Public-Private-Community-Partnerships for Renewable Energy Cooperatives.

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Abstract

In accordance with the "2040 Energy Strategy" Amsterdam must strive to achieve a 75% reduction in CO_2 by 2040 by a set of targets and strategies to abate climate change and fossil-fuel dependency. In 2025, 25% of Amsterdam's electricity needs will be generated sustainably within the city boundaries. However, the current share of sustainable energy production in Amsterdam is around 5.8%. Therefore, a transition towards a larger share of Renewable Energy Technologies within the city boundaries is considered necessary for reducing greenhouse gas emissions. The Dutch literature suggests that Energy Cooperatives can stimulate the energy transition towards decentralised production and consumption of renewable energy. Besides, RET capacity is needed in Amsterdam in order to address the climate problem. Public-Private-Community-Partnerships (PPCP) may represent an option for fulfilling the mentioned goal, by collaborating in metropolitan solutions among the three parties. This thesis studies PPCP as a way of tripartite collaboration for the co-provision of the renewable energy system in Amsterdam by means of Renewable Energy Technologies in the Energy Cooperatives studied. It presents a theoretical construction for the PPCP, which was used as a framework for analysis and also for providing theoretical answers to the meaning and concept of 'PPCP'. The PPCP framework is used to analyse how the Community sector together with the public and private sectors co-provide the renewable energy system. The focus of the study are the Energy Cooperatives in terms of ownership and management of RET and the possible forms of collaboration with the public and private sectors. Then, by analysing six case studies from Amsterdam it was concluded that in Amsterdam there exist tripartite relationships 'PPCP'. Besides the tripartite PPCP, also bilateral relationships were found in which the community sector is a partner and these may represent opportunities to develop further tripartite PPCP.

Keywords: Community Energy, Co-provision, Energy Cooperatives, Public-Private-Community-Partnerships, and Renewable Energy Technologies.

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Abbreviations and acronyms:

- AMS: Amsterdam Institute for Advanced Metropolitan Solutions
- ASC: Amsterdam Smart City
- CE: Community Energy
- EASG: Energy Agreement for Sustainable Growth
- EBA: Emerging Business Areas
- EC: Energy Cooperatives
- ESCO: Energy Services Company
- EXE: Energy Exchange Enablers
- IPCC: Intergovernmental Panel on Climate Change
- LDE: Lokaal Duurzaam Energie
- LREO: Local Renewable Energy Organisations
- PBL: Netherlands Environmental Assessment Agency
- PPCP: Public Private Community Partnerships
- PPP: Public Private Partnerships
- RET: Renewable Energy Technologies
- SDE: Stimulering Duurzame Energieproductie
- SER: Social and Economic Council of the Netherlands
- 4P: People Public Private Partnerships

Chapter 1: Introduction

1.1. Problem statement

Nowadays, driving forces such as resources scarcity and climate change are exerting pressures in the political agendas around the world. These concerns have risen scientific and political discourses motivating policy-making and investments around the world in order to trigger the uptake of Renewable Energy Technologies (RET) and by doing so contribute to carbon emission reductions (Miller, Iles, & Jones, 2013). Increasing demand on scarce and volatile fossil-based energetics and effects of climate change are current challenges for countries (City of Amsterdam, 2010). Moreover, fossil-based energetics normally comes from politically unstable regions around the world (City of Amsterdam, 2010). Until 2010 energy consumption in the Netherlands was based on fossil fuels 95.3%, while renewable energy was a less important issue with a share of only 1.2%. (Geelen & Reinders, 2013). Therefore, The Netherlands aims to deal with more sustainable management of energy and with decreasing dependency on fossil fuels (Ministry of Economic Affairs, 2011). More precisely, Amsterdam plans to become a sustainable metropolis by 2040 by treating energy sources efficiently, and being equipped for the climate change effects (City of Amsterdam, 2010).

In line with recommendations by the Intergovernmental Panel on Climate Change (IPCC), which is based on a reduction in greenhouse gasses of 80-90% by 2050 for developed countries, Amsterdam must strive to achieve a 75% reduction in CO_2 by 2040. The City of Amsterdam has settled its targets and strategies to abate climate change and fossil-fuel dependency within the agreement denominated "2040 Energy Strategy" (City of Amsterdam, 2010). In 2025, 25% of Amsterdam's electricity needs will be generated sustainably within the city boundaries. Nowadays, the current share of sustainable energy production in Amsterdam is around 5.8%, which is still 3% above the national average (City of Amsterdam, 2010). However, a transition towards a larger share of Renewable Energy Technologies (RET) within the city boundaries is considered necessary for reducing greenhouse gasses emissions and for achieving the energy targets. The Energy research Centre of the Netherlands (ECN) states in the National Energy Outlook of 2014 that in the coming decade the share of renewable energy in the Netherlands will increase. Mainly because of subsidies, regulations, tax measures, and the operationalization of large renewable energy projects. Moreover, this increase in RET capacity is expected to come from wind energy and solar power (Energy research Centre of the Netherlands, 2015). Besides this, The Energy Agreement for Sustainable Growth (EASG) states that decentralised generation of renewable energy by people themselves and by cooperative initiatives is also needed in order to address the climate and energy problems (Social and Economic Council, 2013).

For the accomplishment of the mentioned commitment, Amsterdam City has joint efforts with different stakeholders including the programmes: Amsterdam Smart City (ASC), Amsterdam Institute for Advanced Metropolitan Solutions (AMS), and with several private and communities partners. The finality is to foster integrative, collaborative and metropolitan solutions to achieve the mentioned transition. One of these solutions is distributed and renewable energy provision and consumption. (Amsterdam Institute for Advanced Metropolitan Solutions, 2014).

It is suggested in the Dutch literature that Local Renewable Energy Organisations (LREO), for this study Energy Cooperatives (EC), can stimulate the energy transition towards decentralised production and consumption of renewable energy (Boon & Dieperink, 2014). However, RET capacity may be needed in Amsterdam in order to address the climate problem and the renewable energy challenges.

Three sectors in Amsterdam (public-private-community) will play an important role for the successful achievement of the 2040ES goals. Initiatives for renewable energy co-production have already started. Evidence is found at the community level, which says that at the start of 2014, the Netherlands had about 110 energy cooperatives actively involved in making the energy supply more sustainable (Elzenga & Schwencke, 2014). Also, there is evidence of collaboration and facilitation between Dutch municipalities and EC (Elzenga & Schwencke, 2014). As well as, new attempts by private initiatives

for decentralized energy generation by the community sector by collaborating with the public and community sectors (Alliander, n.d.).

The Municipality of Amsterdam, the private and community sectors are already working together on finding metropolitan solutions for the climate and energy problems. In abating the climate problem and the up taking of RET, forms of partnerships among the public-private-community sectors could emerge. The partnerships can be found as Public-Private-Partnerships (PPP) or as single bilateral relations between the community with the public and the community with private sector. Moreover, Public-Private-Community Partnerships may represent an option for fulfilling the mentioned goal, by collaborating and agreeing in metropolitan solutions.

However, linking the Dutch Energy Cooperatives with the concept of Public-Private-Community-Partnerships (PPCP) has not been done so far. In the literature review, knowledge about EC studied under the theoretical framework of PPP or PPCP was not found. Literature regarding the energy provision system in Amsterdam including a community dimension into its current PPP model is yet to be found. Moreover, there is hardly any scientific knowledge about the (new) models or forms of ownership and management of RET assets of EC in which public, private, and community sectors do participate or collaborate (partnerships).

1.2. Research Objectives

This research aims to contribute to the scientific literature regarding Energy Cooperatives (EC) and the new possible modes or forms of ownership and management of (its) RET by Public-Private-Community Partnerships. What I want to explore within my research are the modes/forms of collaboration/participation between the public, private and community organisations involved in decentralised renewable energy production and consumption. Specifically, the new modes/forms of RET ownership and management, in which PPCP are cooperating or participating.

From the results of this research many stakeholders can benefit from scientific knowledge in the mentioned field. Recommendations for energy-policy can be taken from the analysis of the empirical findings with the theoretical framework. Also, the findings can be used to understand the possible or ongoing partnerships among the organisations under the study. As well, the findings can be used to present recommendations and insights for future partnerships among the studied organisations. To mention some stakeholders that can benefit from this research: Alliander Holding Company and its branch companies, Essent, Green Choice, energy producers in general, energy distributors, AMS, ASC, the Energy Cooperatives, and the Municipality of Amsterdam. All of them concerned with the committed energy-climate goals and the need of cooperation.

