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Master Thesis

POWER TO EMPOWERMENT

A case study on how local policy can stimulate local energy initiatives to contribute to the energy transition

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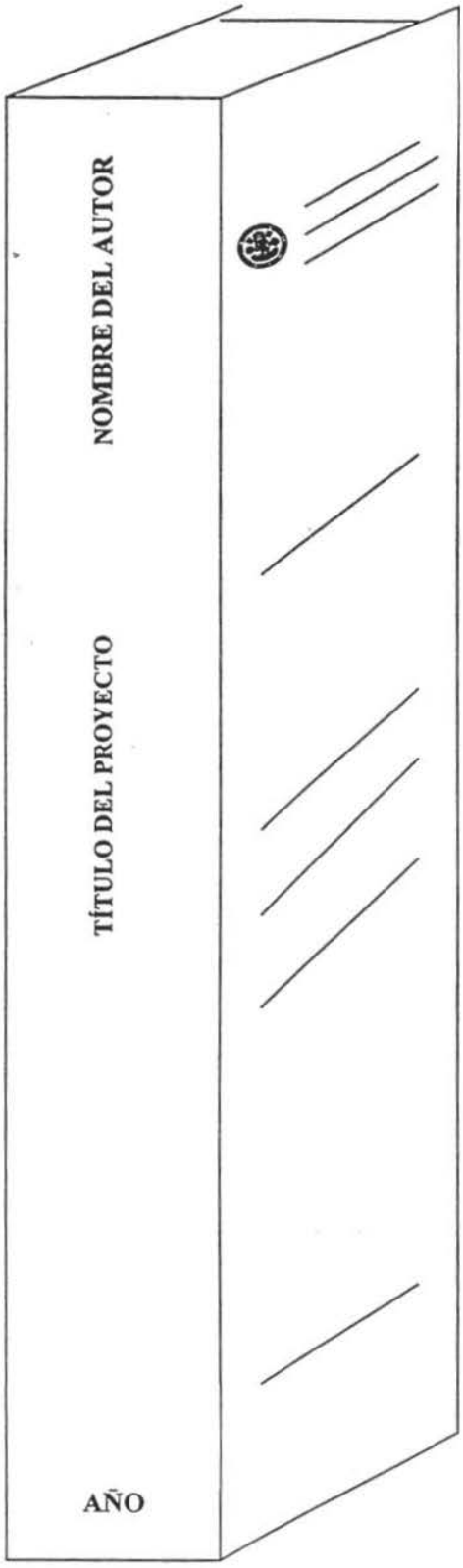

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Preface

This thesis is the conclusion of my Master of Science in Economies and Management of Network Industries. This Erasmus Mundus Master programme includes two Master's degrees. First degree is in the Master of Science in Industries de Réseau et Économie Numérique (IREN) of the Université Paris Sud in Paris, France. Second degree is the Master of Science in the Electric Power Industry (MEPI) at the faculty Escuala Técnica Superior de Ingeniería (ICAI) of the Universidad Pontificia Comillas in Madrid, Spain.

This research has been performed in cooperation with the municipality of Rotterdam. It provides insights into the development of local energy initiatives in Rotterdam and the way local policy can be made compatible with this development.

This research would have never been completed without the help of others. Therefore, I would like to thank my family, friends and fellow students, who motivated me during my studies. Then, I would like to thank all my interviewees, for their enthusiastic input in this research. Also, would like to thank Luis Olmos for encouraging me during the Master and Serge Pajak for giving me good advice on the thesis. Finally, from the municipality of Rotterdam, I would like to thank Irma Arends and Fred Akerboom, for their confidence in my research and support.

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Abstract

Climate change can be described as world's biggest problem nowadays. Citizens are acting and organizing themselves in so-called local energy initiatives; organisations that help contributing to the energy transition, because of their decentralized and sustainable ambitions. Local policy makers are the most important in support of their development. In the case of Rotterdam, the local energy community is still developing and local policy needs a clear view of the energy initiatives in order to stimulate this development. This leads to the following main research question:

How can local policy motivate energy initiatives to contribute to the energy transition in the community of Rotterdam?

With the Q-methodology three different perspectives were found, that indicate there are three different kinds of energy initiatives in Rotterdam: 1) the typical energy initiative, 2) the business-orientated energy initiative and 3) the fluid energy initiative. To motivate the development of local energy initiatives, local policy should pay attention to three parts. First, to motivate more citizens to organize themselves in energy initiatives, the promoting role of the municipality should be increased with promotional activities, like raising awareness under citizens. Second, to motivate energy initiatives to remain existing on the long-term and contribute to the energy transition, the municipality should provide supporting policy instruments, such as a direct contact or coaching sessions. Third, to create self-sustaining organisations that become independent of policy support, policy should strengthen the network, for example with cooperation with intermediary organisations. To adopt this research to other communities, it is important to consider the assumptions of the city Rotterdam, which are the intrinsic motivation and entrepreneurial mind-set under citizens.

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1 Introduction

"Why are we not responding enough to climate change?"

This question is increasingly raised with the appearing of records in temperature, disappearance of islands and polluted air in cities. Where only environmental scientists raised this question at first, now citizens are getting concerned as well. Citizens are even starting to take measures in own hands and organizing themselves in "local energy initiatives": small organisations that increase the sustainability within the community. This bottom-up movement wants to save the world from serious climate consequences. So how can we support and motivate more citizens to start local energy initiatives? This research will analyse the needs of the local energy initiatives in Rotterdam, to eventually construct a policy recommendation for the municipality of Rotterdam to motivate energy initiatives to contribute to the energy transition.

This chapter describes the problem situation in paragraph 1.1. From this, the research questions can be obtained in 1.2. The research method will be described in 1.3. Then 1.4 discuss the scope and 1.5 will point out the relevance of the research. Finally, 1.6 outlines the structure of this report.

1.1 Problem description

Climate change reached a new level of impact with drastic weather changes, melting ice caps, drought and polluted city air. On top of this, international conflicts start to arise while trying to cope with the negative consequences. People are realizing that climate change is real and problematic. Still, even after the Climate Agreement of Paris, in which all major countries pointed out the importance of change towards sustainability, the efforts are not enough. In the Netherlands for example, only 5.3% of the total energy consumption was generated by renewable energy in November 2016 (Visser, 2016).

The Dutch government set a goal of achieving 14% renewables in 2020, but despite the climate goals the renewable transition is going slow. This raises the question: "Why are we not responding enough to climate change?"

The bottom-up approach

The usual top-down approach to the energy transition has not proved to be effective, since national and international policy seems influenced by large energy companies, that are relying on fossil fuels. In the past, one of the biggest barriers of the transition to renewable energy in the Netherlands has been the national energy policy (van Rooijen & van Wees, 2006). Still, large companies are threatened by the growth of renewables, since this can lower their incomes and make it harder to earn back investments (Mulder & Scholtens, 2013). Using a bottom-up analysis allows for researching smaller energy stakeholders. They play an important role in the energy transition, since the change from the traditional fossil-fuel system to the renewable energy system makes decentralization possible. This means the transition will change the structure of the energy system from big central producers to smaller decentralized producers. This has a potential social impact; local governance can create self-sufficient energy systems in smaller communities with local energy initiatives (Akella, et al., 2009).

Case study on local policy of Rotterdam

A prerequisite for the continuity and effectiveness of local energy initiatives is the relation with the local government (van der Schoor & Scholtens, 2014). This analysis will focus on the important relation between initiatives and local government. To do so, the research will perform a case study on the municipality of Rotterdam. In this second biggest city of the Netherlands a good example of the energy transition can be found. Like the rest of the world, the economy of Rotterdam is still depending on fossil fuels, like coal, gas and oil. Therefore, it requires a large transition to change to all renewable energy sources, which was defined as a goal within the next thirty-five years (Gemeente Rotterdam, 2016). Around 2008, the municipality of Rotterdam started to promote sustainability in the city and the energy transition. One of their means is by promoting small scale sustainability in neighbourhoods, and the development of technologies and businesses that contribute to the energy transition. For the total sustainability program, the municipality has a budget available of 26,5 million euros (Gemeente Rotterdam,

2015), which is partly for stimulating the growth of local energy initiatives. So, on one side the municipality has resources available for the stimulation of energy initiatives. However, on the other side they cannot know all the in-side needs, motives and opinions of the energy initiatives themselves. It is required to understand this inside knowledge to construct policy that supports the energy initiatives effectively. This way a policy can be implemented that stimulates the bottom-up movement of the energy transition.

Concluding, the research problem can be described as the local government wanting to support the bottom-up movement of the energy transition, without ineffective government intervening. Therefore, a well-founded policy should be determined, based on clear and understandable perspectives of the local energy initiatives.

1.2 Research questions

Looking at the problem description and the knowledge gaps deriving from this, the following main research question can be defined:

> ***How can local policy motivate energy initiatives to contribute to the energy transition in the community of Rotterdam?***

To answer the main research question, several sub research questions are defined:

1. What is the development of local energy initiatives in Rotterdam and how does it relate to the theory on local energy initiatives?
2. What is the development of local policy in Rotterdam and how is it compared to other communities in Europe?
3. What are the perspectives of local energy initiatives regarding local policy in Rotterdam?
4. How can local policy be made compatible with the perspectives of local energy initiatives in Rotterdam?

Objective

The objective of this thesis is to find drivers to an effective energy transition from a bottom-up approach. This means, making the energy system sustainable and decentralized, by supporting local energy initiatives. With the case study on Rotterdam, this research will try to understand how local policy can support energy initiatives in a community. Finally, this approach can give possible directions for the policy towards local energy initiative development for the municipality of Rotterdam.

1.3 Methodology

The methodology that is going to be applied consists of three parts, which are outlined in Figure 1. The first part will be a thorough literature study to research existing theory on local energy initiatives and local policy. Looking at existing theory on local energy initiatives, a description of the current situation will be given regarding local energy initiatives, their effectiveness, prerequisites, and future developments. As can be seen in Figure 1, the theoretical framework will be used as an input for other phases of the research.

The second part will develop the problem setting on the case study of Rotterdam. This phase will describe the energy initiative development and policy process in Rotterdam. Moreover, it will provide a comparison with other cities in Europe as a mean of measurement. This part will be done using a stakeholder analysis, interviews, field study, policy reports from the municipality of Rotterdam and other media. After this part, both output from the literature study and from the problem setting will be the input for the methodology.

The third part will be an analytical research to answer the last two research questions. The analytical research will be done using the Q-methodology, which allows to quantitatively research subjective perspectives of different stakeholders towards an issue (Brown, 1980). In this case, different energy initiatives of Rotterdam will be analysed with respect to their perspective on the policy of the municipality. This will raise a good understanding of the impacts of policy, which shows how policy connects to the needs of the energy initiatives. The tool that is going to be used for the analysis is the software PQ-method (version 2.35). This software is specifically developed to perform the Q-analysis (Schmolck, 2014).

From these three parts, results and conclusion will flow, which will end in a well-founded policy recommendation. The policy recommendation will be founded by the theory and practice from the literature study and problem setting, as can be seen in Figure 1.

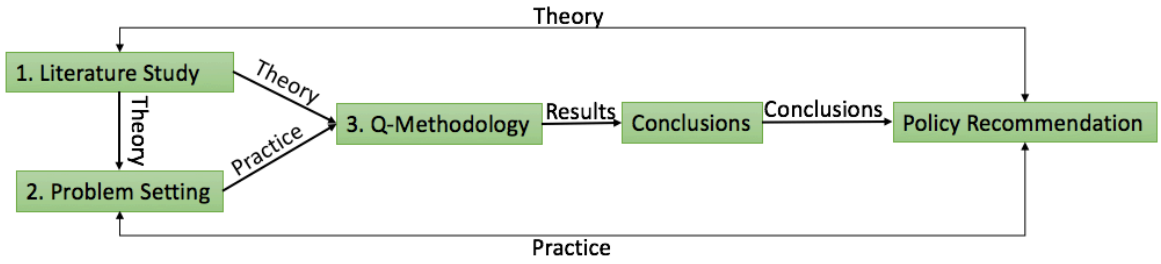

Figure 1. Research Design

1.4 Scope of the research

In order to make the research feasible, a delineation has to be made. The scope of the policy process has been narrowed down to local policy only. Even though regional, national and international policy also can influence the development of energy initiatives, local policy is seen as the most important policy maker (Rogers, et al., 2008).

Furthermore, the term energy initiative has a wide range of meanings in literature. The use of term in this research will be done according to two conditions set by ODE Centraal (2016): 1) energy initiatives should have a legal entity and 2) they should be democratically organized by citizens (ODE Centraal, 2016). Looking at the meaning of 'local', the definition by Walker & Devine-Wright (2008) will be used, which describes that a project can have the local community involved in the process or the outcome of the project.

Moreover, the policy process for development of energy initiatives can be capricious and diverse. Therefore this research can only be seen relevant for this moment in time and to the case of Rotterdam.

1.5 Relevance of the research

"Europe can literally be powered by its people" (Vansintjan, 2017), which shows that the importance of energy initiatives has been acknowledged by the European Commission in the 'Winter package' (Vansintjan, 2017). This shows the relevance of the research, which aims to support the development of local energy initiatives by contributing to the existing literature in several ways.

First, the case study on Rotterdam and focus on the policy development in this specific city is not a commonly used research approach in existing literature about energy initiatives. The research will zoom in on the local community of one city and its involved energy initiatives, where existing research is more about countries or regions in general.

Second, a policy recommendation will be given to the municipality of Rotterdam. The direct link between the practice of local policy making with the theory on energy initiatives is a contribution to existing literature.

Third, the Q-methodology will provide a profound insight in the perspectives of the energy initiatives. This quantitative approach to find qualitative perspectives on policy development is never done on the field of energy initiatives so far.

1.6 Research structure

The research will start with a literature study in chapter 2. In this chapter the existing literature on local energy initiatives and local policy is explored. After the theoretical study, the problem setting will be described in chapter 3, which consists of a stakeholder analysis on the case of Rotterdam. Both the theoretical framework and problem setting will then be used for the methodology in chapter 4. In chapter 5 the results will be presented, which will lead to the perspectives of local energy initiatives and policy design in Rotterdam. Then, chapter 6 will describe the conclusions, together with answers to the research questions. Finally, chapter 7 will discuss the research and provide recommendations for further research.

2 Theory on local energy initiatives and local policy

In this chapter a theoretical framework will be presented about the development of energy initiatives and local policy. Paragraph 2.1 will consist of a literature study on energy initiatives. Then in 2.2 the policy developments towards the local energy community will be analysed. Finally, paragraph 2.3 provides the conclusion of the theoretical study.

2.1 Development of local energy initiatives

Local energy initiatives are initiatives from citizens that help contributing to the energy transition. This contribution can consist of expanding renewable energy generation or changing energy consuming behaviour. Moreover, energy initiatives aim to change the current structure from a centralized energy system to a decentralized system, to gain democratic control and power for citizens (Van der Schoor, et al., 2015). The rise of energy initiatives can be described as the bottom-up movement, in which citizens instead of politicians or big companies are stimulating the energy transition. Seyfang, et al. (2012) even found that a goal of energy initiatives can be to put additional public engagement to top-down policy, so that eventually national politicians will change their policies towards more sustainability.

Types of local energy initiatives

Literature shows that energy initiatives can have very different goals. Also, there exist many different organisational structures of energy initiatives, varying in size, development, legal forms and ambitions (ODE Centraal, 2016). Organisations can have the form of a business, a volunteering group, a temporary project or other possible forms (HIER opgewekt, 2016). The diversity of goals and organizing forms can create misunderstanding, like has been the experience in previous studies. To create more

clarity about the existing energy initiatives, four different types of energy initiatives can be distinguished, displayed in Figure 2.

Energy Demand	Energy Supply	Energy network	Energy Policy & Sytem
• Initiatives that are improving the energy demand, by making it more efficient, energy productive or manageable. • Example: Initiatives that try to influence consumption behaviour by organizing community energy competitions (HIER opgewekt, 2016).	• Initiatives that focus on the energy supply, by renewable generation in different technologies. • Example: Initiatives that locally generate renewable energy by the installation of solar powered roofs (Joosten, 2013).	• Initiatives that want to influence the energy network and improve the integration of renewable energy in the network. • Example: initiatives that support smart grids or the implementation of smaller local grids in communities.	• Initiatives that want to advance policy, workforce and energy system to a more rapid energy transition. • Example: policy groups that want to enforce more women to start their career in the clean energy industry.

Figure 2. Energy initiatives divided by their function, based on the categories of (Clean Energy Ministerial (2017).

Local energy initiative development

In a lot of European countries, the number of local community energy initiatives have grown rapidly (Van der Schoor, et al., 2015). With the number of energy initiatives rising, it is losing its pioneer's character and slowly becoming of established order: the cooperative energy community. Still the existing energy system with large established national or even international energy companies make it hard for local initiatives to enter the market (Van der Schoor, et al., 2015). To have a bigger influence on the energy transition it has proven to be effective that the initiatives cooperate and support each other (Hargreaves, et al., 2013a). This has been done by the creation of local energy communities, in which the initiatives work together and learn from each other. The creation of networks is important to organize a movement for decentralization, because the energy transition is a large scaled development and therefore it needs a steady and big number of cooperating parties (HIER opgewekt, 2016). De la Court stated (2016):

"*When citizens want to become serious partners, they have to organize themselves. We see a movement already, but it is fragmentized. A lot of local energy initiatives create their own little kingdom, but it is important to connect locally, regionally and nationally*."

