision on the neighborhood approach to teir visual langage as well, see chapter 5.3.

RQ 2. What is the difference between participation compared to social contagion?

Within the neighborhood approach to the energy transition, participation is built into the national policy. Municipalities have to work together with residents to come to a successful transition, see chapter 6. However, the tendency still is to lead with the technical side of the transition. Participation is challenging and sometimes scares municipalities because of the negative reaction resident might give initially. Additionally, it is hard for municipalities to reach enough residents who might want to volunteer. Sequential, it is hard to reach representation.

Social contagion builds upon the trust municipalities have acquired in the participation process. Social contagion is not only about activating the network, but goes further and invites municipalities to let residents take over part of the process, see chapter 4. It is not based upon full representation at first, but upon the knowledge that when a network is activated in the right place, all residents will be reached. For transmitting behavior, the snowball seeding strategy is the most useful. This method requires a small group of accesss points. Both participation and social contagion deal with the ineraction between residents and municiapltiy, but their goals differ. Participation aims to achive collaborative deciosion making, whilst social contagion aims to hand over part of the process and trust the network.

RQ 3. What is the current use of of social contagion in the energy transition?

Currently, municipalities lack the courage and knowledge to try out the snowball method to activate residents in their neighborhood approach. The hail and silver bullet methods are sometimes used to spread information, see chapter 6.5.

Resident initiatives on the other hand do use all seeding strategies. They do not have the knowledge to call it e.g. snowball method, but because they are in close contact with or part of the network, instinctively they chose the right way to transmit information and behavior, see chapter 6.5.

In conclusion, these 3 questions help to answer the full research question:

How might we use social contagion effectively in Wijkkompas ?

The conclusions form the research point out it is important to give municipalites the knowlegde and courage to go and try out social contagion. This can be done in multilple ways. Which will be specified

9.2 Design Direction

1. The tool helps residents with the process of social contagion

As mentioned before, municipalities are not able to reach 100% of the population, hence at some point residents have to take 'responsibility' for the spreading and activating their peers in the contagion process. This could be in the form of an app like Buurkracht, where residents can see how many others have been activated or can look for companions to work together with to set up their own intervention like a neighborhood BBQ.

I will not choose this direction because:
-First, the Buurkracht tool and tools alike have been designed already. The ''duurzame huizen route'' is a great example as well as the aforementioned Buurkracht and Parta.

-Secondly, the core business of Wijkkompas is helping municipalities through a process tool. Branching out to a tool for citizens would require too many resources, which are not available to the project team as of right now.

Figure32: Design direction1

2. The tool facilitates a better conversation between the municipality and residents

We have seen that a bottleneck in some municipalities is that there is no active communication between residents and municipalities. Some municipalities do not know how to approach the social side of the energy transition and have to be explained that going to the streets and interviewing is simple yet effective.

The scope of this project is to apply social contagion to Wijkkompas. A prerequisite for this to happen is active communication between municipalities and residents. I will therefore assume municipalities are able to reach out to and maintain contact with their neighborhoods, and thus not pursue this design direction.

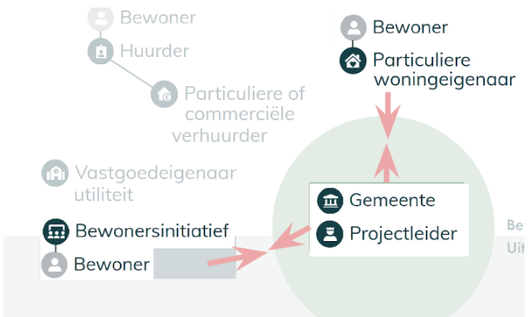


Figure33: Design direction 2

3. The tool shows municipalities benefits and applications of social contagion in the energy transition.

Municipalities are looking for ways to reach the middle groups. They can not talk to every resident individual and thus look for information on how to approach a network-guided activation and transition. The developed method in this thesis fits this need. However, trying out the method and making it stick is a challenge in itself. Appendix G shows us the variety and amount of tools Wijkkompas already gathered regarding the citizen's track within their tool. Many of these tools are PDFs with some theoretical principles and examples of their research, such as a practice story by municipalities or interviews with residents. These tools are valuable, but due to the limited amount of time, project managers at municipalities do not always stick with them.

In other words, there are so many of these tools out there, that it first becomes important to stand out, and secondly, it is important to design an experience that lasts and sticks with the municipalities so that they will come back to the tool and will implement it.

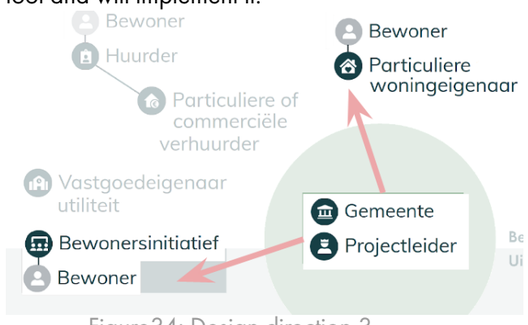


Figure34: Design direction 3

Design direction

The third design direciton is chosen, but for the final design direction for the tool we need to add a component. The design has to be an experience because:

-Municipalities are already bombarded with pdf like tools

Appendix G shows all the tool that are currently used in the citizen track in the Wijkkompas tool. Almost all of these tools are pdf like tools with some insights. The supply is so big that it becomes hard for the municipalities to intergrate the knowledge in their plociy and daily work.

-Social contagion is counterintuitive and needs to be experienced

As aforementioned, participation is well known, but social contagion with the snowball seeing strategy requires them to trust the network and to start small. Both are challenging the current ways of working in the municipality.

- Behavior change needs both a doing and a knowing component

Merely showing the advantage of of the social cMerely showing the advantage of the social contagion method is not enough Implementing a new way of working is a form of behavior change and the two aforementioned goals are part of the behavior change cycle designed by Hermsen and Renes, see Figure 35. The Wijkkompas (WK) addition will focus on the pure transfer of knowledge regarding the six-step approach and the underlying theory. The in-depth knowledge will be added to Wijkkompas in the form of a Kennisdossier, due to time constraints this will not be the main focus of this project.