1.3. Research Questions

Based on the problem description addressed above, and aligned with the research aim, this research study will be guided by the next research questions:

1. **Theoretical question:** What are Public-Private-Community-Partnerships and what do they mean for Energy Cooperatives in terms of ownership and management of Renewable Energy Technologies?

2. **Empirical question:** What modes/forms of Public-Private-Community-Partnerships regarding ownership and management of Renewable Energy Technologies in Energy Cooperatives, do emerge in Amsterdam?

3. **Analytical question:** What insights for energy policy in Amsterdam in the field of Public-Private-Community-Partnerships for Energy Cooperatives regarding ownership and

management of Renewable Energy Technologies can be obtained when combining both the theoretical and empirical findings?

For the first research question, it is needed as a first step to construct the theoretical framework of PPCP. This theoretical framework will be constructed from PPP theory and Energy Community theory. Afterwards, the built theoretical framework will be applied to the case study of EC in Amsterdam in order to give answers to the second research question by finding out what kind of partnership relations do emerge regarding ownership and management of RET in EC. After the data collection analysis, the third research question will be answered by reflecting the theoretical findings with the empirical findings from the first two research questions. By doing so, insights for energy policy in the field of PPCP for EC regarding ownership and management can be highlighted.

In the next chapter, the methodology used for conducting this research is explained in detail, in Chapter 3, the theoretical framework construction is addressed. Chapter 4 includes the empirical findings and its analysis. In Chapter 5 the author discusses the empirical findings by reflecting them with the theoretical findings and by doing so giving answer to the third research question. And chapter 6 concludes this research and provides policy recommendations as well.

Chapter 2: Methodology

2.1. Study Design

Due to the nature of the research questions and objectives, this research is conducted under a qualitative research study. As Kumar argues 'study designs in qualitative research are more appropriate for exploring the variation and diversity in any aspect of social life.' (Kumar, 2011, p. 126). Moreover, the case-study design will be used in order to explore in-depth the aspects mentioned before along the chapters, specifically within the City of Amsterdam. As Kumar states 'in the case study design the case you select becomes the basis of a thorough, holistic and in-depth exploration of the aspects that you want to find out about.' (Kumar, 2011, p. 126). Furthermore, the case study is suitable due to the newness of the concept Public-Private-Community-Partnerships within the renewable energy co-provision context in the City of Amsterdam. Finally, this design is appropriate for understanding and exploring a topic like this one, in which little is known and a holistic understanding of the topic is needed. As Kumar suggests, the case-study is a very useful design when exploring an area where little is known or where you want to have a holistic understanding of the situation, phenomenon, episode, site, group or community... rather than confirming or quantifying. (Kumar, 2011, p. 126).

2.2. Sampling Method

Different from quantitative studies where sampling techniques follow strict construction methods, in qualitative studies -such as this case-study- sampling 'usually use purposive, judgemental or information-oriented sampling techniques' (Kumar, 2011, p. 126). As already mentioned the purpose of this study is to gain in-depth knowledge about a situation, therefore, to determine the sample and its size the following step were taken:

1. Inventory of Energy Cooperatives (EC) in Amsterdam: the search was done by using personal contacts in the field, and also by using the contacts that AMS provided in the relevant study area. The selection of EC for the inventory aimed to include all the initiatives in the region of Amsterdam dealing with renewable energy within the energy cooperative model.
2. Analysis of the inventory: based on their potential knowledge contribution for the relevant study area.
3. A sample of 6 EC was taken. For this step, cases rich in information were chosen. Also, another criteria for the selection of the cases was the willingness to participate by the representatives of the EC. Not only successful or big cases were studied. The attempt was to find a mix of cases including different sizes of cooperatives and different activities in order to have a more heterogeneous sample. For this research the following sample was selected:

    - Amsterdam Energie
    - Eevergreenergy
    - NDSM Energie
    - Onze Energie
    - Zonnepanelen op het dak van Waternet
    - Zuiderlicht

2.3. Data Collection

When studying an episode or an instance, such as the case-study for this research, the attempt is to gather information from all available sources so as to understand it in its entirety (Kumar, 2011, p. 127). That is why the following data collection tools were used:

- From Primary sources:

- ***Semi-structured interviews***: in-depth interviews conducted with expert stakeholders from the public, private and community sectors. To mention some of them, the municipality of Amsterdam, Alliander, and mainly representatives of the energy cooperatives. An interview guide with the relevant topics was elaborated in advance for conducting the interviews. (The interview guide is included in the Annex 2, and the list of interviewees is found in the Table 1).

- From Secondary sources:
  - ***Literature review:*** I was conducted during my research a review of the literature in the fields of Energy Cooperatives in the Netherlands, Renewable Energy Technologies, and Public-Private-Community collaboration and partnerships. Also relevant texts were analysed from governmental publications, policy documents, corporate publications, and EC documents. (These references are included in Chapter 7).

During the data collection process, interviews were conducted with respondents from the public, private and community sectors. For the study sample of energy cooperatives, the following respondents were interviewed: Zuiderlicht, NDSM Energie, Amsterdam Energie, Evergreenergy, Zonnepanelen op het dak van Waternet, and Onze Energie. Furthermore, from the private sector were interviewed: Alliander, Hoom, LDE Program, and Lens Energie. And from the public sector the Economic Affairs Department of the Municipality of Amsterdam was interviewed.

For each respondent either from the study sample and the informants from the public and private sector, one interview was conducted with the person in charge of each energy cooperative or entity. Table 1 shows the interviews conducted and the interviewees.

Community Sector		
Energy Cooperative	**Interviewee**	**Date**
Zuiderlicht	Frank Boon	November 10, 2014
NDSM Energie	Keijen van Eijk	November 4, 2014
Evergreenergy	Jeroen Kruisheer	November 20,2014
Amsterdam Energie	Rolf Steenwinkel	November 18, 2014
Zonnepanelen op het dak van Waternet	Ingrid Heemskerk	November 24, 2014
Onze Energie	Marcel Hort	December 2, 2014
Private Sector		
Company	**Interviewee**	**Date**
Lens Energie	Christiaan Brester	December 1, 2014
Alliander	Marcel van Hest	November 25, 2014
Hoom	Roel Frietman	November 19, 2014
LDE Program	Liddy Vissinga	January 13, 2015
Public Sector		
Organisation/Department	**Interviewee**	**Date**
The Economic Affairs Department	Stephanie van de Wiel	November 18, 2014

Table 1. List of Interviews

2.4. Validity

Regarding validity for qualitative research, it is debatable if data collection methods and concepts in the case-study can be validated and be reliable. Kumar explains that 'as answers to research questions are explored through multiple methods and procedures which are both flexible and evolving, to ensure standardisation of research tools as well as the processes becomes difficult.' (Kumar, 2011, p. 184). Similar to this case study in Amsterdam, different relevant stakeholders were interviewed, and the answers gathered from them are hardly repeatable if the research would be conducted again due to respondents opinions or perception may evolve as time goes by. However, as the author states there are attempts to define and establish validity and reliability in qualitative research (Kumar, 2011, p. 184). To do so, Kumar explains the following components of validity in qualitative studies: credibility, transferability, dependability, and confirmability.

During this research the following measures were carefully followed for ensuring credibility and validity of answers gathered:

- Credibility (synonymous to internal validity): Kumar points out that 'this is judged by the extent of respondent concordance whereby you take your findings to those who participated in your research for confirmation, congruence, validation and approval.' (Kumar, 2011, p. 185). To get credibility of the findings, the respondents confirmed the answers gathered in every interview at the moment. I did so by asking to every interviewee if what I understood as answers, is what they really meant.

- Transferability (synonymous to external validity): Within this chapter it is explained, in the most detailed way possible, the steps taken during this research. As Kumar suggest, transferability can be achieved 'if you extensively describe the process adopted for others to follow and replicate.' (Kumar, 2011, p. 185). Acknowledging that replication would be hard to achieve in future researches. The main goal of describing in detail the steps taken during this research is to show to the readers how the research was conducted and which steps were involved in gathering answers to the research questions.