With the creation of networks the local energy community is strengthened, which can influence the social, economic, financial, cultural and political structure of energy systems even further (Hargreaves, et al., 2013b). The aim of cooperating and sharing is essentially different from large energy companies. This is fundamental for the success of the energy transition. However, community building can have a downside because of tensions, vulnerabilities and limits within the group, which requires consistent policy support (Seyfang, et al., 2012). Furthermore, Van der Schoor et al. (2015) pointed out that energy communities should obtain a shared mentality, clear regional boundaries to define the region included and a sustainable energy provider that is closely linked with the network and its people.

Support of intermediary organisations

Research to clustering of local initiatives in regional networks show that regional energy networks are of support for local initiatives in both formal and informal ways (Van der Schoor, et al., 2015). For small initiatives who have not much experience and knowledge about the traditional energy sector, the networks can be of economical and organisational importance. In several European countries already networks are organized in therefore created intermediary organisations. Such as the organisation "HIER opgewekt" in the Netherlands and "100% Erneuerbare-Energie-Regionen" in Germany. Parag & Janda (2014) stated that these middle actors can play an important role in the socio-technical change that the local initiatives are aiming for. Also, the intermediary organisations can build communities with high trust, which is an important condition for the realization of energy initiatives as well (Dóci & Vasileiadou, 2014).

Size of the energy community

Another point of attention, is the size of the communities in which energy initiatives are arising. This can play a role in the way policy is developed by governments and

implemented by its citizens. Research in the US showed that in larger cities, with over 500.000 inhabitants, the energy transition is more important, because of liberal and educated inhabitants (Krause, 2012). Moreover, Pitt & Basset (2013) found that energy initiatives are more likely to adopt in larger cities than in small and medium sized cities. In contrary, in the European Union it was found that in villages and small cities local energy initiatives were easier adopting in the community, as the community aspect is more relevant (Oteman, et al., 2014). This means that development of the energy community in cities is lacking behind. This can be caused by the complexity of ownership rights and benefit division within the energy community and the society around them (Oteman, et al., 2014). However, most studies weren't quantitative or didn't show the implemented local policy and its effects. Also, literature about policy development for energy initiatives in Europe is mostly focused on smaller communities. The knowledge on development and impact of local policy on energy initiatives in large cities is not abundant. This research of Rotterdam, a city with over 600.000 inhabitants, will therefore add to the literature in a way that it shows the direct impact of local policy in a large city.

2.2 Local policy for energy initiatives

Energy initiatives produce 'grassroots innovations' that can change the existing sociotechnical structure of the current energy system (Seyfang & Smith, 2007). Therefore, energy initiatives ask for a different policy approach. This paragraph will look at most useful policy for stimulating the growth of local energy initiatives.

Policy makers for local energy initiatives

Policy support can be implemented by different parties, like intermediary organisations, international and national policy makers and local governments. Of all parties, local authorities can have the most effective policy instruments to stimulate energy initiatives (Rogers, et al., 2008). The local government has the right resources and stands closest to the community, so that local policy can have a great influence in building up a local energy community (University of Amsterdam & ICLEI, 2012).

Local policy for local energy initiatives

The international organisation ICLEI distinguished four roles for local policy to support renewable development in cities (University of Amsterdam & ICLEI, 2012). Local policy consists of all four roles, but the emphasize is on one or two of them (University of Amsterdam & ICLEI, 2012):

- The regulator: local governing that is done with authority, such as setting-up protocols, regulations and rules for companies.
- The promoter: the municipality governs by promoting its sustainable character, with events, (international) network building and raising awareness.
- The supporter: the municipality shows support with provision of supporting means, like providing facilities, a direct contact, setting-up a working format, etc. (ODE Centraal, 2016).
- The role model: local policy governs autonomously by implementing sustainable projects itself.

What is most effective local policy?

Energy initiatives are not always economically incentivized and profit related and this asks for a different policy approach than regular companies (Hargreaves, et al., 2013a).
Different studies show points of attention when constructing effective local policy. First, the emphasize on the diversity of local energy initiatives is important (Hargreaves, et al., 2013a). Local energy initiatives can have differences in goals, environments and organisational structures that influence the effectiveness of policy (Seyfang, et al., 2012). So, different local initiatives need different policy instruments and regulating or supporting parties. This can be called 'tailor-made' policy, which addresses the individual needs of energy initiatives.

Second, policy should have a promoting role to create strong energy communities. The aim of cooperating and sharing with other organisations is essentially different from large energy companies (Hargreaves, et al., 2013a). Therefore, the creation of networks is important (Hargreaves, et al., 2013b), which are organized in intermediary organisations. Intermediary organisations can play an important supportive role in organizing, managing, and resourcing (Hargreaves, et al., 2013a). This can help to

overcome tensions, vulnerabilities and limits within the network and strengthen the community of energy initiatives.

Third, in the realization of the energy community there should not be too much government intervention with an authority approach. The creation of grassroots innovation is all about having space to arise for new and diverse kinds of businesses (Hargreaves, et al., 2013a). Current policies often include standardized protocols and are therefore most of the time inapplicable for energy initiatives (Hargreaves, et al., 2013a). The most effective policy therefore includes freedom and flexibility for new market mechanisms to emerge, which stimulates the growth of local energy initiatives. However, on the other side, attention should be paid to deprived communities, in which people don't obtain resources, power or ability to engage in environmental issues (Middlemiss & Parrish, 2010). To prevent "energy underclasses" (Walker, 2008, p. 4515), direct local governmental intervention can be helpful (Catney, et al., 2014). De Zeeuw (2016) even found that the best policy instrument for this group is financial contribution of the government, while for other energy initiatives rules, procedures and managing networks could be more of a help.

2.3 Conclusion

Local energy initiatives differ widely in their goals and organisational structures. The creation of energy communities is fundamental for making an influence on the energy transition. Energy communities can be strengthened with the help of intermediary organisations.

It seems that the rise of energy initiatives is lacking behind in large cities in Europe, but not much research has been done to cities' development, which stresses the relevance of this research.

Most important policy makers for the creation of energy communities are local governmental authorities. The municipality can take different roles in stimulating the development of energy initiatives, which are the regulator, the promoter, the supporter and the role model. Local policy should pay attention to three main points. These are 1) that policy should be 'tailor-made', that is addressing the different needs of energy

initiatives, 2) cooperation of local policy with intermediary networks can help the strengthening of the local energy community and 3) policy should be flexible, with less rules and regulation to let the market mechanisms develop around grassroots innovations.

3 The problem setting in Rotterdam

To understand the development of local energy initiatives and the role of local policy in Rotterdam, the problem setting is researched. Since the setting is complex and includes many different actors, a stakeholder analysis is used and can be found in Appendix A. Figure 3 shows an output of the stakeholder analysis, which is a map of the stakeholders and the relations they have with other stakeholders. From this the development of energy initiatives in the case study on Rotterdam is given in 3.1. Then the development of local policy in Rotterdam is described in 3.2. From these two paragraphs, the barriers to the energy initiative development in Rotterdam are found in 3.3. Lastly, the problem setting is compared with other European cities in 3.4.

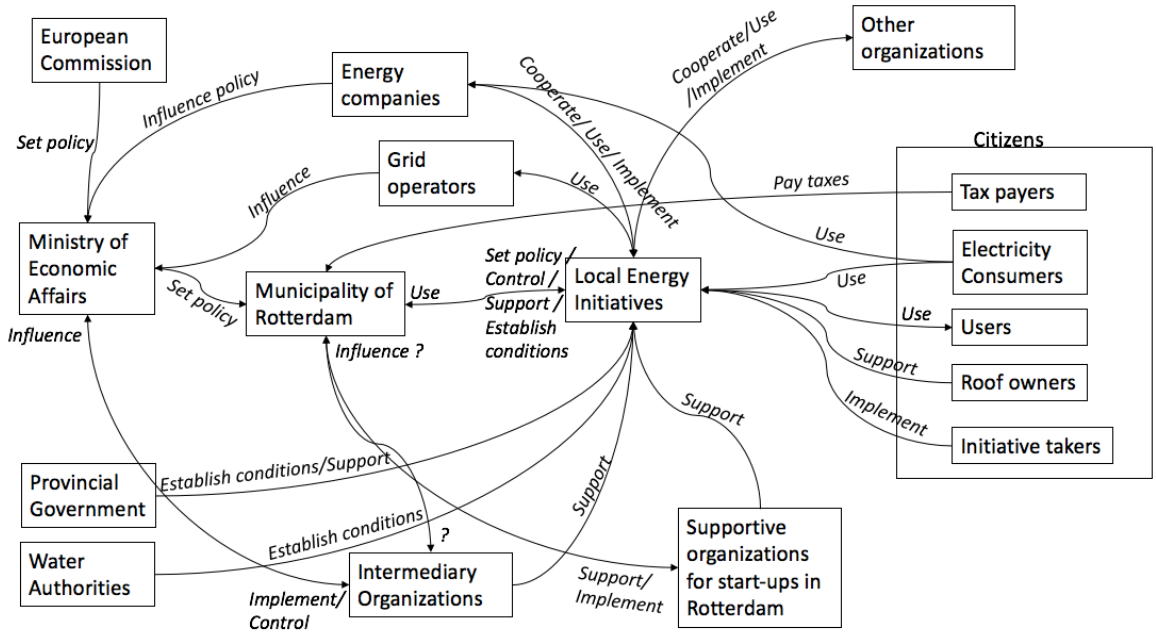

Figure 3. Map of actors and relations between actors in the local energy community of Rotterdam (derived using various sources described in Appendix A).

3.1 Development of local energy initiatives in Rotterdam

The growth of energy initiatives in Rotterdam is still developing. Already some energy initiatives have emerged, but there is not yet an established local energy community. The number of energy initiatives existing was estimated around 32 by this research (Appendix A). However, it is always difficult to interpret how many initiatives exist, because of their diversity, autonomy and novelty. To understand what is important for the energy initiatives and their development, an analysis was carried out including stakeholder analysis, interviews and field study (see Appendix A). From this, three main characteristics about energy initiatives appeared, that should be considered when researching their development:

- **Type of energy initiative**

  It is important to distinguish the type of energy initiative, because the circumstances and policy needs that are ideal for their development differ. Differences between types can be:

  - Performance: the performance of energy initiatives can differ and depend on different causes. For example, some energy initiatives state their performance is tense, because there are mainly volunteers working (Jong & Oppen, 2017).
  - Ambitions: energy initiatives show differences in the ambitions of their organisations, some focus more on the sustainability aspect, while others find involving the neighbourhood more important.
  - The start-up process of the energy initiative: this tells something about the type of organisation. For example, there can be different external parties involved in the start-up process by different energy initiatives.

- **Needs of local support**

  Different energy initiatives ask for different support from the municipality. For example, Schaik (2017) stated they would be helped with data about different households, like who installed solar panels or who had measures of isolation, Jong & Oppen (2017) would prefer to have help from the municipality by means of

facilitation, like meeting rooms, and Joosten (2013) is more helped with a better understanding of different policy procedures.

- **Confidence in and competence of local policy**
  Local policy is received differently between energy initiatives. Some find the municipality accessible and attentive; others find the public organisation too bureaucratic and not effective for the development of their energy initiative (Joosten, 2013).

3.2 Local policy in Rotterdam

"*We are going to continue with energy conservation and new clean energy sources, such as wind and sun. In 2030, we will generate more renewable energy than we will use in total throughout the city*." (Langenberg, 2015, p. 5).

Even though, the city councillor of Rotterdam stated this, the economy of Rotterdam is still largely depending on fossil fuels. Therefore, it would require a large transition to change to only renewable energy sources (Gemeente Rotterdam, 2016). The municipality of Rotterdam, set up a report called 'Programme Sustainability', to stimulate the energy transition. The programme partly aims to put effort in the bottom-up movement of the energy transition and the growth of energy initiatives in Rotterdam. The local policy of the municipality of Rotterdam can be described by ICLEI's four municipal roles (discussed in 2.2), which lead to Figure 4. Figure 4 can be explained by:

- The regulator: The municipality does not govern much with authority, for example it does not use a standard regulation towards energy initiatives. Instead it mostly uses 'tailor-made' policy, that can provide support to the individual needs of different energy initiatives (Arends, 2017). However, to qualify for some financial support, initiatives should meet certain pre-defined criteria.
- The promoter: Local policy consists largely of promotional activities. For example; CityLab010, which is a platform where initiative takers can publish their innovative ideas and asks for local support (Gemeente Rotterdam, 2017).

Also, promotional activities include international cooperation with other countries on renewable related issues, like participating in 'Cities C40' (C40, 2017) and '100 Resilient Cities' (100 Resilient Cities, 2017).

- The supporter: The municipality of Rotterdam's aim is to provide supporting governing, including facilitating and participating in initiatives (Gemeente Rotterdam, 2015). For now, support differs among different energy initiatives (Arends, 2017).
- The role model: The municipality of Rotterdam does a lot of self-governing by implementing sustainability measures into their own organisations, such as saving energy on municipal real estate (Gemeente Rotterdam, 2015).

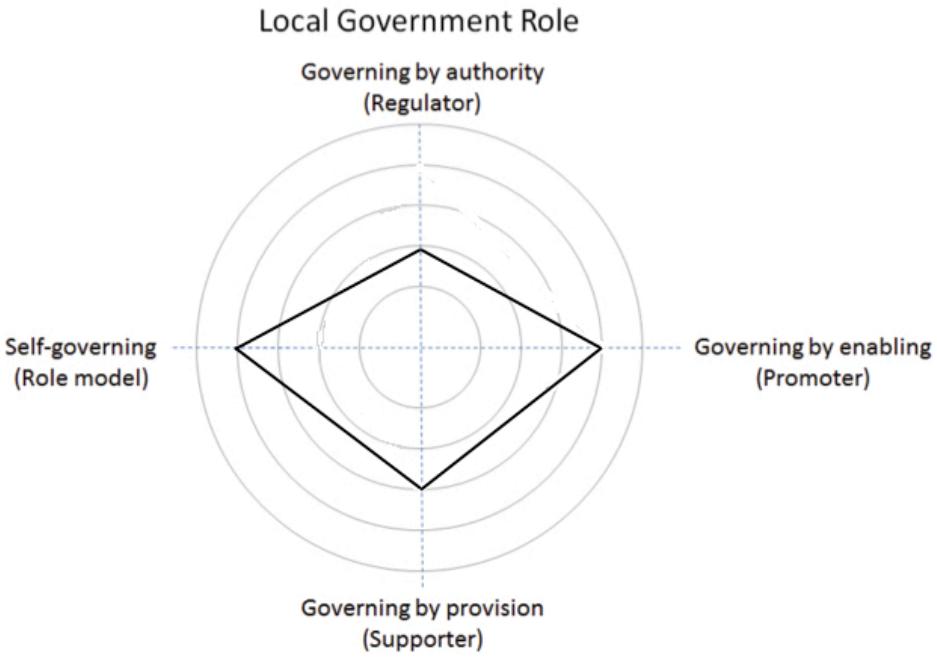

Figure 4. Graphical presentation of the roles of the municipality of Rotterdam (University of Amsterdam & ICLEI, 2012)

3.3 Barriers for local energy initiative development

There are a few barriers for local energy initiative development in relation with local policy development. These barriers came from the stakeholder analysis, field study, interviews (Appendix A) and the previous two paragraphs. The problem setting concerning local policy includes:

- **Entry barrier for energy initiatives**

  Local regulation in the Netherlands is often seen as too excessive for the creation and effectiveness of small new energy organisations, which from an entry barrier for initiatives to enter the energy market. Van Bekkum (2016) stated: *"If the government wants to decentralize the energy system, it should stimulate local energy initiatives instead of regulate them. Inside the law, it should still be possible to have space for experimentation"* (HIER opgewekt, 2016). This flexible and open character of local policy in the Netherlands is something new, that needs to be experimented with. To implement flexible policy, inside knowledge considering local initiatives is required (Hufen & Koppenjan, 2015).

- **Difficulties to support the diverse group of energy initiatives**

  The diverse character of local energy initiatives that occurred from literature analysis, is also clearly present in Rotterdam. The wide diversity between energy initiatives, make it hard to find policy that suits their individual needs. This could have a negative influence on the long-term existence of local energy initiatives. By focussing on the needs of the individual energy initiatives, they can be stimulated to remain existing on the long-term and contribute to the energy transition.

- **The independence of energy initiatives**

  The role of the municipality is important and can have a great influence on the development of energy initiatives. However, the final goal for the energy initiatives would be to become independent and self-sustaining organisations. Here the question arises, how the municipality should support local energy initiatives, without making them too depending on their support? Therefore, it is important to be critical about policy instruments and to measure their necessity and effect before implementing local policy.