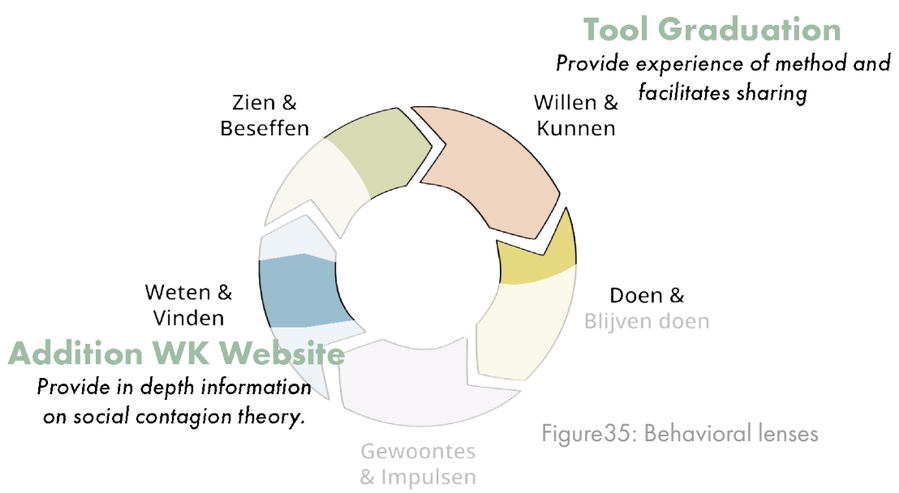


Figure35: Behavioral lenses

Design direction:

To develop a tool that
sparks interest amongst
municipalities to
try out a new activaiton method
by
letting them experience it first hand
and
inspires them to share the tool with others again

Conclusion

The sub-research questions pointed out that participation is on the municipality's radar, but still can be hard to execute because representation is hard to come by and the technical side of the transition is an easier process to manage. Social contagion is one step further since this requires municipalities to let go of part of the process and fully trust the neighborhood network.

The design direction and thus final design aims to spark interest and give municipalities the courage to try out a new method to interact with residents.

Chapter 10

Ideation and conceptualization

With a clear design direction, the ideation focused on letting go of previous knowledge. Taking a step back and trying to find a new perspective that helps put the social contagion into theory in an engaging way. First, the different parts of the design direction are brainstormed on. These ideas are clustered and 3 concept directions are formed. Using a Harris profile 1 directions is chosen and further detailed in co-creation sessions.

10.1 First brainstorm

With the design direction in mind, the ideation phases kicked off with a broad brainstorm on how to achieve the individual goals within the design direction, see figure 36.

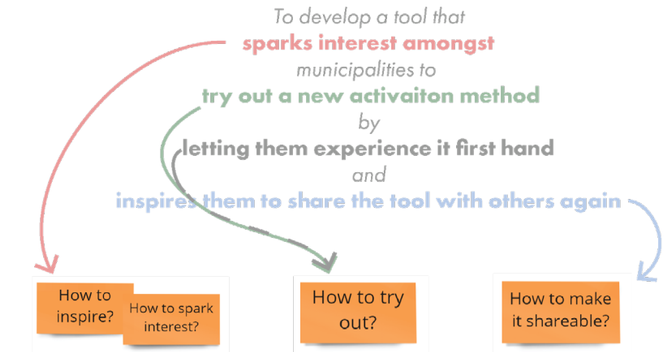


Figure36: Design directions connected to How To's

This brainstorm was executed with 2 peers and intentionally did not reger to the topic of social contagion or the energy transition. Since this helps foster creativity. Once the initial brainstorming round was done, the ideas were translated into concepts related to the design direction within the context of applying social contagion in the energy transition, see figure 37.

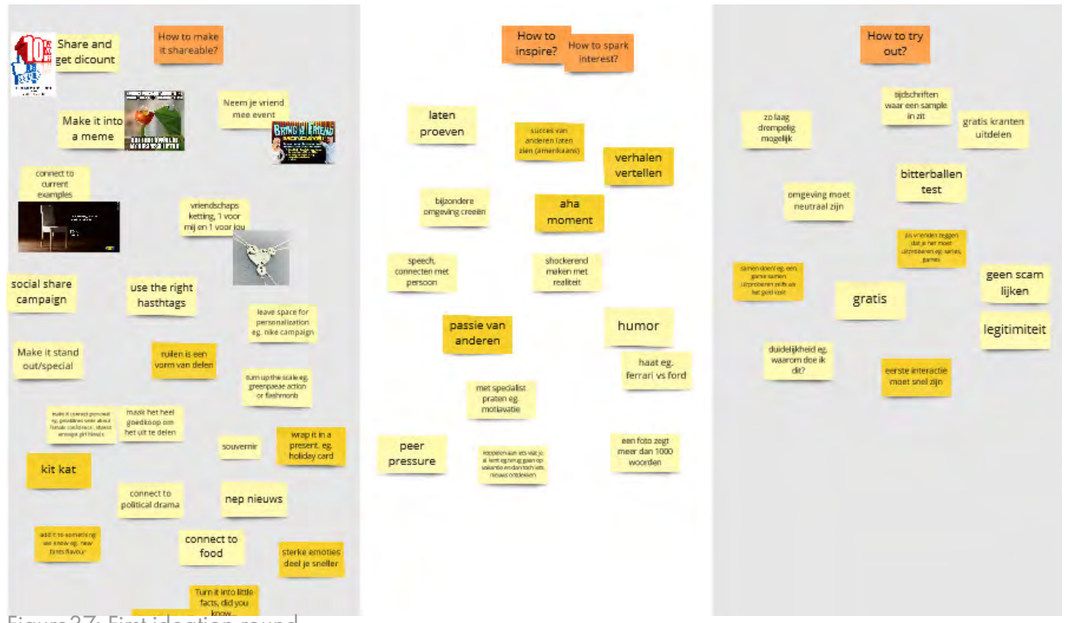


Figure37: First ideation round

In the second ideation round, the answers to the how-to question were used to think of creative mediums for the tool. This focus was chosen since the goal is to break away from the classic interactive pdf format many tools currently use. As McLuhan explains:'' Medium is the message ''. In this case, the experience the municipalities will have with the tool will drive their understanding of the message. The question used for the second round of ideation became: How to engage a municipality creatively in a new theory?