Chapter 3: Theoretical framework

I. Introduction to the Theoretical framework

As established in the first research question, its purpose is to address theoretical answers for Public-Private-Community Partnerships (PPCP) including its definition and meaning. Hence, the research study is conducted under the theoretical framework of PPCP. Using this framework it will be analysed what kind of partner-relationships exist among the public, private and community sectors. Specifically in terms of ownership and management of Renewable Energy Technologies (RET) within Energy Cooperatives (EC). The central attention of the study is the Community sector, specifically the Energy Cooperatives. Within these partner-relationships, three bi-directional relationships can be highlighted: Public-Private, Private-Community, and Public-Community. The sum of these relationships forms the tri-sectorial relationship named PPCP. For the purpose of this research, the most relevant relationships to be studied are the Private-Community, Public-Community, and Public-Private-Community, due to these are the ones in which community is directly involved. Relationships exclusively between the public and private sector are not on the scope of this research and these may be catalogued under Public-Private-Partnerships (PPP). PPCP may co-shape the current fossil fuel-based energy system by co-providing a more renewable and decentralised energy system in which EC can keep blooming. And by working together and aligning efforts, the sectors aim to co-provide and co-shape the future desired renewable energy system.

The literature review found examples of cases from *South* and *North* regarding PPCP and Public-Private-People-Partnerships (4P). Examples varies from water provision projects *for the poor* in South-Asian countries (Franceys & Weitz, 2003), reduction of CO_2 in real-estate developments by engaging end-users in Finland (Kuronen, Junnila, Majamaa, & Niiranen, 2010), and 4P process framework for urban infrastructural development in Hong Kong (Ng, Wong, & Wong, 2013). Although insights can be extracted from this theoretical background, there is not precise literature about PPCP in the specific field of EC and their RET. As a result and for the purpose of this research, the theoretical framework demanded by this study needs to be built up.

Based on the limited theoretical background for the concept PPCP in the field of renewable energy organisations in literature, it is needed to build the concept up from the PPP literature, and it is needed to add to it a community dimension. To do so, a theoretical-framework-building process is developed step-by-step in the next sub-chapters.

In detail, the Community dimension is constructed by using Community Energy theory, EC theory and Cooperative model theory. For the Community Energy theory, the contributions to the literature by of Seyfang et al (2013), Walker and Devine-Wright (2008), and Walker (2008) are used. The definition for EC is taken from the Local Renewable Energy Organisations (LREO) definition given by Boon and Dieperink (2014). Then, for the cooperative theory it is used the literature of Kuronen et al (2010), Huybrechts and Mertens (2014). Thereafter, the literature regarding co-provision role from Watson (2004), Van Vliet and Chappells (1999), van Vliet (2012) and Chappells et al (2000) is used for the PPCP framework as a binding connector between the Community dimension and the public and private sectors subject to partnerships. Then, the ownership and management of the RET is operationalized. As a final step, the Community dimension, the co-provision literature and the PPP theory are converged and this brings as a result the desired PPCP theoretical framework. Furthermore, this built PPCP theoretical model may be shaped with the findings in literature regarding 4P and PPCP for other study fields.

II. Background

Network-bound systems in The Netherlands, as the energy system, have shifted from different organizational models along history. During the last decades systems have dramatically changed. The provision of energy services has shifted from private provision, to nationalisation, and liberalisation

(van Vliet, 2012). Moreover, the electricity sector has been the most evolving and changing sector regarding provider–consumer relations in The Netherlands, during the last decades. Also, the electricity sector has been splitting the production and distribution activities of the network management by creating specialized companies (van Vliet, 2012). Recently, consumers are playing more active roles in the energy provision system, such as: co-participants in resource substitution (regarding the inputs for renewable energy production), and co-owners of the energy utility system by adding renewable capacity and sources for energy provision (van Vliet & Chappells, 1999). As van Vliet (2012) also suggests, consumers are evolving into a more vis-à-vis service provision instead of a captive consumer role, which is named co-provision role (van Vliet, 2012).

After the liberalisation period of the utility markets, including the energy system, new providers (e.g. alternative renewable energy companies or energy cooperatives) are allowed to enter the utility network and compete with the traditional companies for clients who were previously treated as captive consumers (van Vliet & Chappells, 1999; van Vliet, 2012). Furthermore, this shift has led to a bigger size of providers of energy services, distributed generation of the service, new small-scale providers on the service scene, and to differentiation of the service (van Vliet and Chappells, 1999; van Vliet, 2012). It means that among a larger amount of providers, consumers can also choose among different qualities of energy, or as the authors suggest, customers can choose the company that fulfil their needs. Differentiation on the energy services is found, for instance in electricity production and distribution. Companies are competing by offering differentiated products regarding the source of the energy, specifically by how renewable or green is the energy provided (van Vliet & Chappells, 1999). Which also opens the scene for renewable energy co-production by EC. Moreover, policies in 2011 brought separated companies for the production and distribution of energy into the energy system (van Vliet, 2012).

Nowadays, householders and EC are able to be co-investors, co-owners and co-regulators of the energy system. One of the reasons is because householders (and energy cooperatives) have the possibility to install (among other RET) Photovoltaic Solar Panels (PV), Micro Combined Heat and Power (CHP) or on-shore wind turbines (van Vliet, 2012). It is also possible either for householders or EC to co-provide the energy system by deploying RET (decentralised) and by delivering energy surpluses back in to the grid.

3.1. Public-Private-Partnerships (PPP)

Public-Private-Partnerships (PPP) aim to facilitate private sector involvement in technical, managerial and financial resources, for the provision of public services such as infrastructural development for utility services (The World Bank Group, 2012). PPP are defined as ‘a legally-binding contract between government and business for the provision of assets and the delivery of services that allocates responsibilities and business risks among the various partners. The private sector is responsible for the more commercial functions such as project design, construction, finance and operations. PPP take a variety of forms, with varying degrees of public and private sector involvement – and varying levels of public and private sector risk.’ (Partnerships British Columbia, 2003, p. 2). Moreover, PPP are forms of cooperation in which the parties are jointly accountable for activities carried out under their common direction, using their pooled resources and personnel and sharing the risks (Ministry of Foreign Affairs of The Netherlands, 2010). PPP are seen as collaborating agreements for the provision of public services by partnering with the private sector either for the provision of assets, financial resources, technical expertise, assets management or accountability allocation.

More precisely this provision of assets and the delivery of services that is negotiated with the private sector called PPP, is considered by Nisar (2013) as suitable to deal with capital-intensive projects that demand large maintenance labour. PPP, apart from the public participation, require Private initiatives to ensure the provision and performance of assets for a long term, as well as the asset management and investments needed. Therefore, Private participation is considered suitable to offer innovative design, project management skills, financing and expertise .

Coordination, understanding and collaboration among the parties within the partnerships are essential characteristics of successful partnership projects. Nisar (2013) argues that lack of coordination could lead to extra costs among the parties in the partnership. This situation motivates the implementation of partnerships plans that deal with the public services provision in a more efficient and innovative way. Nisar (2012) explains that it is important to make clear how parties are going to formally interface between them, which means a clear delimitation and allocation of responsibilities and accountability. The author continues arguing that although the awareness of the private sector in PPP regarding its responsibilities towards the authority, this relationship may be more based on democratic collaboration and communication instead of a top-down approach (Nisar, 2013).

From the PPP literature, the following insights are highlighted: assets provision and management, services provision, financing, technical expertise, democratization, and accountability. These factors are negotiated, shared or transferred among the contractual parties in PPP. These insights, can be borrowed from PPP literature and used in the current construction of PPCP for EC in terms of ownership and management of the RET. It is also remarkable the importance of understanding, collaboration and communication between members in the partnerships as crucial factor for successful partnerships.

3.2. The need of a Community dimension for the Public-Private-Partnerships

As mentioned in the introduction of this chapter, the subsequent sub-chapters will introduce insights and arguments for the theoretical building of PPCP for EC. If a Community dimension is to be introduced in the PPP theory, then it is first needed to acknowledge that PPP are missing a community dimension. The Community dimension will be built from the community energy theory, energy cooperatives insights, and the cooperative model. Moreover, the Community dimension enables the co-provision role into the PPCP. Within PPCP, the different sectors co-shape and co-provide the renewable energy system.

Although one of the core objectives of PPP is the provision of public services by means of technical, financial and operational arrangements among the contractual parties, for the aim of this research the mentioned community dimension is still missing. As Miller et al (2013) suggest, for the case of energy, systems are more than technical issues, the concept goes beyond pipes, refineries and fuels, but also includes a social dimension that considers humans who design technologies; societies and neighbourhoods that produce and consume energy. Therefore, it is also needed to go beyond public and private sectors in the provision of utility systems and try to explore how the community sector may be included in the system. The authors continue arguing that energy systems can change (to a more sustainable co-provision for instance) only if choices are made by the collaboration of members from the public, private and community sectors (people, business managers, policy-makers, scientists, engineers, and consumers). Also, changes in energy technologies may reshape social practices, relationships and institutions, bridging to new modes of partnerships, collaborations, actors, businesses and systems of provision (Miller, Iles, & Jones, 2013).