3.4 Development of other local energy communities in Europe

To put the development of Rotterdam in perspective, it is compared with three other cities within European countries. The selection of cities was mostly based on availability of literature, but also paid attention to the resemblance with the characteristics of Rotterdam and the experience the countries have with local energy initiatives. Their most important features regarding development and policy-making of local energy initiatives are described in detail in Appendix B. The final comparison can be found in Table 1.

	Number of energy initiatives	Development energy community	Municipality role	Local policy instruments	National policy influence
Nether lands – Rotterdam	Netherlands: 335 in 2016. Rotterdam: 39 in 2015.	Medium	Regulator, promotor, supporter, role model	Platform CityLab010, financial support, facilities, etc.	Moderate goals, very centralized, policy is business oriented
Germany – Hamburg	Germany: over 650 in 2013. Hamburg: +/- 100.	Medium /strong	Promoter supporter	Coordination, matchmaking, promotional activities and financial support	Ambitious goals, binding character of federal decisions, play a major role in development
United Kingdom – London	UK: Over 600 London: unknown	Weak	Regulator, role model	Investing and buying products and services by municipality	Moderate national policy, energy transition mostly business orientated
Denmark – Copen hagen	Denmark: unknown Copenhagen: unknown	Strong	Supporter, promotor	Close contact, financial support, promotion, network building	Ambitious goals, very decentralized; leaves space for local governments

Table 1. Comparison of cities on different features regarding local energy initiatives (see various sources in Appendix B).

The differences and similarities between local policy development in different European countries lead to the following conclusions:

- **Influence of national policy goals**

  Even though the literature study found that local policy is the most important policy maker for the development of energy initiatives, this comparison shows that national policy influences the development as well. In both Denmark and Germany national policy has ambitious goals for sustainability, which translated to both national and local policy instruments. This has led to strong development of energy initiatives in rural areas. In contrary, national policy in the Netherlands and the UK is more business-orientated, which translated to less strong local policy towards the energy community. Moreover, in Germany national policy has a binding character, whereas in Denmark policy is left open for local governments. This leads to the conclusion, that mainly the goals that national governments have towards the energy transition, has influence on the development of energy initiatives.

- **Supporting and promoting role for the municipality**

  From the comparison, it appeared that the supporting and promoting role of the municipality works best in stimulating the energy initiative development. Good examples of this can be found in Hamburg and Copenhagen, where these roles helped establish an energy community. The regulating role is not helpful for the creation of the energy community, as can be seen in London.

- **Municipal policy instruments**

  Denmark is most successful in this comparison of development of local energy initiatives. Their local policy is therefore useful and can be learned from. The policy instruments that they implemented are 1) having close contact with the energy initiatives, 2) providing financial support, 3) investing in (international) promotion and 4) strengthening the energy community with network building and establishing an organisation. These will be considered in further research.

3.4 Conclusion

The development of energy initiatives in Rotterdam is emerging, but there is not yet an established local energy community. Three main characteristics about energy initiatives in Rotterdam should be taken into account when addressing their development: 1) the type of energy initiative, 2) the needs of local support and 3) confidence in and competence of local policy.

The municipality wants to stimulate the growth and development of energy initiatives in Rotterdam, so they can contribute to the energy transition. The role of the municipality consists mainly of self-governing and promoting policy, but also includes regulating and supporting policy. The comparison of different European cities, shows that the supporting and promoting municipal role are most efficient in stimulating the development of energy initiatives. A good example can be found in Denmark, that seems most successful in its development of the energy community. Their policy approach and policy instruments can therefore be informative and should be considered in further research.

The problem setting of local policy in Rotterdam and the development of energy initiatives is three parted. First, the current energy system and existing regulations makes it difficult for energy initiatives to start-up. Second, because of the diversity and novelty of the energy initiatives, it happens too often that initiatives will not make an impact on the energy transition on the long-term. Third, local policy should support the development of energy initiatives without making them too much depending on their support.

Concluding, local policy should find policy that suits the open and flexible character and diversity of the energy initiatives in such a way that it will stimulate them to remain on the market and help the energy transition, without making energy initiatives depending on the municipality's financial contribution. This way the bottom-up movement of the energy initiatives can perform influence on the energy transition.

4 Methodology

In this chapter the methodology will be explained in 4.1, as well as the selection of statements and respondents discussed in 4.2 respectively 4.3. In the end, the design of the interview will be presented in 4.4.

4.1 Q-methodology

The Q-methodology is recommended for policy improvements, since it gives a profound understanding of its stakeholders (Durning, 1999). In this case, the Q-method will give a better understanding of the perspectives of the energy initiatives towards local policy in Rotterdam. It does this, by finding preferences and thinking patterns of the local energy initiatives in Rotterdam. The Q-method uses a sorting scheme to discover this thinking patterns (Brown, 1980). In the sorting scheme respondents sort statements, that were found in theory, which will force them to think about the order of their beliefs (Van Exel & de Graaf, 2005). This way, judgments, needs and preferences of respondents will be sorted to the level of importance. In the end, this will show the subjective perspectives of the local energy initiatives (Smith, 2001). The data analysis will consist of two parts, first the correlations between preferred orders of the respondents will be found and second, a factor analysis will be done (Brown, 1980). This way the Q-methodology combines quantitative and qualitative research, because subjective opinions will be statistically analysed (Dennis & Goldberg, 1996).

4.2 Selection of statements

The collection of statements that are representative for the stakeholder in the problem field is called the 'Q-set'. These are the most important statements local energy initiatives have towards local policy and their development. The statements were found after several interviews, literature study and field study. The literature- and field study

composes of internet articles, blogs, documentaries and other articles on the internet. The whole set of statements can be found in Appendix C. Initially this set composed of a large amount of statements. From this complete set, 30 statements were selected. Selection of these statements has been done by categorizing them into the three characteristics about local energy initiative development, that was found in 3.1. These were: 1) the type of energy initiative, 2) the needs of local support and 3) confidence in and competence of local policy. Every characteristic is represented by statements, as to make sure the Q-set is representative for the problem situation. For some characteristics, more statements were needed to represent the context of it than for other clusters. After selecting the 30 most relevant statements, the statements were made more clear for interviewing purposes, like avoiding double negatives. In the end the Q-set was set-up, which can be seen in Table 2.

Type of energy initiative
1. Development of our organisation is difficult, because of financial reasons.
2. Our development is difficult, because we mainly have volunteers working here.
3. Our development is difficult, because it is hard to involve people in sustainability projects.
4. Our organisation performs well in making the energy system sustainable.
5. Our organisation performs well in involving the neighbourhood.
6. More citizens can be motivated to start up an energy initiative by raising awareness (for example in newspapers and social media).
7. More citizens can be motivated to start up an energy initiative by financial incentives.
8. When starting up our organisation, our contact with an intermediary organisation (HIERopgewekt, ODE centraal) was important.
9. When starting up our organisation, our contact with private or commercial lenders (other than governmental) was important.
10. When starting up our organisation, our contact with other energy initiatives was important.
11. When starting up our organisation, our contact with the municipality was important.
12. When starting up our organisation, a subsidy from the state or province was important.
Needs of local support when continuing the organisation
13. The municipality can support us by providing data, such as installed solar panels or isolation measures in neighbourhoods.
14. The municipality can be of networking support, by linking the existing energy

initiatives in the city.
15. The municipality can support us by providing access to their facilities, like meeting rooms.
16. The municipality can support us by buying our products or services.
17. The municipality can support us by authorizing licenses for the operation of our organisation
18. The municipality can support us by providing access to municipal spaces for our business operation (for example roofs for solar panels).
19. The municipality can support us by assigning a direct contact at the municipality that supports our organisation.
20. The municipality can support us by providing a short-term subsidy for a specific project.
21. The municipality can support us by providing a long term structural subsidy for the whole organisation.
22. The municipality can support us by providing a policy document explaining rules, options for cooperation and procedures.
23. The municipality can support us by showing their support and appreciation, like showing up on openings, presentations or meetings.
24. A good way of working with the municipality is with a contract in which clear agreements have been reached on the plan of action to be implemented within the stipulated term.
25. A good way of working with the municipality is through tenders (public or private).
Confidence in and competence of local policy
26. The municipality is accessible and attentive.
27. For our organisation the policy of the municipality operates well.
28. The supportive role of the municipality is clear to our organisation.
29. The municipality's policy is fragmented, if an agreement has been reached with a department, another department may disagree with it.
30. A barrier in working together with the municipality is the administrative obligations.

Table 2. Q-set of statements

4.3 Selection of respondents

The selection of respondents is called the P-set and is important for the Q-methodology. The P-set is selected with the aim to include the widest possible variety of viewpoints, to show the divergent patron of living perspectives (Van Exel & de Graaf, 2005). Therefore, in contrary to other statistical researches, the Q-method selectively chooses its respondents, who carry different perspectives (Watts & Stenner, 2005).

The P-set is determined by selecting respondents who are representative for the problem. In this case, respondents should be local energy initiatives in Rotterdam and have experience with local policy. To define which respondents should be interviewed in this research, the different functions of energy initiatives are considered. These four functions were presented in paragraph 2.1 in Figure 2. Another important feature of energy initiatives is their age (HIER opgewekt, 2016). Different results are expected to arise, when considering differently aged energy initiatives. When categorizing these four functions and two age periods, we obtain Table 3. In the selection of the P-set, from every group one respondent is interviewed. This will give a wide variety of respondents within the representative group for the research problem. In total this gives a P-set of 8 respondents, which will determine the perspectives of the energy initiatives. This number is sufficient, since the Q-methodology allows to obtain significant results with a smaller number of respondents (Förster, 2013). The 8 respondents are selected out of the existing energy initiatives in Rotterdam, which are listed in Appendix A. The final 8 respondents that were selected, were assured anonymity, as to avoid political correct answering.

	Energy Demand	**Energy Supply**	**Energy Network**	**Energy Policy & System**	**Total**
> 2 years	1	1	1	1	4
< 2 years	1	1	1	1	4
Total	2	2	2	2	8

Table 3. The selection of respondents categorized by relevant features

4.4 Design of the interview

The interviews with the selected respondents will take place with sorting scheme below (Figure 6). Respondents will be asked to sort the 30 statements from 4.2, ranking from totally disagree to totally agree. The scheme forces the respondent to make a consideration between interests (Kroesen & Cuppen, 2013). Next, the respondents will be asked for the underlying motivations of their choices. With this, a profound

understanding of the consideration and motives of different energy initiatives will be obtained. In the end, the set of choices will form the thinking pattern, which will tell the perspective of the energy initiative. Image 1 show an example of the interviews that took place with respondents.

Totally disagree Totally agree

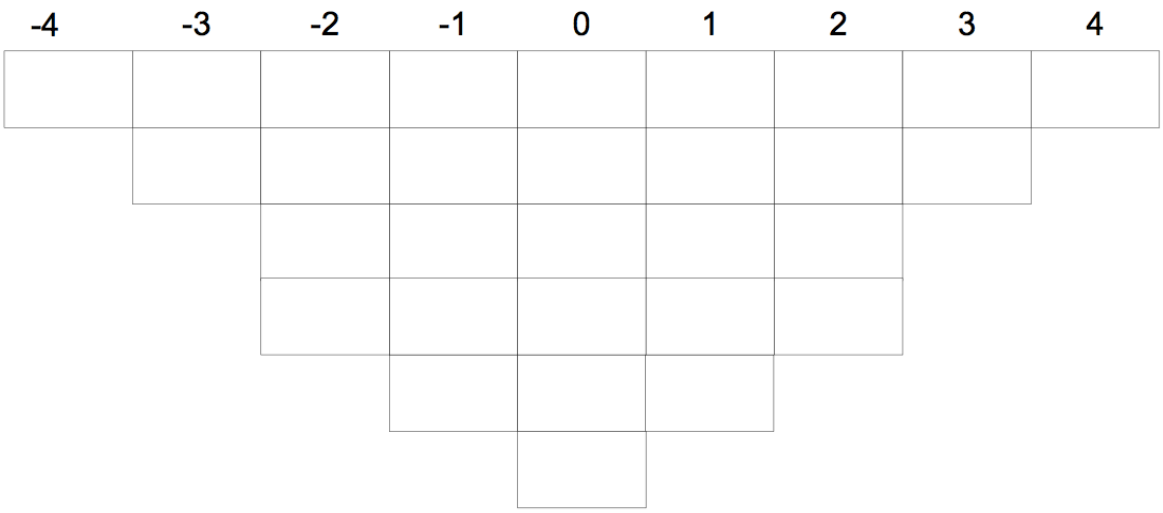

Figure 6. Sorting scheme for interviews (Kroesen & Cuppen, 2013).

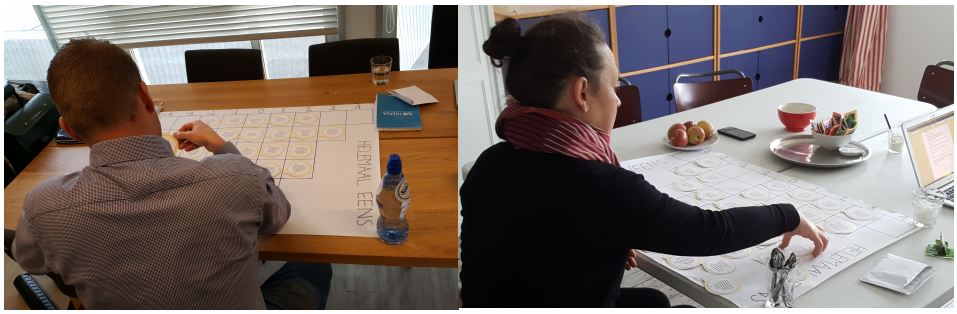

Image 1. Examples of interviews with respondents

5 Results

This chapter will present the results that came from data analyse in 5.1. Then, the results will lead to the outcomes. These are the perspectives that can be found under energy initiatives in Rotterdam, discussed in 5.2.

5.1 Results

The data from the interviews was analysed according to the Q-method, with the software PQ-method (version 2.35). This software was specifically developed for the Q-analysis (Schmolck, 2002). The first step in data analysing is importing the statements and data from interviews into the software. From this, a correlation matrix was derived, which shows the degree of similarity between the Q-sorts. A Q-sort is the ranking of statements from a respondent. Table 4 with correlation matrix shows which Q-sorts were similar to each other and which were different. Here applies: the higher the number of correlation, the higher the degree of similarity. A negative number shows that a Q-sort is the opposite from the other Q-sort. From this can be concluded that respondent A1 and C3 are the most different from each other, as their correlation was the lowest -0.22. Also noticeable is the similarity between B2 and H8, since they have the highest correlation of 0.58. From the correlation matrix, it can be concluded that the majority of Q-sorts correlate positively with each other, and only some have low correlations.

Q-sorts	A1	B2	C3	D4	E5	F6	G7	H8
A1	1.00	-0.09	-0.22	0.08	0.23	0.17	0.54	0.22
B2	-0.09	1.00	0.38	0.21	0.32	0.16	0.17	0.58
C3	-0.22	0.38	1.00	0.14	0.36	-0.05	-0.05	0.16
D4	0.08	0.21	0.14	1.00	0.09	0.15	0.25	0.45
E5	0.23	0.32	0.36	0.09	1.00	0.21	0.31	0.15
F6	0.17	0.16	-0.05	0.15	0.21	1.00	0.35	0.28
G7	0.54	0.17	-0.05	0.25	0.31	0.35	1.00	0.13
H8	0.22	0.58	0.16	0.45	0.15	0.28	0.13	1.00

Table 4. Correlation Matrix of the Q-sorts

Next step is the factor analysis, to determine the factors that will represent opinions. Respondents who have the same opinions towards a subject will form a factor (Brown, 1980). The factor analysis will also show how the different opinions of respondents relate to each other (Brown, 1993). First step in the factor analysis is the creation of the unrotated factor analysis, from which the results can be seen in Table 5. In this Table, eight factors can be seen with their factor loading towards the different Q-sorts. Here applies, the higher the factor loading, the more this Q-sort can be associated with this factor. Also, the eigenvalues and explanatory variance can be seen for every factor. The factors must comply to certain conditions to be further taken into analysis. A condition that has to be applied to this unrotated factor matrix, is that the eigenvalue should meet or surpass the value of 1.00 (Brown, 1980). Table 5 shows that only factor 1, 2 and 3 meet this condition. The other factors will be eliminated from further analysis. Factor 1 explains for 31% of the variance, which means that 31% of the respondents share the opinion of factor 1. Respectively, Factor 2 and 3 account for 21% and 14% of the variance.