The round was executed with two different peers which fostered creativity since the results of the first brainstorm round could be interpreted ambiguously.

The ideas of the two sessions were then clustered into the following categories: (see figure 38)

-Draw attention to the approach
These ideas are similar in that they only fulfilled the first step of the AIDA model (Strong, 1925): attention. In some cases, interest is also addressed, but they do not have enough potential to guide the user through the entire funnel.

-Explain creatively
These ideas focus on the Interest phase of the AIDA model. They require a base level of interest of the user and play into the cognitive process of users.

-Experiencing the approach
These ideas combine the affective and cognitive processes by not only talking about new information but letting the user experience this firsthand and giving them the opportunity to influence the situation themselves.

From these directions, 3 promising directions are highlighted and elaborated in order to make an informed choice as to which direction is pursued.

Figure38: Second ideation round

10.2 Three concept directions

Storyline newsletter

This newsletter explains the principles of social contagion for the energy transition in a set order. Understanding social contagion requires knowledge of social norms, networks, and strategies for starting a social activation fire. By creating a fixed newsletter thread we can ensure a guided process toward understanding what social contagion can mean for the energy transition. Besides, the newsletter is easy to share with colleagues and affords a talk between colleagues. Just like a series, where you invite your colleagues to go watch it and convince them by giving them a sneak peek of the clue. The newsletter fosters a constructive environment where users can not only learn by reading the newsletter but will learn from each other as well.

Story Campaign

The Story campaign uses the principles of simple contagion to spread the method of social contagion online via linked in. A linked-in account dedicated to sharing information and initiatives on social activation will be posted regularly. The posts will contain real-life examples supported by theory. These bite-sized messages make it easy for users to get acquainted with the method. Real-life examples will be collected by contacting several municipalities and asking them for examples of social activation. They will be asked to share the post about their municipality as a means to start several little simple contagion chains.

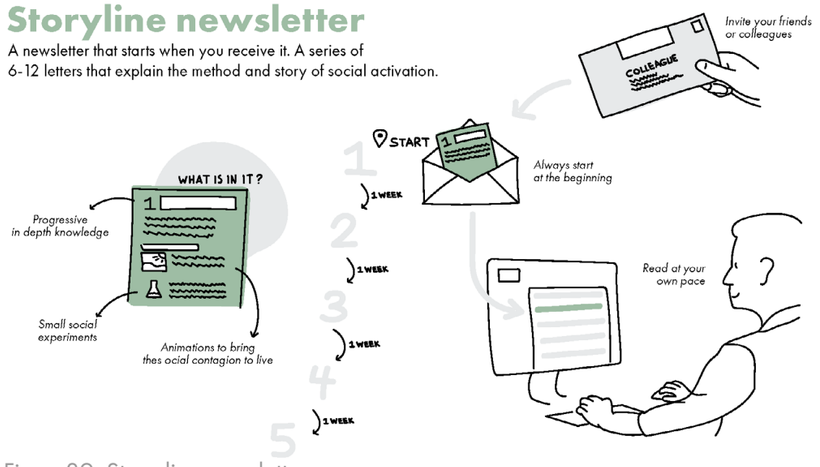


Figure39: Story line newsletter

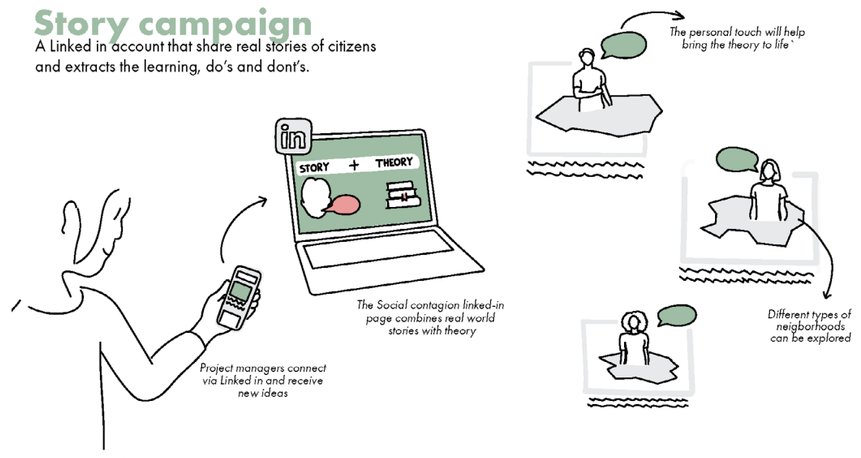


Figure40: Story campaign

Network box

The network box is a gift box with information that will make the feeling of being part of a network tangible. The box with the same principles as a chain letter. Users will receive the box from someone in their network. When opening the box, they are presented with a gift from the sender as well as a map to view who is part of the network (attention). Without effort, the user is part of the method we are trying to convey (interest). The additional booklet explains the concept of the box and details the basic principles of using the power of the network but then in the neighborhood (desire). Lastly, the link to the website and the invitation in the booklet call the user to undertake action and send the box along (action).