The community dimension needed for the PPCP may be in the shape of EC within the renewable energy system. EC may provide knowledge and RET capacity within the renewable energy system. EC may also reshape the energy system and bring new forms of partner relationships between the public, private and community sectors. But before going directly to the Community dimension building, it is worthwhile to first review the available literature about 4P (Public-Private-People-Partnerships) and PPCP (from fields different than renewable energy) in order to get insights for the desired PPCP and its Community dimension inclusion.

3.3. The current literature regarding Public-Private-People-Partnerships (4P) and Public-Private-Community-Partnerships

The literature contains examples of cases from *South* and *North* regarding PPCP and Public-Private-People-Partnerships (P4). Examples were found for water provision projects *for the poor* in South-Asian countries by implementing PPCP (Franceys & Weitz, 2003). Literature regarding 4P was found for: reduction of CO_2 in real-estate developments by engaging end-users in Finland (Kuronen et al., 2010), 4P process framework for urban infrastructural development in Hong Kong (Ng et al., 2013) and 4P in urban redevelopment (Kuronen, Luoma-Halkola, Junnila, Heywood, & Majamaa, 2011). Although insights can be extracted from this theoretical background, there is not precise literature yet about PPCP in the specific field of EC and their RET. Therefore, the theoretical framework demanded by this research needs to be built up. Another aim for reviewing this field of literature is as a way to learn from other cases and experiences either form the North and South contexts. Moreover, to learn about what worked in other cases and what did not. Lastly, it may help to understand what may be useful for the PPCP framework that this research aims for.

3.3.1. Literature regarding Public-Private-Community-Partnerships

Means of PPCP are found in different utility services from North to South. The literature by Franceys & Weitz (2003) provides an example of the South regarding water services provision. Although water provision is different than energy provision, the PPCP behind the water utility service can be analyzed for further research regarding the energy services. This literature was undertaken in different Asian countries to explore interactions and roles between the public, private and civil society sectors in serving the urban poor with water, waste management and sanitation (Franceys & Weitz, 2003). Which is similar to what this research aims for, to use the theoretical model as a spotlight for exploring ways of tripartite collaboration.

From the literature by Franceys & Weitz (2003), the following insights can be borrowed for the theoretical construction. This literature explains the transition between private vendors or civil-society initiatives and PPCP for improving the quality of services for the benefit of the poor (Franceys & Weitz, 2003). Which is similar to the transition within the energy system in The Netherlands (explained later on). The main challenge faced by these partnerships in literature was the uncertainty over the contractual stability within the PPCP, in which parties lack a common understanding about their roles and responsibilities within the partnerships, leading to biased perceptions (Franceys & Weitz, 2003). Moreover, it is also crucial to keep in mind for the PPCP that this research is aiming for that misunderstandings about the expected responsibilities of each party could led to biased perceptions and diminished the effectiveness of the partnerships. As well to keep in mind that understanding among the parties is an essential factor for successful partnerships, as Nisar (2013) from the PPP literature states. Deployment of new renewable energy capacity and new forms of partnerships may stimulate changes in the conventional energy system. If an energy transition is to be done in the following years, then actors may look for symmetric information regarding goals, roles and pathways for it. Therefore, parties need to make clear which arrangements need to be done regarding ownership and management of RET in further partnerships.

Franceys & Weitz (2003), indicate that within PPCP each sector involved has a role. For instance, the private sector is needed for challenging the old utility system of service provision and also to manage it more efficiently. Also, the public sector is needed in order to get the oversight of the governments as economic regulators and facilitators of the partnership and its aims. Moreover, the community sector is needed because of its flexibility and commitment for serving the poorest clients (Franceys & Weitz, 2003). Therefore, for future PPCP for EC is essential to consider a clear distinction and distribution of roles between the contractual participants from the three sectors. Hence, partnerships may also mean a platform of simultaneous information sharing between the interested actors. The municipal government of Amsterdam, the grid operator (or energy providers), and the EC are expected to work on their specific roles as for example the ones from literature mentioned in this paragraph. As well the ES2040 aims for involving each sector on what they can do the best depending on their expertise.

Franceys & Weitz (2003) also found that an important aspect for the PPCP studied was the role of

NGO's as intermediary between the sectors involved. NGO's provided a mediator role between the community's interests and the private sector. Moreover, the authors argue that one important aspect of the NGO's were the activities dedicated to the community sector, such as: information campaigns, communication campaigns, education, and the community mobilization (Franceys & Weitz, 2003). Perhaps in the PPCP that this research is aiming for, NGO's are not present in all the cases or maybe are not present at all. Moreover, the idea behind is that there may be an intermediary between the interested sectors within PPCP. The intermediary may be one of the partners in the PPCP or an external actor. In literature was found that an NGO played the intermediary role in the partnerships, but different cases may be possible as for example the public sector functioning as a moderator or facilitator. But for this research perhaps actors from the private sector intermediating between two or more different EC or intermediating between the public and community sectors for improved energy-environmental results.

Compared to the PPP literature review, this literature provides similarities regarding the effects of lack of coordination, understanding and collaboration among the parties. It is also similar regarding how the unclear delimitation and allocation of responsibilities and accountability led to a misunderstanding about how parties should formally interface between them. Moreover, both branches of literature address the consequences of a weak democratization of participation. Furthermore, Franceys & Weitz (2003) literature provides similarities with the previous chapters regarding how the beginning of the service provision started through history. The service was firstly provided by private initiatives, which later on evolved into a PPCP scheme. In the case of this research our aim is to find out the way Communities (energy cooperatives) may do partnerships with the public and private sectors. As this literature illustrates, there was a transition from the private initiatives into a more collaborative relationship with the public private and community sectors for the provision of public services. Which is similar to what Amsterdam envisions for its further energy transition. Whether or not the private and community sectors' visions match the public ones is subject to the empirical results from this research. It cannot be only analysed, concluded or steered a PPCP only under the approach/study of the public sector.

The roles identified for the sectors in PPCP identified by Franceys & Weitz (2003), may provide insights for further steps in the study of PPCP for this research. For instance, to highlight the important role of the private sector in bringing technical expertise, management skills, and efficiency in the renewable energy service co-provision in which EC are also a partner (as well as the PPP literature by The World Bank Group (2012) suggests regarding the roles of the private sector). Regarding the public sector, like in the case of this literature, it plays both the role of facilitator for the PPCP and the role of an economic and political regulator for the benefit of the partnership (Franceys & Weitz, 2003). Finally, this literature provides insights for the upcoming PPCP theoretical construction, by showing how the flexibility and commitment of the Community sector brought the inclusion of the poorest in the service provision. Contrary to what the private sector could not get. (Franceys & Weitz, 2003). Although 'poor' is not an accurate concept for the PPCP theoretical construction, for the purpose of this research 'poor' can be replaced by consumers under the conventional energy consumption and without access to local and decentralised renewable energy. Therefore, it is needed to go further in the literature of PPCP or 4P for more cases that go beyond the South and the water, sanitation and waste management services.

Although the literature of the South provide insights for the theoretical construction of PPCP, more cases and literature are needed to analyse in order to have a broader picture of the similar partnerships already happening around the world in different utility services. The 4P literature review found three sources. Two from the North case regarding: energy system design for infrastructural developments, urban redevelopments, and 4P-based urban planning process. Moreover, one source of literature from the South was found regarding the case of Hong Kong and the urban infrastructural development.

3.3.2. Literature regarding Public-Private-People-Partnerships for new residential projects

Kuronen, et al (2010) and Kuronen, et al (2011), provide literature from the North regarding energy system design for new residential projects by addressing 4P, urban redevelopments, and 4P-based urban planning process. Kuronen, et al (2010) literature explains the case of real-estate developments by engaging end-users in Finland and reduction of CO_2 emissions. Kuronen, et al (2010) provide some insights for the PPCP theoretical building. Kuronen, et al (2010), suggest energy system design of new residential projects as part of the urban planning. The case presents a 4P framework for low-carbon residential developments, which is tested in to a case project. The framework considers end-users (Community sector) as important players in the decision-making process, also the empowerment of the end-users rather than local government (Public sector) and the developer (Private sector) (Kuronen et al., 2010). The idea of the 4P framework is to bring a third dimension to the partnership and empower it in the design of new housing developments regarding energy and water services. However, there is still an end-user perception rather than a vis-à-vis partnership among the three sectors. From this literature it is highlighted the importance of bringing the end-users to the decision-making process for the infrastructural developments. But people are seen as the future end-users of the new residential developments, rather than people as the co-shapers, co-providers and partners of the energy system within these developments.