Factors → Q-sorts ↓	1	2	3	4	5	6	7	8
A1	0.4055	0.7200	0.1132	-0.2776	-0.3274	-0.2114	0.2020	0.1861
B2	0.6645	-0.4943	-0.0494	0.1619	-0.3285	0.3461	-0.1290	0.2027
C3	0.3420	-0.6792	0.3981	-0.1673	0.1847	-0.0492	0.4458	0.0037
D4	0.5448	-0.0682	-0.4950	-0.4310	0.4819	-0.0649	-0.1433	0.1038
E5	0.5855	-0.0658	0.6600	-0.0198	0.0411	-0.2660	-0.3764	-0.0525
F6	0.5129	0.2921	-0.0840	0.7114	0.3180	-0.1312	0.1245	0.0678
G7	0.6011	0.5563	0.1932	-0.1217	0.1363	0.4756	0.0639	-0.1681
H8	0.7206	-0.1939	-0.4705	0.0233	-0.3382	-0.2149	0.0660	-0.2374
Eigenvalues	25.062	16.655	11.200	0.8389	0.7172	0.5315	0.4423	0.1784
% expl.Var.	31	21	14	10	9	7	6	2

Table 5. Unrotated factor matrix

Next step in the factor analysis is the rotating of the factor matrix. Rotating of the factors will create clusters of subjects close to an axis, which will lead to factors with the highest possible loadings (Schmolck, 2002). In this analysis, the Varimax rotation is used, since this approach is objective and useful for exploratory research (Van Exel & de Graaf, 2005). This research can be categorized as exploratory, because of its qualitative

character in which new problem situations are defined and explored. The Varimax rotation is carried out with the criteria of Varimax, in which factors are rotated to examine the opinions from different angles (Förster, 2013). This leads to the rotated factor matrix from Table 6. Here 3 factors represent 3 different groups of respondents that share the same perspective. A first condition, is that the respondents in a group are highly correlated to each other, and not correlated to other groups of respondents. A second condition, is that factors should have two or more Q-sorts that are loading on them (Kroesen & Cuppen, 2013). This is the case for all three factors, as can be seen in Table 6, where an X stands for a Q-sort loading on that factor. At the bottom of Table 6 the explanatory variance is depicted. The total variance explained by this model is 66%. This is relatively high, which means that the three factors represent a broad part of the existing perspectives on the subject of 'local policy and energy initiatives'.

Factors → Q-sorts ↓	**1**	**2**	**3**
A1	0.0049	0.8240X	-0.1288
B2	0.6081X	-0.0271	0.5637
C3	0.1293	-0.2442	0.8127X
D4	0.7268X	0.1312	-0.0324
E5	-0.0499	0.4413	0.7652X
F6	0.3256	0.4986X	0.0286
G7	0.1229	0.8250X	0.1110
H8	0.8602X	0.1372	0.1393
% expl.Var.	22	24	20

Table 6. Rotated factor matrix with X indicating the factor on which the Q-sort loads

After concluding there are three factors and thus three different perspectives, the following step is to determine which respondent belongs to which perspective. This can be determined by the following formula:

$2.58 \times \frac{1}{\sqrt{n}}$, where n = number of statements (Watts & Stenner, 2005)

In this case, n = 30. So, the Q-sorts must load with 0.47 or higher to have statistical significance on an 0.01-level. As can be seen in Table 6, all Q-sorts load with a higher

level of 0.47, which means all respondents can be addressed to a perspective, and thus 100% of the data can be used in further analysis.

The last step of data analysis is to discover and describe the three factors, that were found in previous steps. The ranking of statements per factor depends on the factor scores or Z-scores. Z-scores are the normalized weighted averages of statements towards a factor (Van Exel & de Graaf, 2005). Based on these Z-scores the statements are ranked in an order that forms an ideal Q-sort for each factor. Z-scores are determined using the following formula:

$w = \frac{f}{1-f2}$, where w = weight and f = factor loading (Van Exel & de Graaf, 2005)

Then the weighted average is normalized using quasi-normal distribution. An overview of all the Z-scores per factor can be found in Appendix D. With the Z-scores also the difference score can be derived from data analysis. The difference scores give the differences between rankings, which can be seen in Appendix E.

Finally, the data analysis results in a factor consisting of a ranking of statements that forms a certain perspective towards a subject that is living in society (Kroesen & Cuppen, 2013). A factor with ranking of preferences is there also called a perspective. The ranking of statements per perspective can be found in Table 7. In the next paragraph the three perspectives will be discussed.

Perspective → **Statement ↓**	**1**	**2**	**3**
1. Development of our organisation is difficult, because of financial reasons.	-1	1	-1
2. Our development is difficult, because we mainly have volunteers working here.	4	-4	-1
3. Our development is difficult, because it is hard to involve people in sustainability projects.	1	-2	1
4. Our organisation performs well in making the energy system sustainable.	3	4	2
5. Our organisation performs well in involving the neighbourhood.	3	3	1
6. More citizens can be motivated to start up an energy initiative by raising awareness (for example in newspapers and social media).	0	0	1
7. More citizens can be motivated to start up an energy initiative by	0	2	-1

financial incentives.			
8. When starting up our organisation, our contact with an intermediary organisation (HIERopgewekt, ODE centraal) was important.	-2	-3	0
9. When starting up our organisation, our contact with private or commercial lenders (other than governmental) was important.	-3	1	-3
10. When starting up our organisation, our contact with other energy initiatives was important.	-2	-1	3
11. When starting up our organisation, our contact with the municipality was important.	2	-2	-2
12. When starting up our organisation, a subsidy from the state or province was important.	-3	0	-4
13. The municipality can support us by providing data, such as installed solar panels or isolation measures in neighbourhoods.	2	1	-2
14. The municipality can be of networking support, by linking the existing energy initiatives in the city.	0	1	0
15. The municipality can support us by providing access to their facilities, like meeting rooms.	-1	0	-3
16. The municipality can support us by buying our products or services.	-1	3	-1
17. The municipality can support us by authorizing licenses for the operation of our organisation	-2	-1	2
18. The municipality can support us by providing access to municipal spaces for our business operation (for example roofs for solar panels).	1	0	1
19. The municipality can support us by assigning a direct contact at the municipality that supports our organisation.	1	0	0
20. The municipality can support us by providing a short-term subsidy for a specific project.	2	2	4
21. The municipality can support us by providing a long term structural subsidy for the whole organisation.	2	2	-2
22. The municipality can support us by providing a policy document explaining rules, options for cooperation and procedures.	-1	-1	0
23. The municipality can support us by showing their support and appreciation, like showing up on openings, presentations or meetings.	0	-3	2
24. A good way of working with the municipality is with a contract in which clear agreements have been reached on the plan of action to be implemented within the stipulated term.	-1	0	3
25. A good way of working with the municipality is through tenders (public or private).	-4	-2	-2
26. The municipality is accessible and attentive.	-2	-1	1
27. For our organisation the policy of the municipality operates well.	1	-1	0
28. The supportive role of the municipality is clear to our organisation.	1	-2	-1
29. The municipality's policy is fragmented, if an agreement has been reached with a department, another department may disagree with it.	0	2	1
30. A barrier in working together with the municipality is the administrative obligations.	0	1	-1

Table 7. The ranking of statements per perspective

5.2 Perspectives

From the data analysis, three perspectives originated that exist among the energy initiatives in the community of Rotterdam. The perspectives will be described here, using the ranking of the statements together with the argumentation of the respondents. The description of the perspectives will be done according to the three characteristics found in 3.1. In Figure 7 the three perspectives and their most common features are presented, which are extensively explained in the descriptions following.

Typical energy intiatives	Business-oriented energy initiatives	Fluid energy initiatives
TYPE • Goal is decentralization and sustainability • Have no other contacts • Example: generates energy on public rooftop and distributes throughout the community	**TYPE** • Focus on sustainability • Financially incentivized • Have contact with private money lenders • Example: builds a machine to generate energy out of waste	**TYPE** • Multipurpose, non-standard organisations • Have contact with other energy initiatives • Example: develops an energy-neutral building
VIEW LOCAL POLICY • Close contact with municipality • Policy considered efficient: accessible and clear • Improvement would include more emphasis on bottom-up policy support	**VIEW LOCAL POLICY** • Policy considered inefficient: fragmentated and unclear • Improvement would include translating policy to implementation level	**VIEW LOCAL POLICY** • Policy considered mixed: complex, but accessible • Improvement should include support that stimulates initiatives to become independent
NEEDS • Open public data • Raised awareness among citizens • Direct contact • Short and long-term subsidies • Coaching about managing and organizing initiatives	**NEEDS** • Sale of products/services to municipality • Short and long-term subsidies • Open public data • Network with other energy initiatives • Flexible contracts • Direct contact	**NEEDS** • Appreciation from municipality • Help with obtaining licenses • Short-term subsidies • Raised awareness among citizens • Clear agreements

Figure 7. Overview of the three perspectives with their most common features categorized in type of energy initiative, view towards local policy and needs for policy instruments

Perspective 1: The typical local energy initiative

This perspective is shared by three respondents and explains 22% of the total variance.

Type of energy initiative

This perspective is formed by typical local energy initiatives, which means that initiatives in this group focus on making their close environment sustainable. This can differ from their street, to the whole city Rotterdam. For this group both sustainability and the community are evenly important (statement 4 and 5: ranking 3). Respondent D4 stated: *"the collaboration with the neighbourhood is essential for the goals of our organisation."* This is because the motive of this group is to decentralize the energy system.

This group has close contact with the municipality from the start (statement 11: ranking 2), but do not seek help or support from other parties like the federal government or commercial companies (statements 12 and 9: ranking -3). The reason for this is what respondent D4 stated: *"our project was too small for support from the state or big companies."*

An example of an initiative in this group can be an initiative that generates energy on a public rooftop and distributes the energy throughout the community.

Confidence in and competence of local policy

This group is in close contact with the municipality from the start and thinks positively about local policy. A contradiction in this perspective is that the organisations find the policy of the municipality working well, and the supporting role clear, while they don't find the municipality accessible and attentive. This can be explained by respondent H8's explanation: *"local policy makers should change their way of working from top-down to bottom-up."* This means that while the organisations in this group are helped by the local policy, they also feel that the municipality is not very willing to work with this kind of new organisations. Like respondent B2 stated: *"it seems that the supporting role has become less and that there is more interest in working together with bigger companies."* Therefore, a better way of working together with the municipality should be by bottom-up support. Examples of this can be coaching sessions for managing volunteers or assigning a direct contact, which will be described more detailed in next section.

Needs for local support

There are several ways of supporting these initiatives by local policy. First, by providing public data (statement 13: ranking 2). As respondent D4 stated: *"at the moment there are a lot of assumptions towards energy, sustainability and energy saving, with the use of data the municipality can win a lot to implement effective measures."*

Second, a problem of this group, is finding people to involve in their projects, as clients, funders or contributors (statement 3: ranking 1). Respondent B2 stated that their biggest bottle neck was finding enough people to involve in their project. They stated: *"We can already make use of communication tools of the municipality, but the question is how can we reach the people that we normally do not?"* For this reason, this group would be helped when local policy focuses more on involving people and raising awareness about sustainability.

Third, these energy initiatives would be helped with intensive and direct contact with the municipality. A direct contact within the municipality would be preferred over contracts with the municipality (statement 24: ranking -1), since their working process and results are new and not yet developed. For this reason, there is no clear view on how the process will go and what will be problems that have to be faced underway. In this respect, respondent B2 declared: *"Projects are always barbarous and inconsistent, so setting agreements will not work, especially not the term in which it will be achieved."*

These energy initiatives can be helped with subsidies on the short-term and on the long-term (statement 20 and 21: ranking 2). Respondent B2 pointed out the advantage of long-term subsidies, because it would help them focus on their business, instead of focusing on satisfying the assignment of the municipality, which is the case with short-term subsidies.

Fifth, a big problem is in the development of these organisations is that they mainly work with volunteers (statement 2: ranking 4). Volunteers do not have time and money to spend in the organisation, but more importantly there is not a real organisational power that drives the organisation to better performance. The municipality can help here by *"giving support on how to process volunteering organisations or providing coaching to these organisations"*, according respondent H8. The initiatives find that local policy should be about helping organisations to become independent and self-sustaining organisations.

Concluding, for this group of local energy initiatives, local policy should change from the traditional old top-down approach to a more bottom-up approach. This would include supporting the energy initiatives to find a driving organisational power to become self-sustaining organisations. Local policy support could include providing data, direct contacts, subsidies, coaching and raising awareness under citizens.

Perspective 2: The business-orientated energy initiative

Perspective 2 was shared by three respondents and explains 24% of the variance.

Type of energy initiative

This view is shared by organisations that focus on sustainability, while being business-orientated. This can be seen by the number of employees that are working for the organisations, instead of volunteers that normally are involved in typical energy initiatives. Also, this group is mainly financial incentivized, and think that others could be more motivated to start an energy initiative with financial incentives (statements 7: ranking 2). Moreover, these organisations are in contact with private money lenders. An example of this group could be an initiative that builds a machine to generate energy out of waste products or implements an ICT system for influencing consuming behaviour.

Confidence in and competence of local policy

These organisations are business-orientated and this leads to some negative opinions towards to the governmental way of working. Main obstacle is that the municipality is fragmented (statement 29: ranking 2), which is according to respondent F6 *"a big frustration, since different departments work differently."* This leads to uncertainty about the agreements with the municipality or ambiguity about who the organisations should contact.

Also, this group finds the municipality not accessible and attentive (statement 26: ranking -1). Respondent F6 explains: *"we had to put effort to come into contact with the municipality."*

Next, the supportive role of the municipality is not clear to this group. This was explained by respondent G7 with: *"the municipality is an organisation with political interests, that leads to investments in big energy companies, which makes it hard for us to compete."* So, this perspective thinks that policy should focus more on the bottom-up

organisations.

Lastly, policy for energy initiatives is not considered working well (statement 27: ranking -1). This is mainly because of its political character and vagueness, which makes it hard to see what the policy practically means for the organisations. Respondent F6 stated as a solution: *"local policy should be translated to an implementation level, which can be read and understood."*

Needs for local support

Although this group is mostly negative about local policy, they also provided some solutions, like respondent F6: *"an assigned person that can help new initiatives with working together with the municipality."*

Still, supporting these energy initiatives by local policy can mainly be done financially, with subsidizing (statements 20 and 21: ranking 2) or buying the products or services from the organisation (statement 16: ranking 3). Respondent G7 stated: *"The municipality as our customer is the best cooperation, because the municipality can be a very trustworthy market player."* Here it should be taken into account that the municipality must meet national and European regulation as it comes to buying products and services from external parties (Arends, 2017), which makes this policy instrument more complex for energy initiatives. Also, a contradiction can be found here, because these energy initiatives indicate they find the municipality as a customer ideal, but they would avoid working together with them. This can be attributed to the fact that this group consists of financial incentivized energy initiatives, which will always value financial contribution high.

There are also other means of local support. First, making public data accessible to the organisations would be helpful (statement 13: ranking 1). Second, the municipality could offer support by creating a network of likeminded organisations (statement 14: ranking 1). Third, the municipality should maintain an open and flexible policy. Contradictory in this perspective is that respondents say they think that making agreements with the municipality is important, but on the other hand they find the agreements in contracts too much restrictive. Respondent A1 explained: *"tightly closed plans work terribly, because the plan becomes more important than the result."* Moreover, they stated: *"the power of small organisations like ours is the flexibility and speed of action. This is something that clashes with the procedures within governments."* From this

can be concluded that this group would want agreements that are open for flexibility. This could for example be agreements about the results, that leave the working plan flexible and give space for rearranging the rules.

Concluding, policy for this group should have a business approach. Unlike other companies, they should provide these organisations with extra support, by for example giving them networking support, data or subsidies. Also, these energy initiatives prefer contracts with an open and flexible character, to give these them a chance to compete with bigger companies.

Perspective 3: The in-between local energy initiative

This perspective is shared by two respondents and explains 20% of the variance.

Type of energy initiative

This perspective values their contribution to the energy transition lower than the other perspectives (statement 4: ranking 2) and the way they involve the neighbourhood even lower (statements 5: ranking 1). Moreover, these initiatives can be described as non-standard with multipurpose, as their organisations range between very different sorts. In contrary to other perspectives, these organisations are in contact with other energy initiatives. An example of an initiative within this group can be an organisation that develops an energy-neutral building.

Confidence in and competence of local policy

This group neutrally views the policy of the municipality (statement 27: ranking 0). Furthermore, on one side they do not understand the supportive role of the local policy (statement 28: ranking -1), but on the other side they feel the municipality is accessible and attentive (statement 26: ranking 1). An explanation for this can be given by respondent C3's reply: *"the employees of the municipality wanted to help us and were very supporting, but all the laws and rules we had to comply to made it seem complex."* Another explanation can be, that these organisations want to be independent from local governmental support, in which contact with the municipality is not that important (statement 11: -2). Respondent E5 declared: *"cooperation with the municipality is slow*

and difficult, so if we do not need it, we rather do not cooperate." This can coincide with the opinion that the municipality is fragmented (statement 29: ranking 1). Respondent E5 says about this: *"it is hard to work together with the municipality, especially for organisations like us with a lot of volunteers."* This could mean that local policy should change in a way that is beneficial for energy initiatives. Also, this group indicated that they mostly consist of professionals, like respondent E5 stated: *"we have all the knowledge and experience we need to be an independent organisation."* Eventually, the development of these energy initiatives requires little local support and this group thinks that also other initiatives could be more independent with policy that support bottom-up development of energy initiatives.