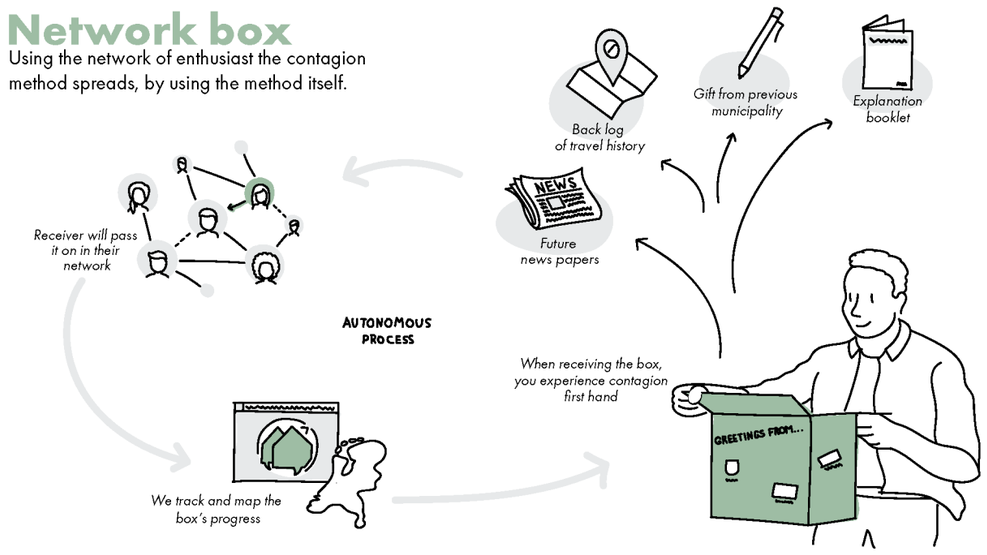


Figure41: Network box

10.3 Final concept direction

The direction that best fulfills the design direction is the network box. This concept not only sparks scores best in the Harris Profile, see figure 42, but also inspired me the most to continue thinking about it and further develop it. The box is an out-of-the-box idea that creates a droste-like effect by embodying the principles it tries to explain. It has the potential to stand out amongst the other tools with municipal officials.

The detailing of the network box was planned to be done through co-creation with its potential users and citizen initiative. The previous research focussed on the relationship of the municipality with the resident initiatives, however, the current design directions use the collegial relationships of officials, and thus new generative research is necessary. Due to time constraints combined with the full agenda after the summer break, it was not possible to organize a co-creation session with multiple participants.

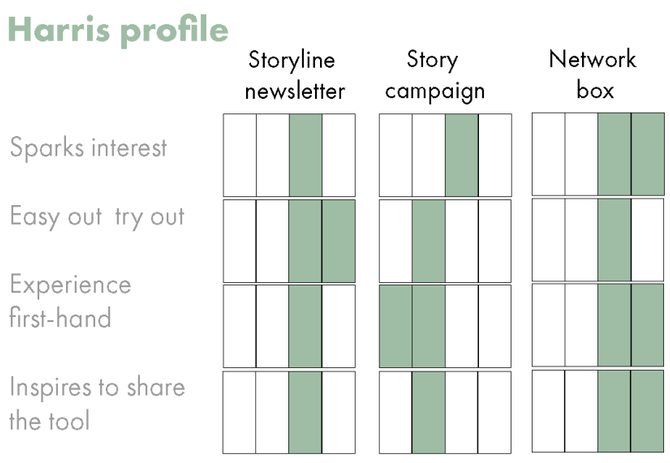


Figure42: Harris profile

The strength of brainstorming together is that people can play off each other's ideas. Since the co-creation session will be individual, the first round of brainstorming helps to create some initial ideas that could be the start for the co-creation session. The initial brainstorming was performed with the same participants as the first round, this helped to specify the brainstorm quickly and come up with concrete and suitable ideas fast. The results of the brainstorm can be found in figure 43.

After clustering 10 possible items were identified which could end up in the network box. The goal of the co-creation sessions hence became not only to come up with more ideas but more importantly to find out which ideas would catch on and which would not.

Figure43: Third ideation round

Cocreation session and Iteration
Five co-creation sessions helped to investigate the Dutch municipality network and explored the possible applications of items in the network box. See appendix F for the detailed session design and E sensitization. Because my graduation was delayed, the time interval between the first interview and the brainstorming session was significant. In order to reconnect with participants and make sure they felt ownership and empowered to join the brainstorming together with me, each session started with a short description of what their previous interview already contributed to the design process.

Three sessions were together with municipalities officials and approached the brainstorming from a form-to-message perspective. It invited officials first to think about what to do with a network box. Consequently this train of thought would help them construct the message they would like to pass to other municipalities. Two sessions were conducted with representatives from citizen initiatives.
These sessions started with the message the representatives wanted to give to the municipalities and from there tried to articulate this message in tangible items for in the box. Besides the message and design of the items, the website was the last component of the brainstorming.

Each session was analyzed and key insights were formulated. All insights were then gathered and again clustered to come to a concrete point for further development of the tool, see figure 44.

-Keep it short and simple
Both municipality officials, as well as resident initiatives, indicated that they do not have a lot of time. Hence the box should not be too elaborate and should be easy to grasp. The logistics of sending and receiving the box should be made as easy as possible and should be free.

-Make the network tangible
Since a network is intangible the exercise to draw out your network helped to visualize. A welcome gift from the sender would help to make the network tangible as well.