Kuronen, et al (2010) literature analyses how decisions are taken under a linear top-down criteria, leaving the end-users out of the decision-making process and being affected by decisions taken upstream (Kuronen et al., 2010). Normally the end-users are only consulted at the final stage of the infrastructural development, and consultations go downstream only for getting people's opinions. Moreover, because of top-down decisions end-users are not able to affect (co-shape or interfere) the way energy systems are provided (Kuronen et al., 2010). These may be challenges to address in future PPCP for EC or in any kind of partnership that attempts to involve people or community in the provision of utility services. Moreover, it is explained that traditionally the partnerships are mainly between the government (public sector) and the developer (private sector), and recently a third player is getting involved in the current PPP and bringing a more 4P relationship (Kuronen et al., 2010). The third player may be found as People or Community. Furthermore, the 4P-based process suggests that both formal and informal relationships may exist between the public, the private and the people within 4P (or PPCP) (Kuronen et al., 2010).

Kuronen, et al (2010) explain how decisions are taken in terms of the energy system for the case study. They explain that the public sector (normally the municipality) takes the lead about the urban planning in which the energy system design is included. Also, the municipality sets regulations for the urban planning, the energy system design and sometimes even provides the energy system (Kuronen et al., 2010). Then, the private sector provides the technical job according to the public sector decisions or regulations. Lastly, people (community sector) are just the end-users of the energy system (Kuronen et al., 2010). On the other hand, PPCP for EC look for collaborative participation in the renewable energy provision system in which Communities can partner with the public and private sectors rather than end-users. Moreover, this research aims to go beyond the perception of cities (public sector) as providers, designers and regulators; and turn into a tripartite partner relationship. The PPCP theoretical framework is not supposed to define which specific actions have to be done by each partner. Contrarily, PPCP are supposed to work as platforms for cooperative relationships between parties to work together for a common objective by defining roles.

3.3.3. Public-Private-People-Partnerships for urban redevelopments

The 4P literature provides another source written by Kuronen, et al (2011), in which the authors address a financial analysis model for urban redevelopment aimed to work under a 4P. The authors describe possible roles that each sector may play within the 4P. Moreover, based on each sector needs the model suggests what the sectors may bring to the 4P. It is argued that by using the mentioned model the interests of the three sectors involved can be integrated in the 4P (Kuronen et al., 2011).

The 4P framework suggests that the most interesting part of the 4P is the relation between the private sector and the people, due to it represents a novel approach in urban planning in Finland in which people's wishes can be addressed in future infrastructural developments. However, for the theoretical construction that this research aims for, the relationship between Private-People (Private-Community) represents only one of the important directional relationships. Meaning that, there is no higher importance allocated in the relationships regarding the PPCP of this research. Also, if people's wishes are to be addressed in future infrastructural developments, this does not imply a collaborative and vis-à-vis partnership between the parties. Also, the proposed PPCP should mean more than a need to approach people's wishes and aim for a constructive wish.

3.3.4. Public-Private-People-Partnerships for public engagement in urban infrastructural development

Then, the 4P literature written by Ng, S. T., et al (2013) addresses a process framework for urban infrastructural development that aims for public engagement. The authors discuss about public engagement and the inclusion of people as a major stakeholder for implementing PPP in urban infrastructural development in Hong Kong (Ng et al., 2013). The 4P framework embraces bottom-up participative strategies to bring public engagement in the infrastructure planning and policy-making process (Ng et al., 2013). The authors suggest that the public engagement framework for PPP projects can assist governmental bodies in the policy-making process (Ng et al., 2013). Two of the main goals of P4 are to strengthen: redistribution of power, and full involvement of people in the decision-making process. Furthermore, the P4 framework draws step-by-step the process to engage people in PPP projects, also it ensures that people's participation in P4 is clearly visible for infrastructure planning and policymaking (Ng et al., 2013). However, this literature is similar to Kuronen, et al (2010) regarding the engagement of communities. But redistribution of power and empowerment of the community sectors is valuable for this research study and also closely related to what the Community Energy suggests as main elements of local renewable energy initiatives.

Although the authors provide a step-by-step guideline for engaging public in the urban infrastructural development, this framework is not oriented for a partner relation among public, private and community sector. Moreover, the framework considers the involvement of people for projects steered by the private and public sectors. On the other hand, the PPCP that this research is looking for, is one in which the three sectors work together for a common goal and nobody is treated as a party that is only consulted to gather its opinions. Regardless the different aims between the 4P literature and the PPCP under the scope of this research; insights can be borrowed for the construction of the latest. For instance, the redistribution of power concept between sectors and the inclusion of people (community) dimension within the PPP. Finally, the way this literature, by Ng, et al (2013), tries to approach people is similar to the Kuronen, et al (2010) literature in the way that both try to gather people's opinions and to include this opinions in projects.

Although this literature does not address PPCP for EC in the way this research is aiming for, Ng et al (2012) provides insights for the theoretical construction of PPCP. Ng, et al (2013) suggest 4 key features to guarantee the inclusion of people in the PPP projects. As already specified this research is not aiming neither for public engagement nor inclusion of people. However these 4 key features may provide insights for the PPCP subject of this research. The 4 key features are: inclusiveness, transparency, interactiveness and continuity (Ng et al., 2013).

The Inclusiveness feature suggested by Ng, et al (2013) can be adapted for the PPCP and it can bring ideas to this theoretical construction regarding the influence of the three sectors on the decision-making process by ensuring a vis-à-vis partnership among them. Also, aiming to include views and needs from the three sectors regarding infrastructural developments. Moreover, by establishing a relationship that replaces the traditional end-users perspective with a co-provision role by the three sectors.

Transparency feature also brings insights that can be borrowed from the 4P. This may represent the alignment of information among the three sectors, by disclosing aims, visions, objectives and expectations. The way transparency is defined for 4P is as a feature that aims to obtain efficient information among actors in other to gain more successful and inclusive projects (Ng et al., 2013).

Regarding interactiveness, Ng, et al (2013) suggest that it is important to have interaction among the sectors involved in the partnerships. Ng, S. T., et al (2013) suggest that this interaction should allow the inclusion of needs and concerns from the different sectors within the suggested framework. One way to achieve it is by making possible reciprocal (tri-directional) communication between the different sectors involved in the partnerships, in which information can be provided to the public but also gathered from the public (Ng et al., 2013). The interactiveness feature opens the window for the vis-à-vis relationships ingredient that the PPCP theoretical building needs. It is important to keep in mind the need for platforms in which the three sectors can constantly, horizontally and reciprocally exchange information about the PPCP.

Finally, continuity highlights the importance of constant communication and information exchange (Ng et al., 2013). For the PPCP that this research is aiming for, this is an important feature due to three sectors are expected to be partners and co-provide an energy system. Therefore, efficient and constant communication is essential for aligning efforts and getting the desired outcomes from the PPCP. Different than gathering people's wishes to include them in future projects, continuity may work for PPCP as a continuous communication and continuous collaborative working for the parties involved in the PPCP. Also, continuity may go further than communication by including as well the continuity of the partner relationship. Parties may ensure the measures to give continuity to the partnership and to the affairs outcome of the PPCP.

Although the framework suggested by Ng, et al (2013) brings insights for the PPCP theoretical construction, the mentioned 4P framework aims for public engagement in the infrastructural developments subject to PPP. Therefore, it differs to the aims of the PPCP theoretical construction. Moreover, it is important to acknowledge that the 4P remarks the importance of involving people in PPPs scheme and the need to avoid two-way partnerships only between the private and public sector. On the other hand, the idea behind PPCP is to bring the three sectors together in a partnership relation. Considering these constrains, it is also acknowledged the importance of this literature and the insights taken from it for the construction of the PPCP theory.