Needs for local support

Local policy could help this group by showing their appreciation (statement 23: ranking 2). Respondent C3 stated*: "it has been important for our development that an employee of the municipality was at one of our meetings. This gives an extra attention to the project, which helped us a lot."*

Another way of supporting would be by giving licences (statement 17: ranking 2). *"It's simple, to perform our activities we need licences*," respondent E5 stated. The process of obtaining a licence is complex, stated respondent C3, according them this was mainly, because of the different departments that had different rules.

Also, this perspective thinks that there should be clear agreements with the municipality (statement 24: 3), because the municipality is a big organisation and cooperation would become easier when it is set in an agreement, like respondent C3 explained: *"a contract would have been easier in our progress, because we were searching for the right contacts a lot of our time."*

Next, this group would be supported by raised awareness under citizens (statement 6: ranking 1), since the performance of these organisations are depending on the involvement of citizens in sustainable project (statement 3: ranking 1). Respondent E5 stated: *"because we are only a small organisation, we cannot raise awareness ourselves, and we need the help of the municipality to do so."* Also, respondent C3 finds it difficult to involve people in their project, they responded: *"people are tied up in old thinking patterns, which made it difficult for us to form a community around us."*

Lastly, this group prefers short-term subsidies over long-term subsidies

(statement 20 & 21: ranking 4 & -2), since their goal is to become self-sustaining and *"subsidies on the short-term help to prioritize and eventually to support us in becoming independent,"* respondent C3 explained.

Concluding, this perspective is shared by multipurpose, non-standard energy initiatives. The view towards local policy is mixed; on the one hand they consider support by the municipality helpful, on the other hand they tend to avoid it, since cooperation is complex. These energy initiatives tend to become independent organisations. Their need for support should be subjected to this final goal. Policy instruments to achieve this, could be: appreciation, short-term subsidies, clear contracts, help with licensing and raised awareness under citizens.

6 Policy Design

Policy design is created, using the literature study from chapter 2, the case description from chapter 3, data from analysis and the perspectives from chapter 5. First, the main findings about the energy initiatives in Rotterdam are described in 6.1. Then, the needs for policy instruments will be discussed in 6.2. This will lead to a policy recommendation for local policy in Rotterdam in 6.3.

6.1 Main findings about energy initiatives in Rotterdam

The correlations between perspectives (Appendix F) and the consensus- and difference statements (Appendix G) can help find the most important findings about energy initiatives. From this, Figure 8 was drawn that shows how the different energy initiatives in Rotterdam relate to each other.

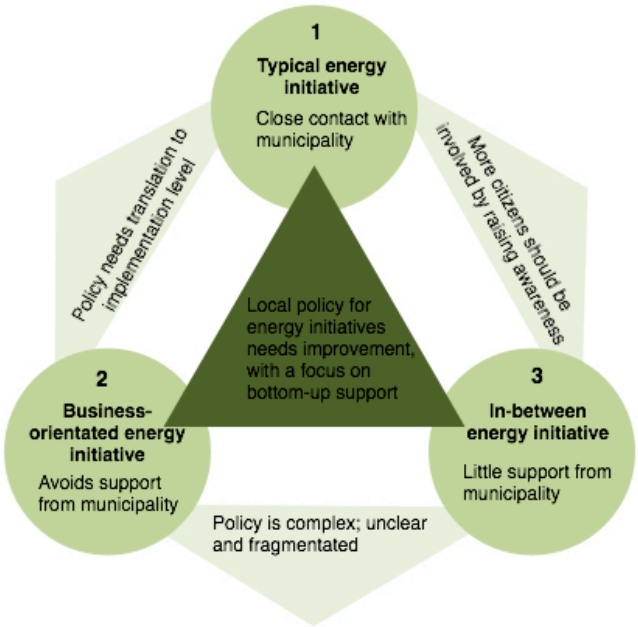

Figure 8. The graphical overview of perspectives, with the characteristics of perspectives in circles, the overlapping characteristics of perspectives in triangles.

These are the most important findings about energy initiatives in Rotterdam. Perspective 1 consists of energy initiatives that are ideal according to the theory (Walker & Devine-Wright, 2008). Noticeable here is that the typical energy initiative has close contact with the municipality. Moreover, this group has the most positive view towards local policy. This could lead to the conclusion that by creating closer contact with the municipality, the usability of local policy will increase.

Perspectives 1 and 3 view that the policy should improve awareness under citizens, which was also found from the theory. The promoting role of the municipality can strengthen the development of energy initiatives.

It was found that energy initiatives from perspectives 1 and 2 score highest in contributing to the energy transition. Perspective 1 pointed out their strong ambitions to both sustainability and decentralization. Perspective 2 has more sustainable ambitions, but can have a greater impact in the future, since their ambitions for growth tend to be higher. Perspective 3 score lowest to both respects. This can be explained by the flexible form that these energy initiatives can have. This makes it difficult to interpret perspective 3's impact on the energy transition and make the chances smaller that these initiatives contribute effectively to the energy transition.

Financial contribution on the short term is recommended over financing on the long term, since all energy initiatives in Rotterdam stated that financial problems are not a reason for difficulties in their development. Moreover, short-term financial contribution stimulates the independence of energy initiatives.

Similarities between all three groups lead to the conclusion that local policy still uses a top-down approach, where a bottom-up support would be more efficient for the development of energy initiatives. For perspective 1 this means they need coaching about the organisation of energy initiatives. Perspective 2 likes to see policy translated into practical guidelines and perspective 3 wants to become independent on the long-term. This means that all energy initiatives mostly need the supporting role of the municipality.

6.2 Policy instruments for energy initiatives

Bottom-up local policy can be shaped with different policy instruments. This analysis will find out what local policy should consist of, to obtain a wide acceptance under energy initiatives of Rotterdam. To find efficient policy instruments, this analysis will look at the policy goals and the needs by different energy initiatives.

Policy goals

From the problem setting in 3.3, three main barriers appeared that are recommended to address with policy design. The problems can be translated to goals, which will function as criteria to which the policy design will be tested. The policy goals are:

1. Policy should address the open and flexible character of the energy initiatives, as to stimulate more energy initiative to start up.
2. Policy should take into account the diverse character of the energy initiatives, as to stimulate energy initiatives to remain on the long term.
3. Policy should create self-sustaining organisations that are independent of support from the local government on the long term.

Policy needs

From the consensus and difference statements (Appendix G), the similarities and differences between needs for policy instruments were found. The similarities in all energy initiatives in Rotterdam lead to a direct policy recommendation, since these policy instruments are effective for all energy initiatives. The differences are important to evaluate when constructing policy. To create the widest support for local policy possible, the disagreements should be evaluated to choose one over the other. Eventually, policy should be created that gains as much acceptance of policy possible under all energy initiatives in Rotterdam.

The policy goals and needs for different policy instruments lead to the trade-off of different policy instruments in Table 8. The trade-off shows in what way the different policy instruments score on the policy goals and to which perspective they apply. In Appendix H, the policy instruments are explained and the scores justified.

	Policy goals			Perspectives		
	1	**2**	**3**	**1**	**2**	**3**
Policy trade-off:						
Assign a direct contact from the municipality to an energy initiative.	+	+	+	✓	✓	✓
Provide access to municipal spaces for operation, such as rooftops for solar powered generation.	+	+/-	+	✓	✓	✓
Raise awareness under citizens by means of social media, competitions, etc.	++	+	+/-	✓	✓	✓
Strengthen the network of initiatives, by organizing network events or an online meeting place.	++	+	++	✓	✓	✓
Provide short-term subsidies	+	+	+	✓	✓	✓
Provide long-term subsidies	+/-	+/-	--	✓	✓	
Buy services or products from the energy initiatives.	-	-	--		✓	
Provide coaching or give guidance about managing an energy initiative.	++	++	++	✓		
Provide access to facilities, such as meeting rooms.	+	+	+	✓		✓
Be involved in projects, by showing appreciation	+	+/-	+/-			✓
Settle agreement	-	+	+		✓	✓
Make public data open to energy initiatives.	+	+	+/-	✓	✓	
Provide licenses	+/-	+/-	+/-	✓	✓	
Cooperate with intermediary organisations	+	+	++			✓
Set out tenders to which energy initiatives can apply.	-	-	+			
Provide document with rules and regulations.	--	--	+/-			

Table 8. Trade-off of different policy instruments by their policy goals and needs and their relation to the three perspectives

6.3 Policy recommendation for the community of Rotterdam

All energy initiatives view that local policy should transform its policy approach more to bottom-up support. This leads to the policy design in Figure 9, showing the three policy goals from previous paragraph and recommended policy. This policy design is considering all the energy initiatives in Rotterdam, but emphasize lays on the typical energy initiative. This group of energy initiatives were the most effective in their contribution to the energy transition.

First, more energy initiatives will be motivated to enter the energy market, when there is a strong energy community. Therefore, the municipality should focus on its promoting role to create a strong energy network. Here contact with intermediary organisations can help to create networks. Next, it is recommended to raise awareness under citizens as to involve more citizens in energy initiative projects. Also, it is recommended to give access to public data, where possible, to increase the opportunities for new energy initiatives to arise.

Second, energy initiatives will make a long-term contribution on the energy transition with the supporting help of the municipality. This includes policy instruments, like: assigning a direct contact, short-term financial support, flexible contracts, provide coaching sessions, access to municipal facilities and spaces.

Third, to create self-sustaining organisations that are independent of policy support on the long-term, the municipality can focus on: strengthening the network of energy initiatives and provide coaching session about the management of energy initiatives. Also, short-term financial contribution is recommended over long-term, since this stimulates the independence of energy initiatives.

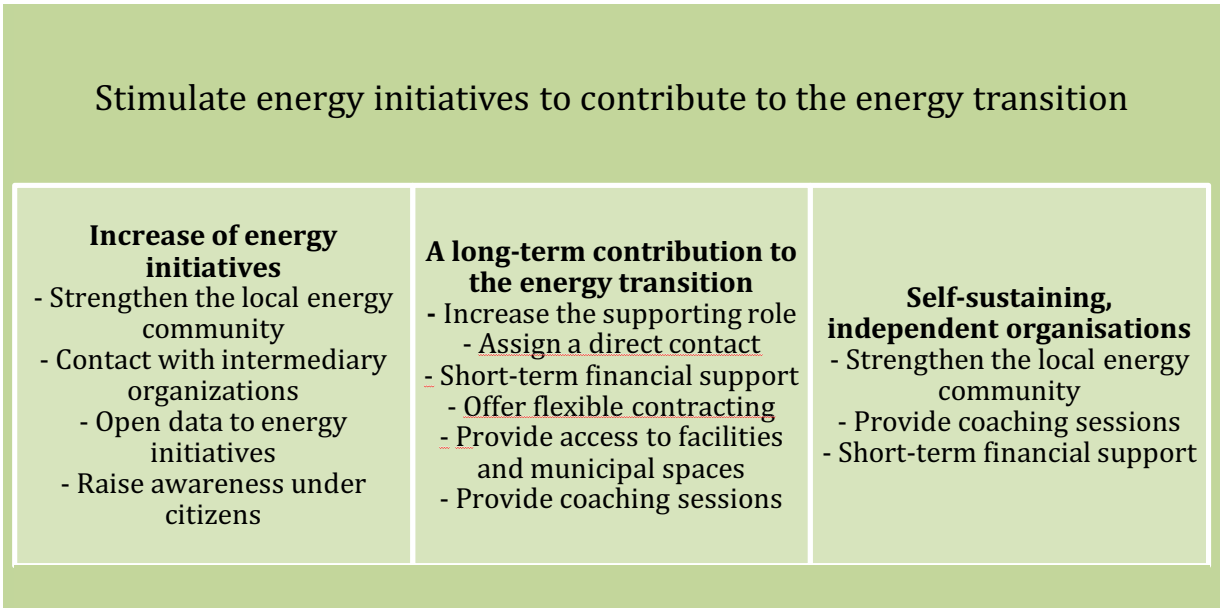

Figure 9. Policy design for local government in Rotterdam to stimulate energy initiatives to contribute to the energy transition

Policy application to other communities

This policy design is recommended for the community of Rotterdam and is therefore based on its specific characteristics. To apply this policy design to other communities, the specifics of the case of Rotterdam should be reviewed. First, the initiative takers had a high awareness of climate change problems and renewable energy related topics and were closely involved in these matters already. This made them intrinsic motivated to start an energy initiative. Moreover, the initiative takers have a sense of self responsibility against climate change. Since they have the opinion that international and national governments are undertaking too less action against climate change, they use their entrepreneurial mind-set to make an effort themselves.

7 Conclusions

This chapter will describe the conclusions, by answering the sub research questions and eventually address the main research question.

The first sub research question: *what is the development of local energy initiatives in Rotterdam and how does it relate to the theory on local energy initiatives?* can be answered with the theoretical finding that for an effective contribution to the energy transition, it is essential that energy initiatives cooperate and create local energy communities. The development of energy initiatives in Rotterdam is emerging, but there is not yet an established local energy community. There are some characteristics about the energy initiatives in Rotterdam, that should be considered when stimulating their development. These are 1) the diversity of energy initiatives, 2) the different needs for local support and 3) their confidence in local policy. Moreover, theory showed the importance of intermediary organisations and local governments in the development of energy initiatives. Lastly, theory about local energy communities was mostly directed to small towns, but from this research appeared that the local policy maker is important for the development of energy initiatives in large cities as well.

To answer the second sub research question: *what is the development of local policy in Rotterdam and how is it compared to other communities in Europe?* it was found that in the case of Rotterdam, local policy towards energy initiatives is still developing. The municipality wants to stimulate the growth and development of energy initiatives, so they can contribute to the energy transition. Eventually local policy should find policy that suits the open and flexible character and diversity of the energy initiatives in such a way that it will stimulate them to remain on the market and help the energy transition, without making energy initiatives depending on the municipality's financial contribution. The municipality already takes good use of 'tailor-made' and flexible policy, that considers the diversity of energy initiatives. An improvement could be found

in strengthening the energy community and cooperation with intermediary organisations.

The role of the municipality consists mainly of promoting and self-governing policy, but also includes regulating and supporting policy. However, from the comparison with other European cities, it appears that the supporting and promoting municipal role are most efficient in stimulating the development of energy initiatives. A good example of supporting policy can be found in Denmark, whose practical policy instruments should be considered in this research.

Regarding the third sub research question: *what are the perspectives of local energy initiatives regarding local policy in Rotterdam?* it can be concluded that there are three different perspectives within the energy initiatives in Rotterdam. These are:

1. The typical energy initiative, that has close contact with the municipality and views local policy positively.
2. The business energy initiative, that avoids contact with the municipality, because it slows down their business. This initiative is profit-orientated, but also makes an important contribution to the energy transition.
3. The fluid energy initiative, that has no typical form of organisation. This initiative has little contact with the municipality and has a mixed view towards local policy.

Similarities between perspectives showed that all energy initiatives mostly need the supporting role and promoting role of the municipality, to provide them with bottom-up support and to involve more citizens in their projects. Differences between perspectives can be found in the different contact with the municipality, the way perspectives perceive local policy and the needs for policy instruments.

Moreover, it was found that group 1 has the most effective contribution to the energy transition, because of their involvement in both sustainability and decentralization. However, perspective 2 can have a greater impact in the future, since their ambitions for growth tend to be higher. Perspective 3's impact on the energy transition is difficult to interpret, because of its different organisational forms, this makes the chances smaller that these initiatives contribute effectively to the energy transition.

To find an answer to sub research question four: *how can local policy be made compatible with the perspectives of local energy initiatives in Rotterdam?* it can be stated that current local policy is already well-developed in its flexible and 'tailor-made' character. However, energy initiatives in Rotterdam pointed out that local policy should become even more about stimulating the bottom-up movement. This would mean adapting their municipal role more into a supporting role. Local support should include different policy instruments, that apply to the needs of different types of energy initiatives, to make local policy compatible with the perspectives of local energy initiatives in Rotterdam. Policy instruments that are recommended:

- Assign a direct contact to an energy initiative, as this helps to create closer contact and gain understanding of local policy. This way local energy initiatives will view local policy more positively and improves its implementation.
- Give guidance or coaching about managing an organisation, provide access to facilities and municipal spaces and open data to energy initiatives, to stimulate the independence of energy initiatives.
- Financial contribution on the short term is recommended over financing on the long term, to stimulate the development of self-sustaining energy initiatives.
- Make public data open, where possible, to increase the opportunities for new energy initiatives to arise.
- Improve promotional activities, to raise awareness under citizens and involve more citizens in projects.
- Build the network of energy initiatives and cooperate with intermediary organisations, so that the local energy community will expand. This would include cooperation with intermediary organisations, that already have a big network of energy initiatives.

Finally, this leads to an answer to the main research question:

> ***How can local policy motivate energy initiatives to contribute to the energy transition in the community of Rotterdam?***

To motivate energy initiatives to contribute to the energy transition by local policy consists of three parts. First part is about motivating more citizens to engage in an

energy initiative, so that the number of energy initiatives will increase. This can be done by promotional activities, to raise awareness under citizens and motivate them to contribute to the energy transition. Also, expanding the network and cooperation with intermediary organisations is recommended, since citizens who are connected to the topic or other persons, are more likely to engage in energy initiatives, or start energy initiatives themselves.