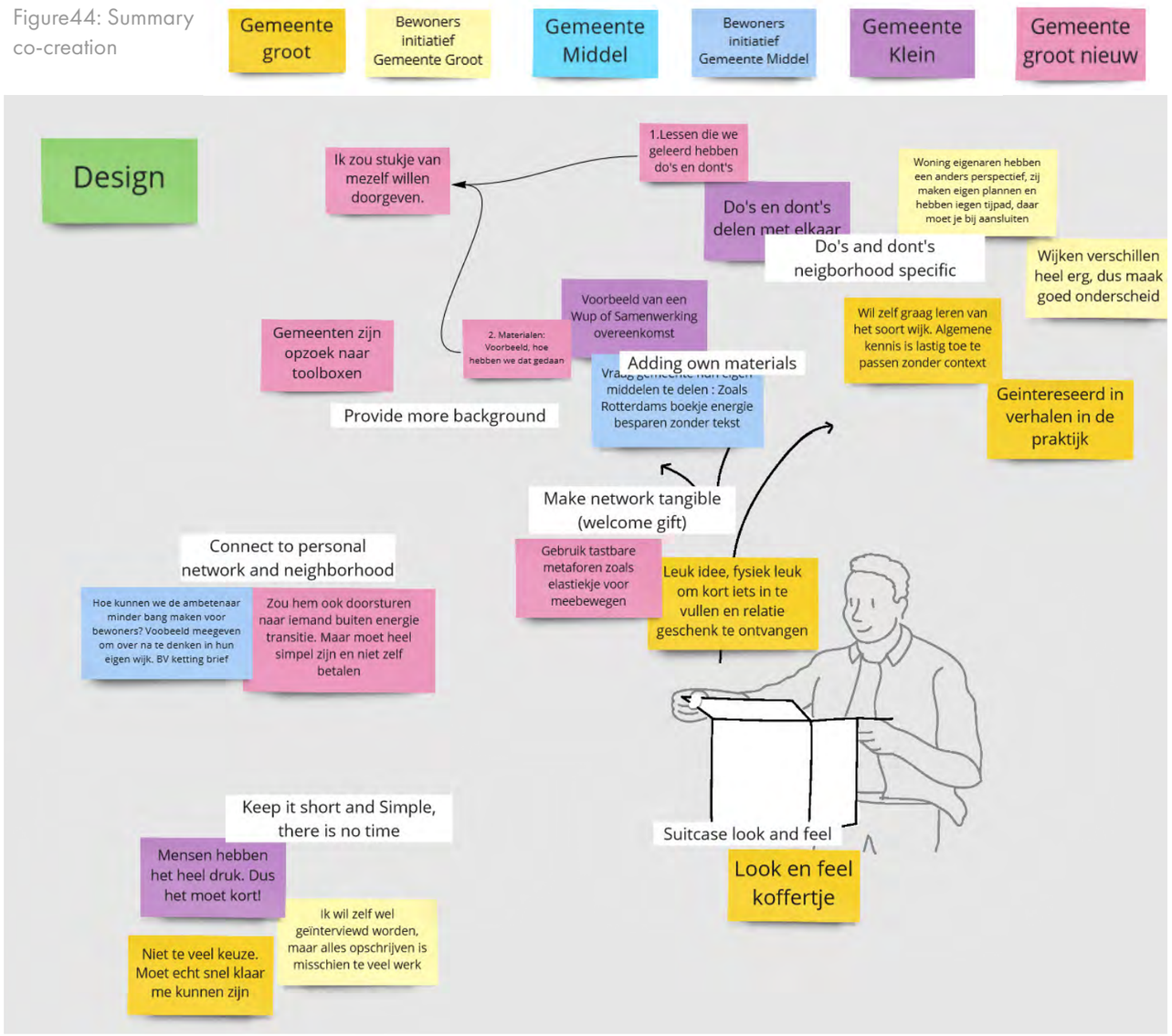
-Provide more background
Even though time is limited, municipalities would like to have a concrete tool or approach as to how they can implement network thinking in their daily activities.

-Bring something personal
Besides the personal gift, municipalities instantly mentioned materials they would like to share in the box with trusted individuals. They did not feel comfortable with sharing everything online, since they then lose control over who will use it.

Resident initiatives liked the idea of sharing practice stories with municipalities, they hoped this would help lift the barrier of working together with residents in other municipalities as well.

-Do's and Don'ts
Municipalites would like to learn form each other but in a concise and context-specidic matter. What works in one neighborhood might work, will be counter productive in the other.

Figure44: Summary co-creation



In conclusion, the participants like the concept of the network box and knew to whom they would like to send it. They were able the make the idea their own and were looking forward to a more thorough explanation of how to use the network approach in practice.

Chapter 11

Final product

Lopend vuurtje

The contents of the box

The Lopend Vuurtje box, see figure 45, introduces municipality officials to what a network is and how you use the power of a network in your neighborhood or project. Even Though a network is not directly tangible, it can have a lot of impact. Consider the ice bucket challenge. It may seem like a simple video that spreads around the internet, but the catch lies in the fact that you are invited by someone you know well and you pass it on to others again. This is the power of networking at its best: finding a way to connect your message to a network. Providing you with a wide reach of your message and participants with some insight and the feeling they belong in their community. This is exactly what the Lopend Vuurtje Box aims to do.

The box consists of 7 different items that all contribute to both educating the receiver on network theories as well as activating them to go out and experience the power of a network in the real world.

- The introduction letter explains what you can expect from the box and immediately give the call to action as to send the box after you have used it.

- The A3 Flyer details a 6-step approach towards implementing the network theory supported by some basic principles.

-The Practise story Cardset shows examples of the application of network theory in practice. Residents explain how they tackle the energy transition together.

-The Walking map reveals the hidden network between municipalities and invites the receiver to join.

-The Logbook municipalities with the opportunity to connect to previous recievers and senders.

-The Network card is a small exercise to visualize someone's personal network.

-The Experiment is a hands-on example of how you can bringing the network theory to practice by yourself.

-The Personal gift is optional and can vary from a pen to a notebook or example materials that municipalities would like to share.

Figure45: Contents of the Lopen Vuurtje box

The box

The Lopend vuurtje box is designed to be an experience. The experience starts with the packaging of the box. This should spark the curiosity of the municipalities. The Sticker at the top shows the project. There is room left for the send label. Around the box, a dotted line with pins invites the reviewer to write their city down and shows them the history of the box right away.

Introduction letter

The introductory letter will be placed in a green envelope with the call start here printed on it. Since receivers do not have much time it is important to guide them through the box. This letter details not only the contents of the box but also explains why we made it and where people can learn more.

The letter is written with a playful and energetic tone of voice in order to immediately engage the reader and to make clear this is not a regular tool but an experience box.

Flyer

The goal of the flyer is to educate the user on the network theory in general and on the application of the theory in the context of the energy transition.