The literature review under PPCP and 4P, brought insights for the PPCP theoretical construction that this research is aiming for. The literature reviews examples from the South and North, and also examples related to water services, waste management, and energy. From the literature review regarding PPCP and 4P it was not found what PPCP should mean for EC and its meaning is yet to be answered along this research. Therefore, and as already introduced, it is needed to build the theoretical framework for PPCP and to give it direction for EC. In order to continue with the PPCP theoretical construction and to give it the right direction for EC, it is first needed to keep working on the Community dimension demanded by the PPCP. Within the Community dimension the Community Energy literature is analysed in next chapter. Thereafter, Cooperative Model theory and Energy Cooperatives theory are both addressed.

3.4. Community Energy Theory

In order to build the PPCP theoretical framework, it is also needed to define, contextualize, and integrate to it the Community dimension. To do so, literature regarding Community Energy by Seyfang et al (2013), Walker and Devine-Wright (2008), and Walker (2008) is analysed as follows.

3.4.1. What is Community Energy?

Community Energy is a form of organisation in which communities get involved in supply-and demand-side sustainable energy initiatives. Community Energy exhibits a high degree of ownership and control of the renewable energy means. Community Energy benefits collectively from the

outcomes generated by these initiatives (Walker & Devine-Wright, 2008). Some of these outcomes that may be: local renewable energy, energy savings, knowledge, networking, community empowerment, environmental and income.

From the case of UK, Community Energy has its origins rooted in civil society. According to Seyfang et al.,' survey, the community energy sector is predominantly citizen-led and community-based from the outset (2013). The survey shows that most of these initiatives (93%) have been set up by individuals or other pre-existing community groups (Seyfang, Park, & Smith, 2013).

3.4.2. What does Community Energy do?

The main objectives of Community Energy are: improving energy independence, community empowerment, and income generation for the community (Seyfang et al., 2013). Furthermore, the main activities Community Energy performs are: sustainable energy generation and energy-conservation (included energy education and awareness).

Seyfang et al., also argue factors that influence the emergence of Community Energy, one of them is related to networking and partnerships (2013). The authors point out the importance of forgoing supportive partnerships and networking links with external organisations, and they found that in the UK's case most of Community Energy initiatives cooperate with another entity. Community Energy mostly cooperates with: local authorities, other community groups and businesses (Seyfang et al., 2013).

3.4.3. Community Energy: Ownership and Management

According to Walker (2008) Community Energy can be owned in different levels. Community Energy can be fully owned by the community, or co-owned by the community and the private sector (the public sector may be another possible partner but is not mentioned by the author) (Walker, 2008). Ownership can be found in terms of the RET assets and in terms of the RET outcomes. Regarding ownership of the assets of the RET, this kind of ownership is related with the property of the assets. Regarding the outcomes of the RET, this implies that the renewable energy produced is also subject of ownership as well as all the benefits attached to it. Also, other configurations are possible, as for example: one party is the owner of the RET assets and the remaining party is the owner of the RET outcomes, or both parties have a share in both the assets and its outcomes.

Furthermore, for the RET outcomes analysis, a distinction is needed between communities of locality and communities of interest. The latest one is related to communities that have common interests in renewable energy procurement but do not share the same location (Walker, 2008). For instance, the outcomes generated by the RET, owned by Community Energy initiatives or between Community Energy initiatives and private sector, can be subject to non-local consumption due to the participants do not live within the same locality. Or another example, outcomes can be partly consumed at the local level and also co-owned by another party (Walker, 2008). On the other hand, 'where community is equated with locality (however defined) different models of ownership may be seen as more or less inclusive and collective.' (Walker, 2008, p. 4402).

Walker and Devine-Wright (2008), also distinguish a *process* and an *outcome dimension* in Community Energy. These two dimensions are catalogued as part of the management in Community Energy for the purpose of this research. For the process dimension (A), a high degree of involvement of people in planning, starting, and the running of the Community Energy is crucial. Questions like who participates in the Community Energy are highly important. Principles such as empowerment, community participation and capacity building are essential for the process dimension. On the other hand, the outcome dimension (B) is more concerned about where the benefits (outcomes) of Community Energy are distributed; instead of who generates the benefits. Under the outcome dimension the authors evidence that Community Energy are either willing to work with local authorities or willing to empower them the management of renewable energy projects, as long as the community gets benefits from it. Finally Walker and Devine-Wright (2008), suggest an *alternative dimension* (C) in which people are less concerned about processes and outcomes, instead people would agree on projects that may bring something productive and useful for the communities. The

authors state that this last dimension may accept different possible combinations of *processes* and *outcomes* in communities (Walker & Devine-Wright, 2008).

Figure 1 by Walker and Devine-Wright (2008), shows the *process* and *outcome* dimensions explained above, regarding community renewable energy. The process dimension axis ranges from closed & institutional to open & participatory, while the outcome dimension axis ranges from local & collective to distant & private. In the shadowed area A, are found the projects focused more on the participation processes of the initiative. In the area B, the projects that are found are more concerned about the outcomes generated by the initiative rather than by whom the outcomes were obtained. Lastly, the dimension C illustrates projects without strict concerns of processes or outcomes. The remaining quadrants in the graph may represent renewable energy projects either in the hands of utility managers or private initiatives out of the community scope (Walker & Devine-Wright, 2008). Moreover, it can be said that there is a relationship between the outcome dimension and the communities of interests, and between the process dimension and the communities of locality.

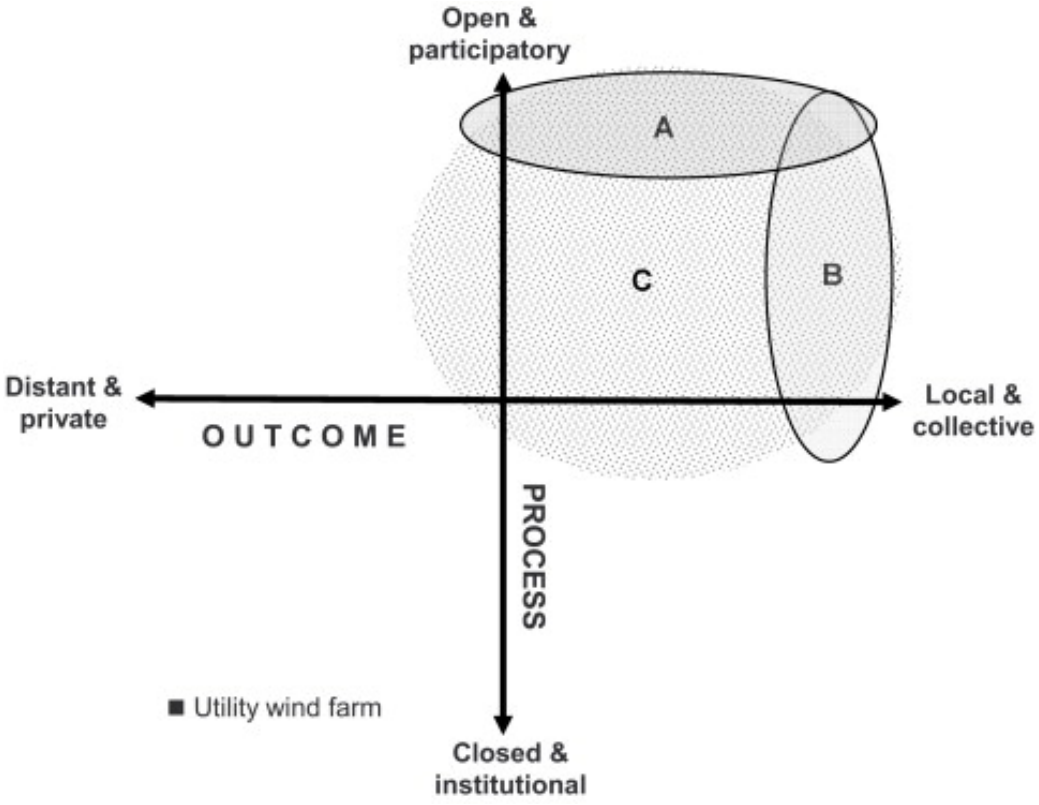

Figure 1. Process and Outcome Dimensions (Walker and Devine-Wright, 2010)

Finally, Walker (2008) distinguishes different models of ownership within Community Energy. The models are: cooperatives, community charities, development trusts, and shares of commercial projects owned by a local community organisation (Walker, 2008). The Energy Cooperative model will be further analysed in the next section.