Second, is about motivating existing energy initiatives to remain on the market, and make an impact on the energy transition. Local policy can help here by performing a supporting role, which includes different policy instruments. Recommended policy instruments are assigning a direct contact, short-term financial support, flexible contracts, provide coaching sessions, access to municipal facilities and spaces.

Third, is creating self-sustaining organisations that are independent of policy support on the long-term. This could be done with strengthening the network of energy initiatives and provide coaching session about the management of energy initiatives.

Other findings were that the biggest impact on the energy transition is by typical energy initiatives and business-orientated energy initiatives. It is recommended for local policy to focus on these kinds of energy initiatives. Lastly, to apply this policy recommendation to other communities, it must take into account the assumptions of Rotterdam, which are the connectivity between initiative takers and the intrinsic motivation, self-responsibility and entrepreneurial mind-set under citizens of Rotterdam.

8 Discussion and recommendation

The results that lead to the conclusions of this research lead to a discussion. First the discussion of this research will be presented in 8.1. Then recommendations for further research will be given in 8.2.

8.1 Discussion

There are some limitations to the Q-methodology. First, the Q-methodology is partly qualitative research. This means that the meaning of the statements was subject to the own interpretation of the respondents. This could have led to misleading results. This error has been tried to avoid by interviewing the respondents parallel to the statement selection, as to make sure their understanding and the understanding of the researcher were equal. Second, the analysis includes only a small number of respondents. For this reason, it may occur that some perspectives existing in society are left out of scope. To make this possibility as small as possible, this analysis tried to include a wide ranch of different energy initiatives. Third, respondents may have given politically correct answers, because of their cooperation with the municipality. This has been tried to avoid by choosing for the anonymity of the respondents and emphasizing this to them.

Also, limitations occur when looking at the results of this study. The results show the impact by different types of energy initiatives. However, there is no quantitative data that proofs the effectiveness of the energy initiatives. Therefore, it is difficult to say what the contribution of energy initiatives is to the energy transition. Another limitation was that the research analysed the respondents in a specific moment in time. Because this development is still emerging, changes in policy or attitudes of energy initiatives can happen quickly. This means the conclusions of this research are only valid in a short period of time. Lastly, this research uses the community of Rotterdam. When energy initiatives in other communities would have been interviewed, it could have led to

different results. This is important to consider, when applying the conclusions of this research to other communities.

8.2 Recommendations for further research

This research has led to some questions, that can be addressed in further research:

- Further research can be done to the quantitative effect of local energy initiatives on the energy transition in cities. There have been some studies about the effect in smaller towns, however there is no data about bigger cities. Quantitative data can be about the amount of energy savings or number of households that are connected to a locally generated source. This can be helpful, since it can proof the influence of local energy initiatives in cities to national and local policy makers. But it can also proof which type of energy initiative is the most effective in its contribution to the energy transition.

- At this moment, a difficulty in the research was that this kind of study was not yet performed to other communities. This made it impossible to compare results and put them in perspective. With further research using the same methodology, but applied to different communities, results can be compared. Similar results can lead to a confirmation of the conclusions of this study and differences in results can lead to new insights.

- Further research can be performed looking at the longer term in which energy initiatives develop and policy is changed. Because the energy community is still emerging, research on the long-term development, could improve the understanding of energy initiatives. Another option would be performing the same research after a period of time in which circumstances and policy have changed. This way it can be checked whether changes in types and needs of energy initiatives have occurred.

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Appendices

Appendix A. Stakeholder analysis

A stakeholder analysis is important to consider into the analysis, because the research environment is large and multiple actors are involved. The stakeholder analysis is performed with the method described by de Haan & de Heer (2012). The goal of the stakeholder analysis is to create distinctness of all relevant stakeholders and their dependencies between each other. Stakeholders are described here as persons or organisations that are involved in the local energy community, meaning that they can influence or are influenced by the local energy initiatives.

Part 1: Mapping the actors

It is difficult to count and represent all the existing local energy initiatives in Rotterdam. The organisations are very different and this makes it difficult to interpret what is a real local energy initiative and what not. Also, the organisations are very new and autonomous, which could lead to small groups that are invisible for this research. This research found the following group be local energy initiatives in Rotterdam:

- Blijstroom
- Stadsgas
- De DakAkker
- Switch Energy
- Uit je Eigen Stad
- Scoren met Energie
- BlueCity Rotterdam
- Energy Zero
- Solarplaza International
- Slimdak
- Duurzame Oevers
- Stadswindenergie 010
- Zonnepanelen Delen
- Energy Floors
- Blaakende Zon
- Tiny House Rotterdam
- Movares
- SamenZonneEnergie
- Spouwmuurfonds
- Zon in Middelland
- Metromining
- Stichting Schiezicht
- Bazelbuurt
- Rotterdams Milieucentrum: milieucoaches
- Heidebes
- Marktplaats Duurzaam Bouwen
- Beladon floating farm
- De Fruithaven
- Broodnodig
- Kruidenbuurt
- Cooperatief de Blakende Zon
- Energie Legioen
- Concept House Village

Overview of actors

From literature study, researching the web, interviews and experience a large number of actors were found that can influence or are influenced by the local energy initiatives. The actors can be listed and divided by their function, as shown in Table A1. On the left is the function of that group and on the right the actors that belong that that function is listed.

Function	Groups
Implement initiatives	- Local energy initiatives - Municipality of Rotterdam - Citizens as initiative takers - Energy companies - Grid operators - Other organisations
Set policy	- Municipality of Rotterdam - Water authorities - Provincial governments - Ministry of Economic Affairs - European Commission
Establish conditions for initiatives	- Municipality of Rotterdam - Water authorities - Provincial governments
Control of the policy towards the energy transition	- Municipality of Rotterdam - Water authorities - Provincial governments - Ministry of Economic Affairs - European Commission
Influence national policy towards energy transition	- Energy companies - Grid operators
Support the initiatives	- Municipality of Rotterdam - Intermediary Organisations - Supportive organisations for businesses in Rotterdam

	- Citizens as consumers - Citizens as tax payers
Use of the services from initiatives	- Citizens as users - Local energy initiatives - Energy companies - Municipality of Rotterdam - Grid operators - Other organisations
Cooperate with energy initiatives	- Other organisations - Energy companies

Table A1: Overview of all involved stakeholders in the local energy community sorted by their function

Map of actors and relations

The actors and their functions from Table A1 can be made more clear and understandable when mapping them. In Figure A1 the map of involved actors and their relations is given. In this way, the map clearly shows relations between actors and therefore independencies can already be discovered.

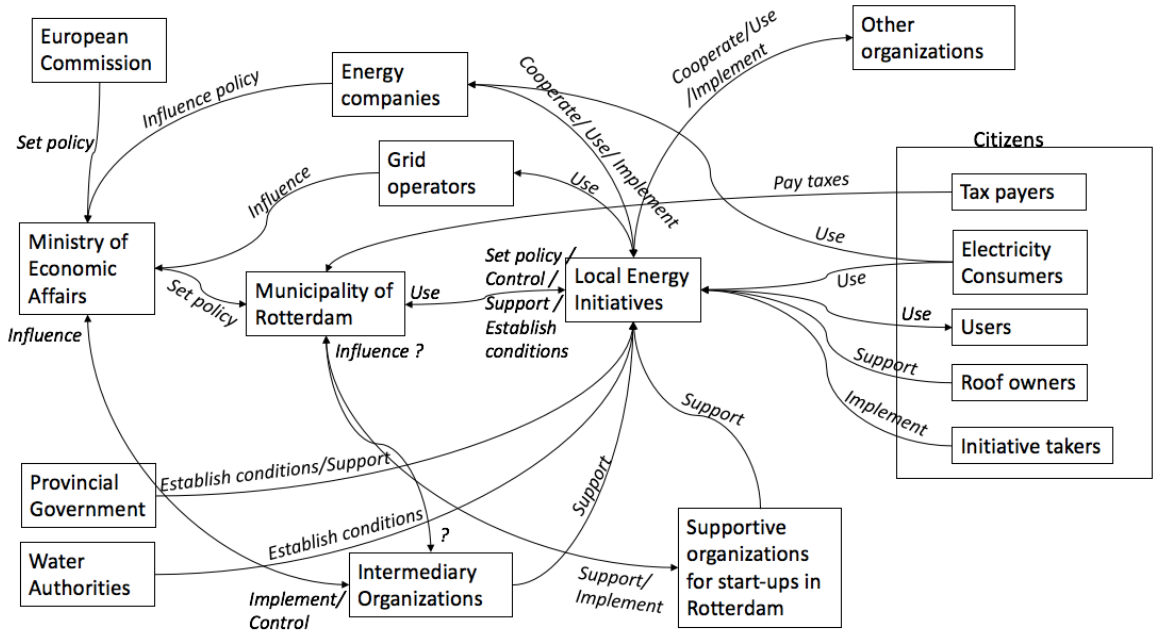

Figure A1. Map of actors and relations between actors in the local energy community of Rotterdam.

Synthesis

Looking at the first part of this stakeholder analysis, the first noticeable things can be found. First, the diverse character of local energy initiatives can be confirmed by looking at this stakeholder analysis, because it was found that they can be implemented by and cooperate with a lot of different stakeholders. These can be: energy companies, grid operators, the municipality, citizens as initiative takers, citizens as community groups and other organisations (such as housing corporations, architectural companies, agricultural organisations). This can not only lead to very different forms of local energy initiatives, but also requires firm cooperation skills of these very diverse actors. For example, for a local energy initiative that wants to cooperate citizens with energy companies, a new form of cooperation has to be discovered and settled.

Secondly, this stakeholder analysis found that local energy initiatives are supported by three groups mainly; the municipality, the intermediary organisations and the supportive organisations. The European Commission and national government pointed out the importance of the local energy projects. As can be seen in the map, the way to reach the local energy initiatives is through the supporting organisations. These supporting organisations are on its turn independent from policy made higher up. So this stakeholder map shows the dual interdependence between these actors and the importance of local policy making.

Thirdly, the map of the stakeholder analysis shows the important role of the municipality. As can be seen in the map, on the one hand the municipality uses the services and goods of the local energy initiatives. On the other hand, the municipality sets policy, controls, supports and establish conditions for the energy initiatives. From this we can say that the municipality has the strongest link with the local energy initiatives and they play a crucial part in the policy development for local energy initiatives.

Part 2: Finding relevant actors

Stakeholder power importance

Next it is important to find the relevant actors for the given problem situation. To do so, Figure A2 depicts what are important actors to take into account in this analysis. This Figure orders all involved actors according to their level of interest in the local energy community and the level of influence they can play in the local energy initiative community.

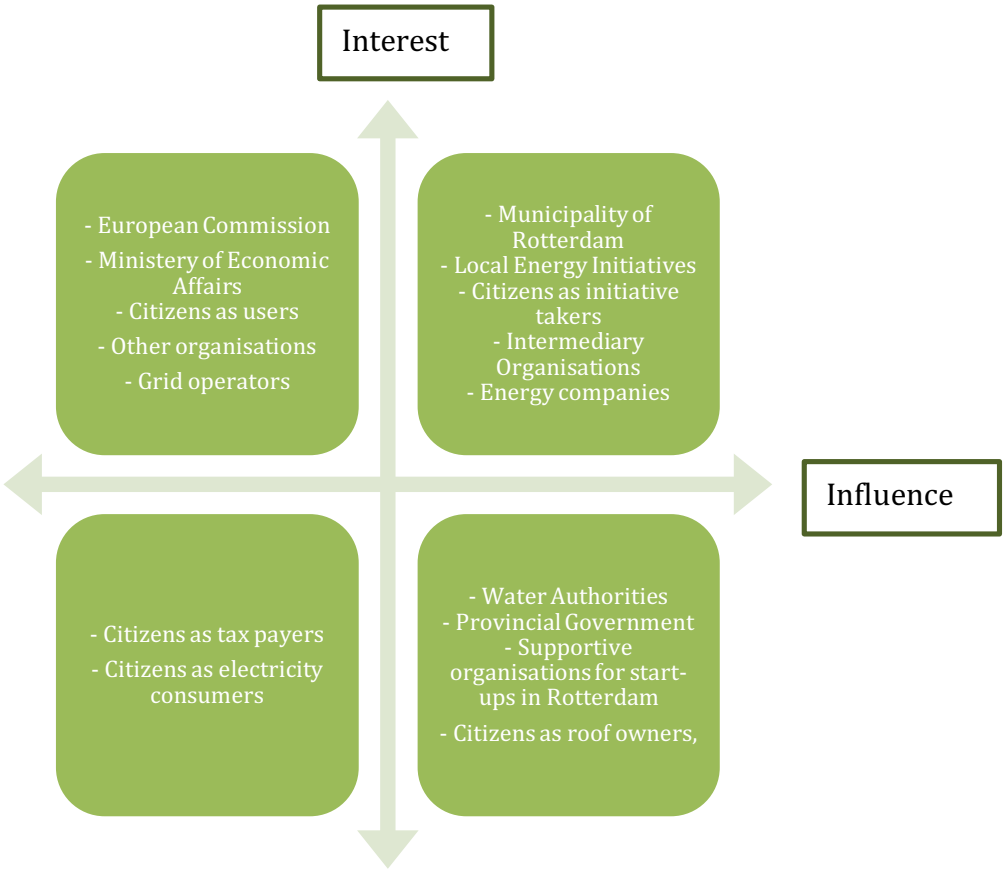

Figure A2. Map of stakeholders with interest and influence in the local energy community

The upper left group includes the European Commission (EC), Ministry of Economic Affairs (ME), citizens as users, other organisations and grid operators. These actors all have interest in the development of local energy initiatives. The EC and ME have interest since they would want to see more local development on sustainability. However, as discussed in part 1, they don't possess direct influence on the development of a local community. They have to let this up to municipality. For this reason they were ordered

in no influence. Citizens as users and other organisations have interest in the local energy community since they would want to use the services or products, however they don't have direct influence on the local energy community. Since they cannot directly improve the development in the city. Grid operators have interest in de the new movement of local energy community, but cannot do very much to influence the development.

The lower left group does not possess interest nor influence. These are the citizens as tax payers and electricity consumers. This group does not have an interest in the development of the local energy community and also don't have a influence, since they cannot improve or stimulate the development in such a way that is important. They could only make use of the services of local energy initiatives, but since they are not particularly interested in this, the chances are small that this will have a substantial effect.

The lower right group has influence on the development of local energy communities, but their interest in this development is low. The Water Authorities and the Provincial Government can have influence, since they can set conditions to which the local energy initiatives have to settle. However they don't have substantial interest in the local energy community, since this is not their first priority in policy making. The influence of the supportive organisations for start-ups in Rotterdam is the supporting role they can play. They however, don't own particular interest in sustainable start-ups, and are therefore ordered in the 'not interested' group.

The upper right group possesses both influence as interest in the local energy community of Rotterdam. Therefore this group contains the most important actors for the given problem situation. In the next step of the stakeholder analysis, these actors will be explained in detail.

Relevant actors

The actors that seem important from the power/importance Table in the previous step are the actors that are both interested in the local energy community and that can have influence on the energy community. These important actors can be analysed using a

'relevant actor'-Table, which can be seen in Table A2. For all actors, it was questioned whether they possess important resources, if they are replaceable by other actors and how much the energy community depends on these actors. When actors score high on the three criteria, they can be seen as a relevant actor for the development of the local energy community.

Actors	Important Resources?	Replaceable?	Size of dependency?	Relevant actor?
Municipality of Rotterdam	Yes	No	Large	Yes
Local Energy Initiatives	Yes	No	Large	Yes
Citizen as initiative takers	Yes	Yes	Small	No
Intermediary Organisations	Yes	Yes	Small	No
Large energy companies	Yes	Maybe	Medium	Maybe

Table A2. Determination of relevant actors

For the municipality of Rotterdam applies that they have important resources in the form of a wide ranch of policy instruments. They are not replaceable, since the local policy maker is the only governmental actor that has direct contact with local energy initiatives. Moreover, the energy community depends largely on the functioning of the municipality, since local authorities have the most effective policy instruments to stimulate energy initiatives (Rogers, et al., 2008). This makes the municipality a relevant actor.

Local energy initiatives themselves are an important resource, since the energy community depends on other local energy initiatives. The network is most important in developing the community. Local energy initiatives cannot be replaced by other actors, such as companies or governmental organisations. Also, the energy community depends

largely on local initiatives, since the community is made off this initiatives. For this reason the local energy initiatives are a relevant actor as well in this analysis.

Just like mentioned above, citizens as initiative takers are also an important resource. Their ideas and labour are important for the development of the energy community. In contrary, citizens can be replaced by other citizens, since many citizens can have the idea to start-up initiatives. The dependency of the community is therefore small and this makes this actor not relevant.