Even though municipality officials have a limited amount of time, their need for knowledge was apparent during the co-creation sessions. In order to quickly convey the theory, the flyer is designed from a visual point of view with the text being only supplementary. Even without reading the text, the user should be able to grasp the basic concepts of the method.

The Principles on the front side of the flyer are a combination of both Centola's theory as well as practice insights collected during my own research. They provide the basics of network thinking which is necessary to encompass the method presented on the backside of the flyer.

The 6 step network approach details how to fundamentally work together with a neighborhood network from the perspective of a municipality official. This perspective was chosen since officials often do not know where or how to start working together with the local communities. The citizen initiatives on the other hand have their roots in the communities and therefore tend to apply network thinking and approach more intuitively. Ofcourse, the network thinking mindset could benefit their activities as well, for example, it could help them identify their position in the network and help them analyze the strengths of their community. But the system of municipality and resident initiative is best helped when municipalities start to invest in the power of the local networks and communities.

Resident initiatives identify the collaboration with the municipalities as one of the bottlenecks for their success in the energy projects they run.

Since every community, neighborhood, and network is different, the 6 step approach focuses on the route most municipalities tend to avoid. It uses the silent power strategy to start the social activation process. Step 2 of the approach explains that in the case of a central network the silent power strategy could still work, but the influencer strategy becomes an option. The 6 step approach is built as a basis for a new approach. The principles provide the municipalities with the right tools to customize the steps toward the neighborhood they are then working in.

The website further details the approach and principles.

Practise story card set

The card set provides insight into the application of the network theory in practice. The examples are extracted from the first interview round. The resident initiatives who use the network theory often do not consciously realize it but learn from practice what works best in their community. The card set encourages municipalities with real-world examples of theory and helps to imagine how the theory could work for them.

The cards consist of a short quote from the resident, telling in their own words what the intervention entailed in their project. Followed by a brief explanation of the context and a connection to the theory.

The card set now consists of 3 cards and can be expanded upon. However, the amount of cards is consciously kept small since this improves the comprehensibility of the Lopend Vuurtje Box as a whole. If the need for more stories becomes apparent, the website can facilitate that.

The ''De Parken'' Neighborhood in Apeldoorn shows two different stories from the same community. This is done on purpose to show that within one network, different strategies serve different goals.

Walking Map

The walking map is designed to motivate receivers to send the box throughout the country. Even though many municipalities have closer connections to the province they are in, the map shows the entire country. This will help frame the question as to whom you will send the box differently. It also helps receivers to think of their network on a bigger scale. We can all name some colleagues who are part of our network when we work for the same company or organization. Spreading information or behavior change through these networks is relatively simple.

The real challenges arise when different networks have to be connected. This is also the case in the neighborhoods in the energy transition when the frontrunner has to connect with the late majority. By framing the map strategically we guide the train of thought of the receiver which will enrich their experience of the full Lopennd Vuurtje box.

It is possible to start your own box and start a new chain. In this case, this will not end up on the physical map since the new box will have its own copy. This is where the online digital double of the box comes in really handy. A map on the website will show the path and location of all the boxes.

The box is designed in such a way that it should be very easy for a participant to start their own box. All the materials can be found and printed from the website, or you can just order a new box and send it to your network.

Logbook

The logbook is an addition to the walking map. In the logbook, municipalities are invited to share a bit more about themselves. Not only about their work in the energy transition, but also about their position in their own neighborhood network. It can be easy to get lost in a project for a neighborhood in which you do not live yourself. But it is important to remember that you not only work for these residents, your own neighborhood will have to transition away from natural gas at some point as well.

The logbook is intentionally kept short. A digital double will exist on the website. Receives are invited to go to the website and fill in an online logbook as well. Here the focus is on what their key learnings are. What are the do's and dont''s you have discovered during your work on the energy transition? Alongside the do's and dont's the neighborhood is shortly classified so that municipalities can easily determine how the do's and dont's apply to their project.

My Network Card

The network card is a small exercise that receivers can do quickly. The receiver is asked to put themselves in the middle of the card. Secondly, they are asked to think of a theme in which they have a network. For example a manager networks at work or the soccer network with their friends. In one group of people, multiple networks can be present. Thus it is important to identify the type of network you will draw out.

Secondly, they are asked to fill in as many connections as they have in this network. Strong connections are put closer, whilst weak connections are further away. On the front of the card, the network surrounding this graduation project is shown as an example.

The exercise was initially designed for the co-creation session to help me to get an understanding of the network of municipality officials. But it proved to be a valuable exercise for officials themselves. It is quick, and easy and connects the network theory to a personal level.

Experiment

The chain letter is a small experiment municipality officials can execute by themselves. The chain letter could go around in the neighborhood where a municipality is starting an energy project. The example questions are designed to connect both to the topic of the transition as well as with the neighborhood and its history. In the letter, the municipality explains they are starting an energy project in the neighborhood and that they would like to kick things off with this letter. The goal is to reach as many residents as possible. A common goal and a personal connection are two key ingredients to start a chain reaction that becomes the talk of the town.

The letter in the Lopend Vuurtje box is written as an example letter as if the municipality is a resident receiving the letter. Additionally, some tips are added to make the letter personal, like adding a handwritten part in the letter and answering the posed questions yourself first.