From this sub-chapter the following insights can be presented. Theories regarding ownership and management of Community Energy were described. Ownership can involve levels of participation and different dimensions. For the management of Community Energy, two dimensions were also discussed regarding the outcomes of RET and the processes of renewable energy generation. Table 2 lists different modes of ownership found in literature (Enzensberger, Fichtner, & Rentz, 2003; Maruyama, Nishikido, & Iida, 2007; Schreuer & Weismeier-Sammer, 2010; Walker, 2008; Walker & Devine-Wright, 2008; Warren & McFadyen, 2010). And finally, The Energy Cooperative was introduced as one specific model of ownership within CE.

Modes of ownership
• Individual and collective ownership • Locally concentrated / geographically dispersed collective • Ownership of the means of production and ownership of its outcomes or benefits • Participation in the shares of the projects • Full ownership and co-ownership with one professional investor • Legal ownership and sense of ownership

Table 2. Modes of Ownership

3.5. Cooperative Model Theory

Within the renewable energy system, apart from the public and private sectors, different forms of renewable energy initiatives (at community level) may be found. These initiatives may use different organizational models such as: corporations, companies, associations, or even informal ventures between two enthusiastic persons. However, one of the aims of this research is to focus on the EC and therefore the need to select the cooperative model for further study.

Cooperatives, different from Public-Private-Partnerships (PPP) in which the main actors are from the Public and Private sectors, refer to organization models among 'users-investor' participants that can be from the community. Furthermore, different from the PPP the cooperative model has more community-roots in its organization. As described by Huybrechts and Mertens (2014) from the field of renewable energy, Cooperatives are 'firms that are owned by their users rather than by their investors (as is the case of capitalist corporations). It means that the former enjoy what is referred to as their "double quality". They are simultaneously members and users of the firm. Their ownership rights take a very specific configuration. First, firm's net earnings are usually divided pro rata among the members according to the volume of transactions they have realized with the firm. And second, all voting rights are apportioned among the members according to their relative amount of transactions, or, more simply, on a one member, one vote basis.' (Huybrechts & Mertens, 2014, p. 196). On the other hand, also limitations for the cooperative model are identified in the literature. Huybrechts and Mertens (2014) argue that some of the main limitations or barriers for the emergence and development of cooperatives are: limited access to capital, time consuming decision-making process, misleading social or stakeholders perception regarding the cooperatives (the authors argue that some cooperatives have lost their cooperative authenticity by adopting mainstream businesses practices), and barriers to entry (government regulations, market control, monopolies, and the size of the investments). Also, it is argued that despite of the main advantages of the Cooperatives, the mentioned limitations have hampered the diffusion of its model (Huybrechts & Mertens, 2014).

From the above mentioned three main characteristics can be highlighted: ownership by user-investors, division pro rata of income, and the one-member-one-vote basis. These three components can be translated for the convenience of this research into: legal ownership of goods (property rights of goods) by members of the cooperative, ownership/rights on the outcomes of the goods, and decision-making participation. Also, three main limitations are highlighted: access to capital, slow decision-making, and barriers to entry.

3.6. Energy Cooperatives Theory

For this research, the conceptualization of Energy Cooperatives (EC) is made out from the definition for Local Renewable Energy Organisations in the Netherlands which says: 'organisations, initiated and managed by actors from civil society, that aim to educate or facilitate people on efficient energy use, enable the collective procurement of renewable energy or technologies or actually provide (i.e. generate, treat or distribute), energy derived from renewable resources for consumption by inhabitants, participants or members. The latter live in the vicinity of the place where the renewable energy is generated.' (Boon & Dieperink, 2014, p. 298). From this concept the following factors are highlighted:

local management by its members, renewable energy knowledge sharing, renewable sources of production (RET), local production and consumption of energy by means of renewable sources (outcomes of the RET), implicitly the operational activities for the RET that make the EC to work (the management), implicitly the empowerment of the decision-making process, and the control and ownership of the EC.

EC theory also brings insights in the theoretical construction of PPCP about greening the grid in the co-provision of the energy system. EC theory adds a local dimension of energy generation by renewable sources means. It brings decentralized energy production and consumption to the conventional energy utility system. And it links communities in the co-provision of renewable energy with the remaining actors in the energy utility system.

The construction of the PPCP theory has its basis on PPP, examples of PPCP and 4P. It was argued that a C dimension is needed in order to go further in the PPCP construction. Therefore, cooperative theory, energy community theory and energy cooperatives theory were added into the theoretical building. The next sub-chapter brings a connective ingredient into the PPCP theoretical construction. Renewable energy co-provision literature is intended to add a binding relation among the public, private and community sectors. Before defining what PPCP are and what PPCP mean for EC, it is crucial to add the essence of what are these partnerships for. Therefore, renewable energy co-provision is addressed in the subsequent sub-chapter.

3.7. Renewable Energy Co-Provision.

The literature reviewed about Co-provision in utility systems is written by: Watson (2004), van Vliet and Chappells (1999), van Vliet (2012) and Chappells et al (2000). The mentioned authors also address energy co-provision. For this research, the focus is to gain understanding of the contributions of renewable energy co-provision theory for the PPCP theoretical construction. Specifically for binding the Community dimension within the desired PPCP.

Starting by defining the concept Co-provision, Chappell et al (2000) define it in the following way: 'utilities are currently defined as collective providers of goods and services mainly through large-scale technical infrastructures and physical networks... They are collective socio-material systems of provision' (Chappells et al., 2000, pp. 18–19). Moreover, there is a relationship between public utilities and citizen-consumers, in which the objective is the provision of resources and services (Chappells et al., 2000). Furthermore, the co-provider role states a relationship between consumers and providers in which the former shares with the latest the provision of electricity (or other utility services) to them or to other consumers (van Vliet, 2012).

Van Vliet and Chappells (1999) explain that in the organisation of utility services provision, two actors can be distinguished regarding the roles and level of involvement in the utility system management: active service providers and passive consumers (van Vliet & Chappells, 1999). As already addressed, these two actors are transiting into a more active relationship for both parties. Moreover, consumers and providers have been characterised for having a more vis-à-vis role in the network-bound services provision (van Vliet, 2012). Van Vliet and Chappells (1999) explain that 'co-provision is the provision (including generation, treatment, distribution and consumption) of utility services by a range of new intermediaries (Energy Cooperatives is one of the intermediaries included by the authors), alongside or intermingled with centrally provided systems' (van Vliet & Chappells, 1999, p. nd). From the prior argumentation, it can be highlighted the role of EC in renewable energy co-provision by provisioning energy (generation, transmission, distribution, load, consumption or storage) intermingled with the current energy system.

Chappells et al suggest that co-provision implies a set of new actors and intermediaries in the energy system (2000), and for the purpose of this research the Energy Cooperative actor is selected as the most relevant for the scope of this research and its upcoming sections. Moreover, Sedee (2014) explains that community energy initiatives, in which EC are included, have became new players within the energy system and she explains that these initiatives are playing an intermediary role

between the end-users and the energy companies or grid operators (Sedee, 2014). Moreover, members of EC may also have more roles within the energy system. In the EC, members may be consumers/end-users of the energy system and co-providers as well. Since energy generation by means of RET is intermittent, members of EC rely on energy companies as back-up providers of energy. Therefore, members of EC are still consumers/end-users (and co-providers as well in terms of renewable energy) of the conventional energy system. Additionally, both the members of EC and the EC are also co-providers of the energy system.

Chappells et al (2000) discuss the forms in which the systems of provision are found regarding ownership and management, the authors state that the utility services could be run by state companies, private companies or a combination of public and private holders (Chappells et al., 2000). Within the term 'private' the authors include any attempt of non-governmental intervention or any participant out of the public sphere, from which we can understand that community initiatives are also included (e.g. EC running windmills or Solar PV Panels to produce local renewable energy). Also, van Vliet provides an example about how in the last decades householders have become owners and (co)regulators of renewable energy and RET by installing house-scale technologies such as: Photovoltaic Solar Panels (PV), Micro Combined Heat, Power (CHP) and Wind Turbines. He also explains how these technologies and the co-provision role have made possible the delivery of electricity surplus in to the distribution grid (van Vliet, 2012).

Recapitulating, the relevance of co-provision for this research is that the three sectors under study are co-providing the utility service system for renewable energy. For instance, the public is setting the rules of the system of provision in the utilities while at the same time participating as shareholder in the different steps of the energy system (policy instruments may be also included). Furthermore, the service provision of the utility is performed by the private sector, but apart from markets or public modes of provision, other modes of provision are nowadays also included (Chappells et al., 2000). For instance, self-generation of renewable energy at local level by individual citizens or communities is nowadays an option in the energy system.