Intermediary organisations also possess different important resources, that mostly focus on building up the community on national and local level. However, there are also other ways to achieve a community and therefore they can be seen as a replaceable actor. The dependency of the community to intermediary organisations is therefore small and this makes the actor not relevant due to this analysis.

Large energy companies also have important resources for the development of energy initiatives, such as finances and experience (Molenaar, 2017). The question if the actor is replaceable is hard to answer, since this depends on the future and how the energy system will change in such a way that energy companies become replaceable or not. Also it seems that large energy companies are changing their business strategies in such a way that they create energy initiatives themselves. The dependency of the development of energy communities is considered medium in this analysis, since energy companies play a big role in the energy system at the moment, but it seems to change. For now the dependency is large, in the future it may disappear entirely. Because there is much uncertainty and complexity about this actor and because in the future energy companies can become more important in the future, it will be taken as a relevant actor to be researched further. From the interview with energy company Eneco, it occurred that currently energy companies are going along in the development of energy initiatives. Molenaar (2017) explained:

"*You can try to stop the development as an energy company, but you can also participate in the change. It can be bad to be too progressive, but you can also be on the right track and in that case it is better to join the movement. We try to not keep tight to our old business model, but watch carefully to see what happens next*."

This shows that already established energy companies proof the importance of energy initiatives and that they as well are becoming an important player in the development. Energy companies become part of this by cooperating with or investing in energy initiatives and even implementing energy initiatives themselves.

Part 3: Interviewing of the relevant actors

In this part of the stakeholder analysis interviews took place with the relevant actors. There have been two interviews with current local energy initiatives, one interview with energy company Eneco and several personal communications with the municipality of Rotterdam. The interviews with local energy initiatives took place outside the community of Rotterdam, to make sure that there were enough respondents left for the methodology part of this research. Because these interviews are input for the methodology, it would cause a false causality if the respondents in the method were interviewed using their own input. This way an energy initiative in Zoetermeer 'DeZo' and an energy initiative in The Hague 'Energy Party – 070Energiek' were selected as interviewees.

With the interviews the opinions of relevant actors were determined. The interviews took place in a certain format, which can be seen in Table A3. Next to interviews, the stakeholders opinions are expanded with theory from literature study, that is articles on the internet, documentaries, newspaper articles, etc.

Interview for energy initiatives

Introduction

- Explanation of thesis project
- Purpose of the interview
- Interview structure

Current situation

- What does your energy initiative do exactly?
- Which people work here? Volunteers, permanent jobs?

- What other parties do you work together with?
- How is your performance so far?
- What are your results and are you satisfied with that?

Start-up phase of the initiative

- What was the main motivation to start with this energy initiative?
- How was the start-up process? What went well, what went wrong?
- Was there any government policy that helped to start-up the initiative?
- Specific; what was the local policy? How did the municipality help? What did you think of this?

Policy involvement

- What kind of government support do you received?
- What does local policy look like for you?
- Does local policy work? What are the results? What are the pros and cons?
- Do you think this local policy also works for the creation of new initiatives?

Finally

- What are your goals for the future?
- How do you think policy can help in the future?

Interview for energy company Eneco

Introduction

- Explanation of thesis project
- Purpose of the interview
- Interview structure

Current situation

- What does Eneco do with the new development of emergence of energy initiatives?
- What is your goal of involving local energy initiatives?
- How do you see Eneco's role in the development of energy initiatives?
- What resources do you put in?

- Which parties do you work together with?

Policy involvement

- Do you work together with governments, like municipalities?
- If so, how is this going?

Finally

- How do you look towards the development of energy initiatives, what is your attitude and opinion about it?
- Is the development of energy initiatives not a threat to an energy company like Eneco?
- How do you see the future for Eneco?

Table A3. Interview format for energy initiatives and energy company Eneco.

Synthesis

From the interviews and field study of the important stakeholders, a few noticeable things occurred. These can be clustered into three categories:

- **Difference in type of energy initiative**

  It is important to distinguish the different types of energy initiatives, because the circumstances that are ideal for the development of energy initiatives differ. This means that different types of initiatives need different policy instruments. Differences can be found in:

- The performance of the energy initiatives tells something about the reason why an energy initiative is successful or not, the reasons for this and the circumstances that are ideal for development of the energy initiative. Some energy initiatives stated their performance was tense, because there were mainly volunteers working (Jong & Oppen, 2017). However, energy initiatives that are already developed, mostly have more employees and their performance is different.
- Also, energy initiatives showed differences in the ambitions of their organisations and this can have effect on the development as well. Like, some focus more on contributing to the energy transition or the sustainability aspect, while others find involving the neighbourhood or the community aspect more important.

- The reason why energy initiatives start-up, and how the start-up processes was going, tells us a lot about the development of energy initiatives in a certain community. Because of the diverse character of the energy initiatives, the way they underwent the start-up process is very diverse as well. Some experienced difficulties with contact with the local policy makers (Jong & Oppen, 2017). Others were included by the local policy from the start with public tenders, while again others found the tenders too demanding for start-ups (Bots, 2015).
- Moreover, energy initiatives had different ideas about how to motivate more people to start up an energy initiative. Some stated this was most easily done with financial incentives (Schaik, 2017), others thought it would be more helpful to raise awareness about the possibilities of starting-up an energy initiative (Jong & Oppen, 2017).

- **Needs of local support**

  From the interviews and literature and field study a lot of different needs of local support for the development of their energy initiative occurred. Different energy initiatives ask for different support from the municipality. For example, Schaik (2017) stated they would be helped with data about different households, like who installed solar panels or who had measures of isolation, Jong & Oppen (2017) would prefer to have help from the municipality by means of facilitation, like meeting rooms, and Joosten (2013) is more helped with a clear framework of different policy measures.

- **Confidence in and competence of local policy**

  The way the local policy is received also differed among the interviewees. Some found the municipality accessible and attentive. Others found the organisation too bureaucratic and not effective for the development of their energy initiative, like Joosten (2013) stated: "*For a project we got the rights from one counsellor to all municipal flat roofs of Rotterdam to generate electricity. This was great, but then we got to the first building and the real estate company of the municipality didn't know about our right.*"

Appendix B. Description of energy initiative development in different countries

Germany - Hamburg

The growth and importance of local energy initiatives in Germany is large. In 2013 there were already over 650 energy initiatives that were contributing to the energy transition, which is famously called the "Energiewende" (Wieg, et al., 2013). The transformation to decentralization in Germany, is still very top-down decided with a dominant role for the national government (Oteman, et al., 2014). The national policy in Germany includes all sorts of regulations and rules. First and most importantly, is the existence of a feed-in tariff, which guarantees a fixed price for renewable energy that is above the market price and grid priority, in order to ensure profits from renewable investment (Mosher & Corscadden, 2012). Secondly, there is abundance of financial support for renewable energy, such as 100 billion in credit loans for energy-saving projects and a subsidy scheme for renewable heating initiatives (Oteman, et al., 2014). Thirdly, Germany raises taxes against fossil fuelled activities. The public acceptance is big under the German citizens. This way the energy initiatives are very much accepted and many citizens are motivated to contribute to them. Also, local energy communities in German villages are often seen as a way of strengthening the community and local economy (Dóci & Vasileiadou, 2014). All though there has been a strong development of community energy in the rural areas of Germany, cities seem to lack in renewable energy development. Germany's capital Berlin was ranked lowest at renewable energy development by the German Institute of Economics, which was caused by a lack of local political support and action for the development (Diekmann, et al., 2012). Moreover, green political parties pointed out the importance of the bottom-up development, but still regional energy programs are inactive as to support of energy initiatives (Blanchet, 2015).

Local policy in Hamburg is mostly with a supporting and promoting role. The local authority has far-reaching abilities, but federal decisions are still binding (University of Amsterdam & ICLEI, 2012). Policy instruments differ from financial support to

promotional activities (University of Amsterdam & ICLEI, 2012). However its gain in development, the development of Hamburg is still lacking behind that of smaller towns.

Concluding, in Germany local policy is influenced by the ambitious national policy. This proved to be effective in smaller communities, but not in rural areas where the energy community is lacking behind in development and remains mostly centralized.

United Kingdom - London

The intermediary organisation Mongoose Energy (2017) stated there are over 600 community-owned energy projects exsiting in the UK in 2017 and the numbers are growing. The UK government promoted community energy early on with policy instruments, like different policy programmes, funds for research and subsidies. The policy instruments are mainly focused on local energy community projects that will facilitate technological shifts, promote renewable behaviour and embed large sustainable projects in communities. (Walker & Devine-Wright, 2008) stated that national policy had changed in such a way there is more attention for decentralized, local energy project. The funding and support schemes existing were supportive to start a diversity of local initiatives. However, Seyfang et al. (2012) found that national policy led to a more business oriented look on community energy rather than a volunteering subsidy dependent growth of energy projects. Kivimaa & Kern (2015) also stated that there were not any policy instruments aiming for direct change of the social networks or replacement of key actors. They stated that compared to other European countries the UK lacks in policy instruments for the energy transition. Seyfang et al. (2013) stated that local policy in the UK should be made more consistent, so that the diverse character of local energy initiatives can be supported. Also, local policy should consider tensions and vulnerabilities in the community. Devine-Wright & Wiersma (2013) even claims that the complexity of and diversity between the initiatives in the UK can be a barrier to achieving the policy goals for carbon reduction, because of the many negiations that are needed to achieve coorperation.

United Kingdom's capital London implemented a local programme that wants to stimulate the decentralization of the energy system, improve generation by renewable

energy and energy savings in the city (Davis, et al., 2011). This programme and its related policy instruments are implemented by the municipality, which makes the governing role mostly a regulator (EnergyforLondon, 2015).

Concluding, national policy in the UK has similarities with the one from the Netherlands in a way that it is more business-orientated than sustainability-orientated. This could be one of the reasons why the energy community is lacking behind the energy communities of Germany and Denmark.

Denmark - Copenhagen

Denmark is a wind powered country, around 42% of the electrical power consumption comes from wind turbines. The country is successful in its energy transition. According to Reijn (2016) this is because of the sTable policy in subsidies for research and investments in renewable energy. The Danish government started to support the development of renewable powered energy already in 1980 and has been a sTable steering role (Agency, 2012). In contrary, Wind People Denmark (2013) stated that the late subsidy changes and new tax schemes had made national government a more unreliable partner and was a drawback for initiatives to start investments. Also, Oteman et al. (2014) found that the energy transition in Denmark is seen more as a local goal rather than a national goal, in which all citizens should cooperate to achieve the goal of 100% renewable energy by 2050. The Danish energy system is mostly decentralized, the connection between energy initiatives and local governments is strong and the community aspect of local energy is important. Most decision-making is done by the municipalities, such as guidance and financing, which creates space for different small scaled projects to arise (Oteman, et al., 2014). Despite the progression there are also problems, which mainly have to do with ownership structures and the lack of social cohesion in larger cities. Due to these problems Denmark is the only existing country with a law that includes the community aspect for the distribution of benefits from renewable energy (Energieministerit, 2008). Overall, in Denmark it seems that development is bottom-up, with new corporations and ownership structures, aimed to convince citizens to participate (Oteman, et al., 2014).

Copenhagen wants to be the first major city that reaches the carbon neutral status in 2050 (C40, 2015). Copenhagen's local policy is closely related to the energy initiatives itself and has a mostly supporting and promoting role. It installed an organisation that stimulates the cleantech industry with financing and other policy instruments (CLEAN, 2017). Also, Copenhagen puts attention to promotional activities, as to enhance the development of renewable energy.

Concluding, Denmark is on top in the development of local energy initiatives. Striking is that literature showed their local policy works most closely together with the energy initiatives. This could proof that close contact of local policy with energy initiatives is indeed effective.

Appendix C. Table of statements

To gather the opinions of the current local initiatives, observations has been done through literature study, field study and interviews with comparable stakeholders in other communities. Like Van Exel & de Graaf (2005) state the opinions are caught in statements that include actual and practical information about the problem area. From this eventually a large amount of statements was compiled, which is presented in Table C1. This table composes all the views on the topic that are existing within the stakeholders in the current situation.

Statement	Source
The goal of our energy initiative is raise awareness about sustainable energy practices in the neighbourhood.	(Schaik, 2017)
Our organisation is doing ok, but the situation will always be tense, because of financial and organisational reasons.	(Schaik, 2017)
Our energy initiative is good at involving disadvantaged neighbourhoods.	(Schaik, 2017)
The motivation to start up this energy initiative was to save the planet from climate change by making the region energy neutral.	(Schaik, 2017)
The motivation to start up this energy initiative was to share knowledge about sustainable practices with the neighbourhood.	(Schaik, 2017)
Starting up the initiative took a lot of time, which became a barrier for its development.	(Schaik, 2017)
Starting up the initiative costs a lot of money, which became a barrier for its development.	(Schaik, 2017)
We started our initiative with different money lenders.	(Schaik, 2017)
Our goal is to be independent from any money lenders in 2 to 3 years.	(Schaik, 2017)
The municipality is very receptive; they try to think with us and help us.	(Schaik, 2017)
For our organisation, the policy of the municipality operated well.	(Schaik, 2017)
There are not many financial opportunities existing for the start-up of energy initiatives.	(Schaik, 2017)

Public tenders from the municipality have the problem that they are too demanding for small initiatives.	(Schaik, 2017)
The facilitating role of the municipality is the most important for the development of energy initiatives.	(Schaik, 2017)
The municipality can help us with providing data about households and their energy behaviour, like who installed solar panels, etc.	(Schaik, 2017)
The municipality can help us by linking the existing energy initiatives in the city.	(Schaik, 2017)
The municipality can help us by providing financial aid, specifically for hiring employees.	(Schaik, 2017)
A barrier in our development is the small number of employees working here; since volunteers don't always have the time to work on the project.	(Schaik, 2017)
A problem in the cooperation with the municipality is that there is no coordination from the municipality to achieve a common goal.	(Jong & Oppen, 2017)
The motivation to start up this energy initiative was to get control over our own energy consumption.	(Jong & Oppen, 2017)
The motivation to start up this energy initiative was because of lack of dedication from the national government; as to take matters in own hands.	(Jong & Oppen, 2017)
The motivation to start up this energy initiative is to strengthen local involvement and create a connection in the society.	(Jong & Oppen, 2017)
The motivation to start up this energy initiative is to help the big challenge of the energy transition.	(Jong & Oppen, 2017)
When starting up an organisation contact with the municipality is important.	(Jong & Oppen, 2017)
Our organisation was used as a policy mean of the politics within our municipality.	(Jong & Oppen, 2017)
The municipality can help us by providing access to their facilities, like meeting rooms.	(Jong & Oppen, 2017)
The municipality can help us by providing more financial aid.	(Jong & Oppen,

	2017)
The municipality can help us by providing more communication about current developments within the municipality and other organisations.	(Jong & Oppen, 2017)
The municipality can help us by involving us in their policies and make our cooperation more intensive.	(Jong & Oppen, 2017)
The municipality can help us by buying our products or services.	(Jong & Oppen, 2017)
The municipality can motivate more citizens to start up an energy initiative by raising awareness (for example in local newspapers and on websites).	(Jong & Oppen, 2017)
The municipality can motivate more citizens to start up an energy initiative by involving citizens in a fun way (for example with competitions).	(Jong & Oppen, 2017)
The problem of starting up an energy initiative is that it takes a lot of energy and time.	(Jong & Oppen, 2017)
Our energy initiative can also play a role for unemployment by hiring employees.	(Jong & Oppen, 2017)
Trust between us and the municipality is important when cooperating with them.	(Jong & Oppen, 2017)
We are rarely in contact with other energy initiatives.	(Jong & Oppen, 2017)
Energy is becoming more of a service than a product.	(Molenaar, 2017)
Cooperation with different parties, like energy companies can be of importance for growth of the energy initiative.	(Molenaar, 2017)
The development of new technologies is important, also on a business and profit level.	(Molenaar, 2017)
The complexity of the politics in Rotterdam make it hard to start an energy initiative in the city.	(Joosten, 2013)
The policy of the municipality is fragmented, if one part of the municipality makes an agreement, another part can disagree.	(Joosten, 2013)

The municipality can help us by providing a smart and appealing financing model consisting of loans with favourable terms.	(Joosten, 2013)
Lending energy initiatives a capital gives them the chance to start up.	(Joosten, 2013)
The energy market is difficult to understand and therefore a clear framework and explanation would be favourable.	(Joosten, 2013)
Making clear arrangements with municipality is important when cooperating.	(Ven, 2015)
It was hard to understand what the role of the municipality could be in supporting our organisation.	(Ven, 2015)
Our organisation performs well, we book a lot of progress in making the neighbourhood sustainable.	(Ven, 2015)
The motivation to start up was to make the whole region energy neutral.	(Bots, 2015)
Call for tenders (aanbestedingen) from the municipality are too difficult to participate in a small energy initiative like us.	(Bots, 2015)
An established contact at the municipality helps us to have regular contact with them.	(Bots, 2015)
The municipality can motivate more citizens to start up an energy initiative by financial incentives.	(Bots, 2015)
We did not need the municipality so far.	(Brinkman, 2015)
The municipality can help us by showing their support and appreciation, like showing up on openings or meetings.	(Brinkman, 2015)
The motivation to start up was to raise awareness about renewable energy and what people can do themselves in the neighbourhood.	(Brinkman, 2015)
It is important that the municipality stays flexible and finds out the individual needs of the initiatives.	(Brinkman, 2015)
Cooperation with the municipality is not a goal on its own, but it can be helpful in achieving our goals.	(Hueting, 2015)
A barrier in starting up our project was the administrative complexity within the municipality.	(Hueting, 2015)

The municipality consists of a lot of different offices which makes it hard to cooperate with them.	(Hueting, 2015)
It is good when the municipality keeps a certain distant between them and let the initiative take the lead.	(Hueting, 2015)
Energy initiatives can also help the municipality with knowledge and takeover of tasks.	(Hueting, 2015)
Oral agreements with common ambitions can be more of a help than signed contracts with difficult rules.	(Hueting, 2015)
The municipality is risk-averse and therefore they are cautious in cooperation.	(Hueting, 2015)
Most investment by all sorts of governments still go to the big energy companies that are fossil fuel dependent.	(Climate Deniers, 2016)
To increase the bottom-up movement of the energy transition, more interest should be put towards local initiatives.	(Climate Deniers, 2016)
The municipality can help us by authorizing licenses for our business.	(HIERopgewekt, 2017)
The municipality can support us by establishing a contract that assures rights and obligations.	(HIERopgewekt, 2017)
The municipality can help us by providing a short term subsidy for a project.	(HIERopgewekt, 2017)
The municipality can help us by providing a long term structural subsidy for the whole organisation.	(HIERopgewekt, 2017)
The best way of working together with the municipality is becoming partners in a structural partnership.	(HIERopgewekt, 2017)
The municipality can help us by providing access to municipal spaces for our business operation (for example roofs for solar panels).	(HIERopgewekt, 2017)
The municipality can help us by providing support of an employee or councillor.	(HIERopgewekt, 2017)
The municipality can support us by releasing of public tenders.	(HIERopgewekt, 2017)

Table C1. Table of statements that are relevant in the problem field.