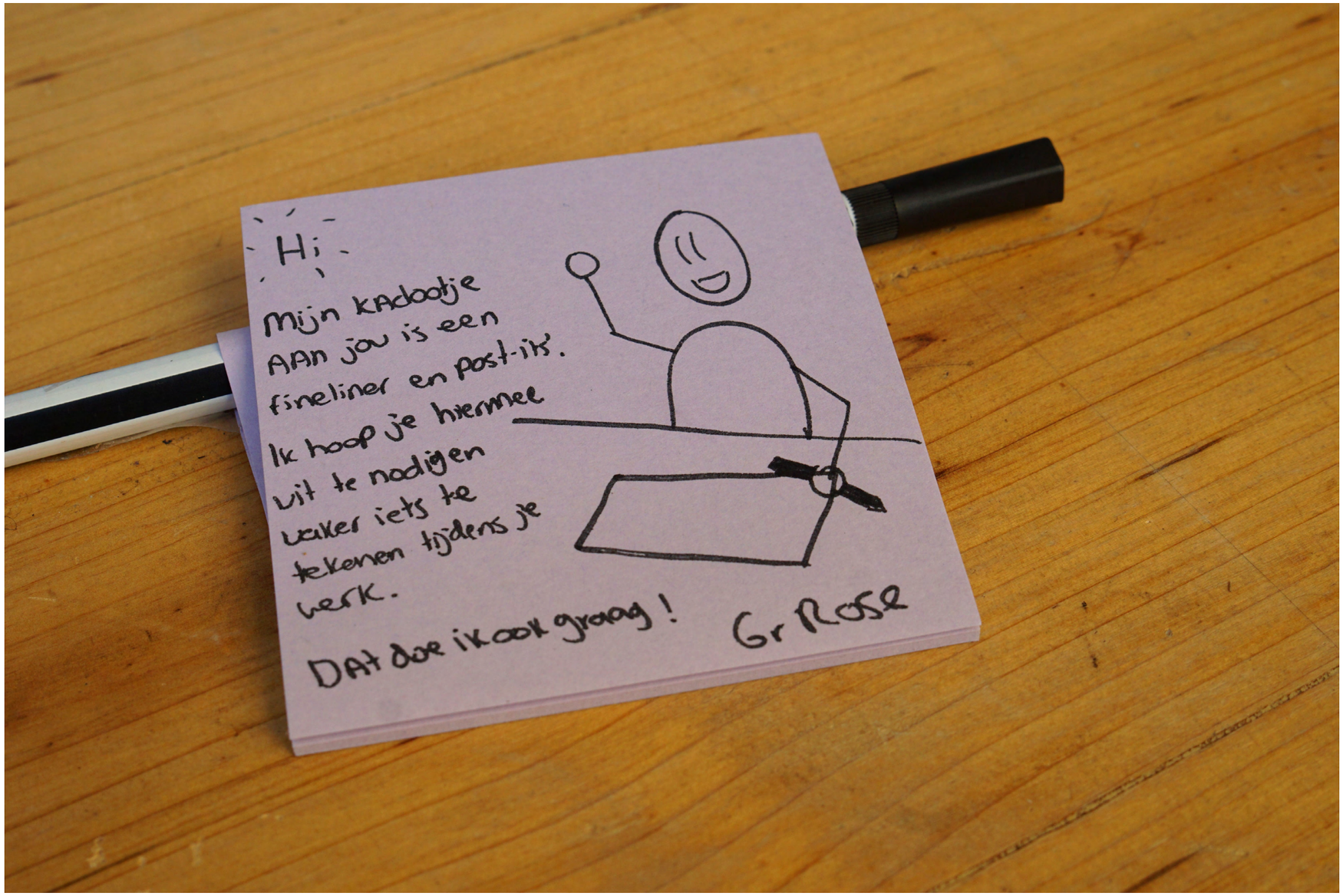
There is no template letter since municipalities always use their branding and signature when communicating with residents. Hence this letter merely serves as an example of how a little experiment could be started.

There is no digital double for the letter since this is an experiment. It is meant as a small exercise and small addition to the red thread which is the 6-step network approach. Besides, following the letter online would make it possible to see when the latter would fail to catch on, which is not motivating.

Personal gift

Besides the designed materials each recipient is invited in the introduction letter to leave a personal gift in the box. For the prototype, I decided to add a fineliner since this represents visual working for me. Some municipalities might add a similar personal gift, others could add some materials they have developed for their neighborhood project. It is up to the receiver and senders themselves.

The personal gift is added as a means to make not only a cognitive but also an affectionate connection to the box. This makes it easier to remember once you have sent it away.



Website

The website functions as both a kennnisdossier as well as the place where the digital double is hosted. An interactive map shows the path that the Lopend Vuurtje box has taken. When you click on a city on the map a small portion of the logbook will appear alongside the dos and donts that the municipality has formulated.

The website is also the place where senders can find their Post NL label and can request another box or print the materials themselves.

A linked-in section on the website shows the online path the Lopen Vuurtje box will create. When people receive the box they are invited to write a small linked-in post about their experience. They are then asked to tag the person who has to send them the box and tag the one to whom they will be sending it. This Linked-in Chain will function as the digital double for the box.

The principles and 6-step method are also detailed on the website. Even though the website is a kennisdossier and should provide in-depth knowledge the flyer did not provide yet. It is worth mentioning the kennisdossier should be comprehensible for new readers as well since many municipalities use the Wijkkompas Website as a wikepedia voor ''De wijk aanpak''.

The last section of the website directs the user to the book and my graduation repost for when they would like to know about the topic and the network approach.

Chapter 12

Recommendations and conclusions

After the co-creation session, a prototype was designed and produced. The Lopend vuurtje box was sent to several participants for evaluation, see chapter12.1. Secondly, throughout this project, there have been limitations and insights which will be shared in chapter 12.2. Lastly, a short conclusion concerning the full project is made.

12.1 Prototype evaluation

The Lopend vuurtje box prototype consists of all the materials mentioned in chapter 11, see figure 46. The size of the box was unintentional since the boxes were left over from another project. However, the design on the outside was very much intentional. For the evaluation, all 20 previously involved participants were contacted, as well as two new municipalities. Of the 22 contacted participants 6 could participate in the product evaluation, see table 3. They were all briefed that the box is intended for municipal project managers and was asked to take on this role themselves for the evaluation. A few days after receiving the box a short 20-30 min interview focussed on their impression and

NR.	Municipality (population)	Role
1.	Municipality 1 (160.000)	Project manager municipality
2.	Municipality 1 (160.00)	Citizen initiative, Neighborhood 2
3.	Municipality 2 (120.00)	Energy corporation Citizen initiative
4.	N.V.T	Consultancy agency Housing corporation
5.	N.V.T	Consultant Municipality
6.	N.V.T	Consultant Municipality

Table3: Participants product evaluation

Figure46: Prototype Lopend vuurtje box

improvements for the box. Appendix H shows the analysis of these interviews. The main takeaways from the evaluation were:

+ It is very well-designed and inviting
All participants pointed out the box is well designed. They mentioned there was attention to detail in all the material they encountered. The outside of the box was perceived as the start of the experience, as intended. The materials invited them to explore what they had just received in the mail. It made them curious and took them away from their day-to-day routine.

+ The amount of parts is just right
The quantity of the objects in the box was of interest to me since municipalities had pointed out earlier to have limited time. All participants felt that the number of parts was just enough. When asked what part was their favorite, they had a hard to choose since all pieces together tell a story.

+ Sending it to one person
When asked, the participant did want to send the box to the next person. The initial idea of having recievers send multiple boxes was not shared by any of the participants in this evaluation. That would be too time intensive. Sending the box away once was seen as a highly likely action for the participants.

- Clearer start point in the box
Even though the outside of the box was inviting. Participants had trouble first finding the introductory letter. One suggestion was to start some of the instructions on the box itself.

- Add a step-by-step guide
Three out of the six participants would have liked a step-by-step guide to the materials in the box. They felt unsure if they executed everything in the right order.

- Unclear target group
All participants were aware the box was designed for municipalities, but because of some formulation of the materials, they expected it to be for residents as well.

- Theory can be more integrated into the energy transition context
The social contagion theory and the method presented were designed for the energy transition but could be used in different sectors. However, there was no explicit mention of the energy transition right now. This was confusing.

- Goal needs to be clarified
The box invites recievers to explore the theory by themself. But five participants indicated that the overall goal of the box and the intended behavior change could be mentioned more explicitly. A little provocation is not a bad thing when framed correctly.

In conclusion, the concept of the box was received well. Participants were enthusiastic to send the box and, after some time, were able to grasp the concept and theory the box tried to convey. Their valid points of improvement were focused on the detailing and execution of specific text and materials. Which can be improved easily.

12.2 Discussion

As with all projects, this graduation project has been subjected to certain limitations. Some were outside my sphere of influence, others were merely a derivative of the time constraints and thus strategic choices that I had to conclude the project in time. The limitations within my sphere of influence could be viewed negatively, however, I propose to see them as opportunities for future research.

A limited amount of Municipalities were interviewed

For the evaluation of the current use of participation and social contagion in the energy transition, only 3 were interviewed. All municipalities are Wijkkompas users and thus this might have influenced the results that were obtained. For example, Wijkkompas has a clear vision of the importance of the social side of the energy transition. It is likely that municipalities that use the Wijkkompas tool have a similar vision.

Recommendation
To further scale the qualitative insight obtained in this project it would be desirable to interview a municipality that does not use Wijkkompas. Other factors of municipality diversity should be taken into account as well then such as population and geographical location.

Qualitative data could not be validated quantitatively

Due to time constraints and a lack of network the qualitative insight in this project was not validated quantitatively. Besides, the social nature of this project has made it hard to obtain any quantitative data whatsoever. During the first collaborative phase of this project, a graduate student from Utrecht Univeristy did try to formulate a quantitative research question. Lemmers found that the municipalities connected to Wijkkompas are not yet far enough to compare their approach in terms of switching households or the tempo of the transition to neighborhoods in which Wijkkompas was not used. The data for social contagion in neighborhoods is obtained very locally, for example in Haarlem where a single flat was analyzed (Kleijwegt, 2018).

Recommendation
Besides interviewing a municipality not connected to Wijkkompas, it would be beneficial to formulate a questionnaire in which the main qualitative insights could be validated quantitatively regarding both municipalities and resident initiatives.

Lopend vuurtje box pilot test

Due to time constraints, it has not been possible to perform a first pilot study to investigate the process of actually sending the box through a social network. The ''send ability'' of the box could not be determined fully. Only through indication in the evaluation interviews.

Recommendation

Wijkkompas is advised to perform a small pilot study in which the ease of use of the Lopend vuurtje box in practice is determined.

Energy crisis

On February 28 of 2022, this graduation project started. Simontainously Russia attacked Ukraine which consequently started the energy crisis in Europe. The prices of natural gas skyrocketed and still at the end of this project energy poverty is of concern. The influence of these events on this graduation is apparent. Gas has become a hot topic which has made more residents aware. There has been a decrease in energy usage and the Dutch government is quickly implementing policies to further reduce gas usage.

On the flip side, the topic of natural gas has become a sensitive one as well and is for many people now negatively connected to the high prices for example.

This all has influenced this project, and to what extent is hard to determine. What we can say is that during COVID-19 we all thought that habits formed in this period of time would stick. Some do, and more people work from home now, but many other habits, like flying less did not stick around. In conclusion, when reading this report, the lens of the present time (2022) should be considered when the insights and recommendations done in this report are applied in a future context when the energy crisis might be solved.

12.3 Conclusion

The purpose of this project was to design a tool that would implement the social contagion theory effectively in Wijkkompas. The current use of social contagion theory was very limited with municipalities. They tend to struggle with the participation process. In this process, they are in charge, but in the social contagion process, they have to let the network process go.

It was found that the most impact could be made when municipalities would learn to trust and try out the new method for interacting with residents. This aligned very well with Wijkompas' vision for the neighborhood approach for going from TVW to WUP. They found that to accelerate the technical transition, you have to invest in the social transition first. Based on the recommendation made in the project their visual language was changed to reflect this vision.

The tool designed in this project is an extension of that vision. The Lopend vuurtje box uses the principles of the social contagion theory to spread the knowledge and activation for the theory itself. The box is designed for municipal project managers and is sent in the inter-municipal network. When someone receives the box they are immediately part of the network and part of the network theory. The box itself further explains the theory through little assignments, practise stories, and an information flyer that details the 6-step method for the application of social contagion in the energy transition specifically.

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