Appendix D. Z-scores per factor

This appendix contains Table D1, D2 and D3 with the Z-scores of statements given per factor. Here applies; the higher the Z-score, the higher the statement fits with the factor, the higher the statement is depicted in the Table. So for the Table applies that the order in which the statements can be read, will be the ranking of the statements used for analysing the perspectives.

Statement number	Z-score
2	1.722
5	1.615
4	1.448
21	1.303
20	1.138
11	0.888
13	0.847
18	0.772
19	0.706
3	0.662
28	0.209
27	0.164
6	0.103
14	0.086
23	0.042
29	-0.061
30	-0.086
7	-0.189
1	-0.230
24	-0.292
22	-0.456
15	-0.535
16	-0.658
17	-0.665
26	-0.913
8	-0.974
10	-1.035
9	-1.595
12	-1.698
25	-2.318

Table D1. Z-scores for factor 1

Statement number	Z-score
4	2.092
16	2.018
5	1.677
29	1.051
21	0.905
20	0.764
7	0.703
9	0.698
1	0.626
13	0.485
14	0.485
30	0.413
19	0.279
18	0.276
24	0.075
6	-0.277
15	-0.279
12	-0.287
10	-0.421
26	-0.494
27	-0.700
22	-0.702
17	-0.834
25	-0.898
11	-1.038
3	-1.186
28	-1.188
8	-1.328
23	-1.390
2	-1.526

Table D2. Z-scores for factor 2

Statement number	Z-score
20	1.778
10	1.589
24	1.319
4	1.239
17	1.239
23	1.129
5	0.809
29	0.809
3	0.699
18	0.350
6	0.350
26	0.350
22	0.270
27	0.000
8	-0.080
19	-0.190
14	-0.190
1	-0.270
28	-0.270
30	-0.350
7	-0.430
2	-0.430
16	-0.510
25	-0.619
21	-0.619
13	-1.239
11	-1.429
15	-1.509
9	-1.589
12	-2.208

Table D3. Z-scores for factor 3

Appendix E. Difference scores

This appendix shows the differences scores, which can be seen in Table E1. In this Table applies that the higher the statement is placed in the Table, the more consensus there is in the three factors. The difference scores shows the difference between significances of the statements on the factor (Brown, 1980). This means that statement 18 "The municipality can support us by providing access to municipal spaces for our business operation (for example roofs for solar panels)," was the most agreed on that it should be categorized in between 0 and 1. So most respondents slightly agree on this statement. Striking is that statement number 4 "Our organisation performs well in making the energy system sustainable," is highly ranked in all three factors. Also, it is higher ranked than statement number 5, which is "Our organisation performs well in involving the neighbourhood." This means that the energy initiatives perform better in making the energy system sustainable rather than involving the neighbourhood. With statement number 2 "Our development is difficult, because we mainly have volunteers working here," there was the most disagreement. Which means that all factors have a different opinion about this point.

Statement	Factor 1	Factor 2	Factor 3
18	1	0	1
6	0	0	1
14	0	1	0
30	0	1	-1
4	3	4	2
25	-4	-2	-2
19	1	0	0
27	1	-1	0
5	3	3	1
22	-1	-1	0
1	-1	1	-1
20	2	2	4
29	0	2	1
7	0	2	-1
26	-2	-1	1
8	-2	-3	0
15	-1	0	-3

28	1	-2	-1
24	-1	0	3
12	-3	0	-4
21	2	2	-2
3	1	-2	1
13	2	1	-2
17	-2	-1	2
11	2	-2	-2
23	0	-3	2
9	-3	1	-3
10	-2	-1	3
16	-1	3	-1
2	4	-4	-1

Table E1. Consensus and difference scores of the statements towards the factors

Appendix F. Correlation Matrix

Table F1 gives the correlations between factors, which shows the relationships between different perspectives. In this case, correlations are between 0.006 and 0.03, which is relatively low. This means that the factors don't coincide with each other. However, the correlations are not negative neither, which means that there is no strong opposition between different perspectives.

Factor → ↓	**1**	**2**	**3**
1	1.000	0.02343	0.02633
2	0.02343	1.000	0.00658
3	0.02633	0.00658	1.000

Table F1. Correlations between factors

Appendix G. Consensus and Differences statements

This appendix shows the consensus statements in Table G1 and difference statements in Table G2, with statements that are significantly similar or different from each other.

No.	Statement	Opinion
1	Development of our organisation is difficult, because of financial reasons.	Neutral → Disagree
4	Our organisation performs well in making the energy system sustainable.	Agree
5	Our organisation performs well in involving the neighbourhood.	Agree
6	More citizens can be motivated to start up an energy initiative by raising awareness (for example in newspapers and social media).	Neutral → Agree
14	The municipality can be of networking support, by linking the existing energy initiatives in the city.	Neutral → Agree
18	The municipality can support us by providing access to municipal spaces for our business operation (for example roofs for solar panels).	Neutral→ Agree
19	The municipality can support us by assigning a direct contact at the municipality that supports our organisation.	Neutral → Agree
20	The municipality can support us by providing a short-term subsidy for a specific project.	Agree
22	The municipality can support us by providing a policy document explaining rules, options for cooperation and procedures.	Neutral → disagree
25	A good way of working with the municipality is through tenders (public or private).	Disagree
27	For our organisation the policy of the municipality operates well.	Neutral → Disagree
30	A barrier in working together with the municipality is the administrative obligations.	Neutral → Disagree

Table G1. Consensus statements between factors

		Perspective 1	Perspective 2	Perspective 3
No.	**Statement**	Q-Score	Q-Score	Q-Score
2	Our development is difficult, because we mainly have volunteers working here.	4	-4	-1
7	More citizens can be motivated to start up an energy initiative by financial incentives.	0	2	-1
8	When starting up our organisation, our contact with an intermediary organisation (HIERopgewekt, ODE centraal) was important.	-2	-3	0
9	When starting up our organisation, our contact with private or commercial lenders (other than governmental) was important.	-3	1	-3
10	When starting up our organisation, our contact with other energy initiatives was important.	-2	-1	3
11	When starting up our organisation, our contact with the municipality was important.	2	-2	-2
12	When starting up our organisation, a subsidy from the state or province was important.	-3	0	-4
13	The municipality can support us by providing data, such as installed solar panels or isolation measures in neighbourhoods.	2	1	-2
15	The municipality can support us by providing access to their facilities, like meeting rooms.	-1	0	-3
16	The municipality can support us by buying our products or services.	-1	3	-1
17	The municipality can support us by authorizing licenses for the operation of our organisation	-2	-1	2
21	The municipality can support us by providing a long term structural subsidy for the whole organisation.	2	2	-2
23	The municipality can support us by showing their support and appreciation, like showing up on openings, presentations or meetings.	0	-3	2
24	A good way of working with the municipality is with a contract in which clear agreements have been reached on the plan of action to be implemented within the stipulated term.	-1	0	3
28	The supportive role of the municipality is clear to our organisation.	1	-2	-1
29	The municipality's policy is fragmented, if an agreement has been reached with a department, another department may disagree with it.	0	2	1

Table G2. Difference statements between factors

Appendix H. Policy instruments explanation and justification of scores

This appendix will focus on Table H1, and will explain the scores of different policy instruments.

	Policy goals			Perspectives		
	1	**2**	**3**	**1**	**2**	**3**
Policy trade-off:						
Assign a direct contact from the municipality to an energy initiative.	+	+	+	✓	✓	✓
Provide access to municipal spaces for operation, such as rooftops for solar powered generation.	+	+/-	+	✓	✓	✓
Raise awareness under citizens by means of social media, competitions, etc.	++	+	+/-	✓	✓	✓
Strengthen the network of initiatives, by organizing network events or an online meeting place.	++	+	++	✓	✓	✓
Provide short-term subsidies	+	+	+	✓	✓	✓
Provide long-term subsidies	+/-	+/-	--	✓	✓	
Buy services or products from the energy initiatives.	-	-	--		✓	
Provide coaching or give guidance about managing an energy initiative.	++	++	++	✓		
Provide access to facilities, such as meeting rooms.	+	+	+	✓		✓
Be involved in projects, by showing appreciation	+	+/-	+/-			✓
Settle agreement	-	+	+		✓	✓
Make public data open to energy initiatives.	+	+	+/-	✓	✓	
Provide licenses	+/-	+/-	+/-	✓	✓	
Cooperate with intermediary organisations	+	+	++			▪
Set out tenders to which energy initiatives can apply.	-	-	+			
Provide document with rules and regulations.	--	--	+/-			

Table H1. Trade-off from different policy instruments by their policy goals and needs of perspectives

Table H1 depicts the policy instruments that appeared from interviewing on the left side. Then on the middle the policy goals are displayed. These goals arose from the problem setting in chapter 3:

1. Policy should address the open and flexible character of the energy initiatives, as to stimulate more energy initiative to start up.
2. Policy should take into account the diverse character of the energy initiatives, as to stimulate energy initiatives to remain on the long term.
3. Policy should create self-sustaining organisations that are independent of financial support from the local government on the long term.

The policy instruments can score from – to ++ on the different policy goals. On the right the three different perspectives are shown. When a perspective scores positively or neutrally on the policy instrument this is displayed by a check in the Table.

The first five policy instruments are common for all perspectives. These are:

- Assigning a direct contact: as a mean of guidance for energy initiatives in the complex cooperation with the municipality to increase understanding and benefits of local policy. Also, direct contacts can take into account the diversity of each energy initiative. This instrument scores + on all policy goals, since it is a flexible instrument that can be applied to different organisations and leaves the responsibility up to the initiative itself.
- Providing access to municipal spaces: because the operation of energy initiatives often requires space in the community. This scores on policy goals 1 and 2, since it is a flexible policy instrument that gives opportunity for organisation to energy initiatives. Since not all energy initiative would need this it scores +/- on goal 2.
- Raising awareness about energy initiatives: to involve more people in participating in their projects and motivate more people to start up an energy initiative. This scores high on goal 1 and 2, since it stimulates more people to start-up, it reaches a diverse group.
- A network with other energy initiatives: to strengthen the coherence among energy initiatives in the community, so they can learn from and cooperate with each other. This will stimulate more people to start an energy initiative and help to remain on the long term, while reaching all different sorts of energy initiatives, so this scores high on all the goals.

- Short-term subsidies: All initiatives share the same need for financial contribution by short-term subsidies. This coincides with goal 3, that stated the municipality should find policy that stimulates the development of self-sustaining energy initiatives to become independent from financial contribution on the long-term. Also it can apply to all different types of energy initiatives and can be flexible, so it scores + on goal 1 and 2 as well.

Then there are also policy instruments that are only effective for one or two perspectives. Between those instruments, the policy maker has to trade-off to find out the instruments that are most effective:

- Long-term subsidies: Perspective 1 and 2's need for long-term subsidies do not match with policy goal 3. All energy initiatives in Rotterdam stated that financial problems are not a reason for difficulties in their development. This is a paradox and can lead to the conclusion that even though financing might help energy initiatives, they may not be necessary in their development and other policy instruments can be of more importance. This is the reason why this instrument scores low on policy goal 3. Scores on policy goals 2 and 3 are neutral, because it is not known if all energy initiatives will qualify for this long-term subsidy. If this is not the case, it can disadvantage goal 2 and 3. This leads to the conclusion that long-term subsidies might not be as effective as the energy initiatives indicated.
- Buying products/services: perspective 2 finds this a preferred way of cooperating with the municipality, whereas perspective 1 and 3 do not find this helpful. Here a paradox can be found of perspective 2, since they have a negative view towards local policy and tend to avoid working together with the municipality. Also, the municipality must meet national and European regulation as it comes to buying products and services from external parties (Arends, 2017). This decreases the benefits of this policy instrument and is the reason to score low on all three goals. Regulations make it harder for the flexible and diverse initiatives to make us of this instrument. Also, this instrument can make energy initiatives depending on the municipality.
- Provide coaching or give guidance about managing an energy initiative: this instrument was proposed by perspective 1 and is helpful for all three goals, since

it will stimulate initiatives to develop and contribute to the energy transition in an efficient manner. Also it will take into account its diverse and developing character.

- Giving access to facilities: perspective 1 and 3 think this is helpful for their organisation, as they do not have these facilities themselves. Perspective 2 indicated they have these facilities themselves. However, for non-professional organisations this would be a good support. This policy support is good for all three policy goals, since it emphasizes the flexibility, diversity and new character of the energy initiatives and helps them to remain on the long-term.
- Appreciation: perspective 3 prefers this policy instrument, since they find it effective when the municipality shows interest in their projects, perspective 1 has a neutral view towards this. Perspective 2 has a negative view, since they are more business-orientated and have the feeling they do not benefit from this. Since this policy instrument is not costly, but can have a great effect for perspective 3, it can be recommended. Because it does not apply to all perspectives this scores low to policy goal 2. It may help with entering the market, so it scores + on policy goal 1.
- Agreements: there is a lot of differences about settling agreements with the municipality. Perspective 3 would prefer clear agreements, perspective 1 is negative towards this and perspective 2 is neutral. Also, all perspectives explained that they are new organisations that need flexibility in their development. Agreements therefore should include flexibility as well. This was something that perspective 3 and 2 set as an assumption, whereas perspective 1 was only thinking about the strictness of rules, which is not beneficial for them. Concluding, agreements can be helpful for energy initiatives, if they are flexible and open for change, this also explains the negative score on the policy goal 1. However, agreements could be tailor-made and helpful in remaining them on the market, therefore it scores good on goal 2 and 3.
- Open data: this could help perspectives 1 and 2. Also it scores good on the policy goals, since it will help more citizens to enter the market and it can be used for various goals, so it is good in respect to the diversity of the initiatives. It has no relevant effect on making organisations sustainable, so it scores neutral on goal 3.

- Licenses: perspective 3 was the only group valuing the licensing with a high score, this can be explained by this group not having close contact with the municipality which makes it harder to understand the process of obtaining a licence. When assigning a direct contact to the energy initiatives from perspective 3, this problem could be solved and therefore the it scores neutral on the policy goals.
- Cooperation with intermediary organisations: even though not any of the perspectives loaded positively on this statement, it also showed that this can benefit the development of energy initiatives. It can help the organisations with its flexible and diverse character to enter the market and remain on the market, without being dependent of local policy support. This is why it scores high on all three goals.

From the statements appeared two policy instruments that are not efficient for energy initiatives according to all initiatives. These are the policy instruments that should be left out of policy design:

- Tenders: are not considered effective by all three perspectives, because they are too demanding, time-consuming and complex for small organisations like energy initiatives. This is also the reason to score low on policy goals 1 and 2, it is not flexible, not open for all types of organisations. However, it would improve the independence of the energy initiative, which is the reason to score + on policy goal 3.
- A document with rules and regulations: all three perspectives don't consider this as efficient, since energy initiatives develop better in a flexible environment without too much rules. For this reason it scores low on policy goal 1 and 2. Also policy goal 3 is only +/-, since a document with rules will not have a particular negative or positive effect on creating self-sustaining organisations.