Then, the PPP theory implies formal participation among public and private sectors for the development and provision of public services, for this case the utility services regarding energy provision. When adding the Community pillar to PPP, it is assumed that also informal relationships are possible between the community sector with the public and the private sectors. Either formal or informal relationships, both are binding nexus in the renewable energy co-provision role between the different three sectors involved.

Co-provision among the public-private-community sectors in the energy utility system may suggest different levels regarding the ownership and management of the utility's hardware. Specifically, in the way ownership and management of the RET in EC is distributed by the three sectors. As Watson (2004) and Chappells et al (2000) argue, renewable energy co-provision can be also distinguished in the level of collaboration between consumers and producers including a shared ownership of the final outcome or in the level of active consumer role in the co-development of the renewable energy system which includes as well the delivery of renewable energy services and the ownership of RET, systems and services as well (Chappells et al., 2000; Watson, 2004). It can be assumed that a higher co-provision role may lead to more PPCP for EC in terms of ownership and management of RET and on the other hand a more passive role may lead to less PPCP, as figure 2 illustrates.

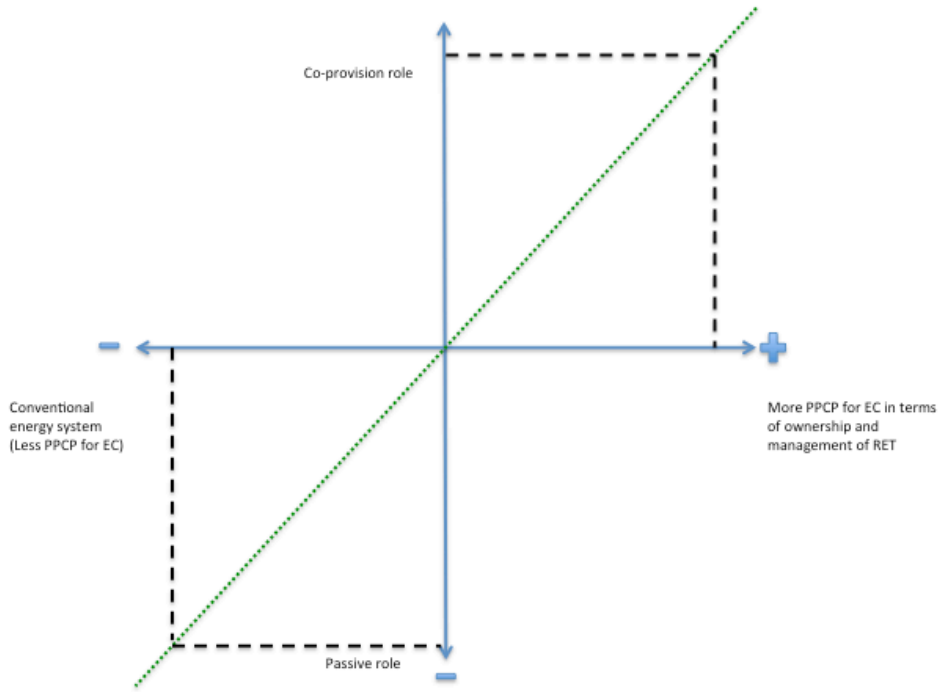

Figure 2. Co-provision role versus Passive role

What co-provision adds to the construction of the concept PPCP, is the collaborative and inter-dependent relationship among the three sectors in the service provision of renewable energy within the utility system. It is assumed that within the partnerships between the public, private and community sectors, co-provision roles are present. Therefore, co-provision ties the actors from the public, private and community sectors in the provision renewable of the renewable system. The three sectors are not isolated actors behaving and deciding about the renewable energy system on their own. Contrary, this role brings the collaboration ties for the co-shaping of the renewable energy system. Finally, and as the research questions suggest, the modes of ownership and management of the RET in the EC, in which the public, private and community sector can collaborate is yet to be answered.

3.8. Ownership and Management of Renewable Energy Technologies

To analyse the possible or on-going PPCP for EC in the case of Amsterdam, both ownership and management concepts need to be operationalized. Furthermore, RET are also subject of definition and operationalization due to the need of delimiting the type of technologies to be analysed, specifically for Energy Cooperatives.

3.8.1 Operationalization

Concepts	Definition	Indicator
Renewable Energy Technologies	Although the definition of technology includes more than devices (namely know-how, knowledge, systems, etc.), this research will focus only in devices at local level producing renewable energy as the main outcome by using renewable inputs. This research will focus on Solar PV panels, CHP, solar heaters, geothermal exchange, small urban turbines and on-shore windmills, which are the most recurrent in the inventory of energy cooperatives made for this research which is attached in the Annex 1.	RET capacity at community level or under the energy cooperative model.
Property	The property rights on the RET have two	Rights on the property: to

Rights of RET	dimensions: the rights on the ownership of the RET and the rights on the outcomes generated by the RET.	whom belongs the RET devices. Rights on the outcomes: to whom belongs the energy produced or the income/benefits generated by the RET outcomes.
Management of RET	For this research is understood as the capability to control and the power to decide about the use or disposition of the RET and its outcomes.	Who makes decisions, what kind of decisions are taken, under which formalities, how is the decision-making process regarding RET in the EC.

Table 3. Operationalization

3.9. What are Public-Private-Community-Partnerships and what do they mean for Energy Cooperatives in terms of Ownership and Management of the Renewable Energy Technologies?

From the Public-Private-Partnerships (PPP) theory, the co-provision literature and the Community pillar defined above, the concept of Public-Private-Community-Partnerships (PPCP) can be constructed. As already explained this is needed to analyse the kind of partner-relationships existing among the public, private and community sectors in terms of ownership and management of Renewable Energy Technologies (RET) in Energy Cooperatives (EC).

PPCP are defined as a binding contractual relationship, either formal or informal, between the public sector, the private sector and community-rooted initiatives. The contract relationships can be either bilateral or tripartite, always including the community sector. The nature of this binding contract is the co-provision of utility services, for this case renewable energy, by the public, private and community sectors. PPCP allocate responsibilities, roles, ownership, and management among the three participant partners. Within PPCP some of the partners may have double roles. For instance the community sector may have an user-investor role and a co-provider role, due to community-rooted initiatives invest in their own RET capacity but are still users of the public grid and utility services. Also, PPCP may vary regarding the level of involvement of the parties in the utility system co-provision, and this may range between more passive roles to more active service co-provider roles. PPCP aim to shift from an end-user/hierarchical relation in to a more partners' relation, in which parties work on the supply-and-demand-side of local renewable energy co-provision. Benefits, roles and responsibilities may be also shared according to what each party can do best.

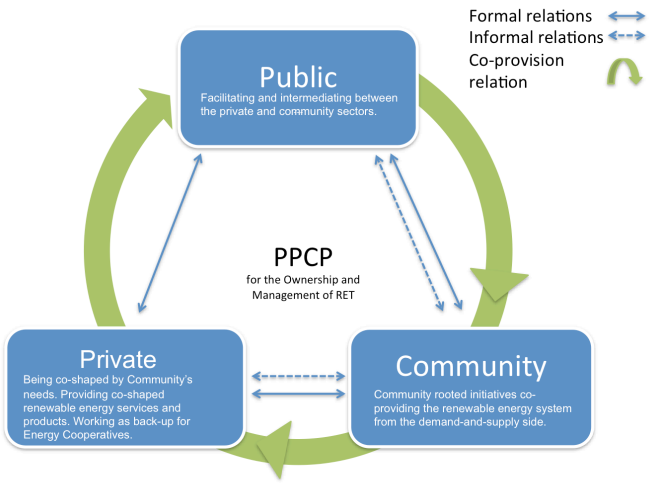

Figure 1. PPCP. Adapted from the P4 generic model from (Ng et al., 2013, p. 377)

PPCP are based on the democratization of collaboration, communication and decision-making, in which the relevant actors from the three sectors involved are included. Coordination and understanding of the desired and common goals make possible to have efficient and symmetric information in the partnership. By aligning information symmetry and adding transparency it is possible to obtain contractual stability based on each party's needs and potential roles. As well, by providing a platform of reciprocal and simultaneous information sharing in which parties can interact and ensure continuity of the projects subject to the PPCP.

Once the PPCP theoretical construction is done, other questions are still to be answered. Questions arise about who owns the RET and when, for how long does it last, how RET are managed, how decisions are taken and by whom. Moreover, questions like what kinds of PPCP are happening, empirically in Amsterdam, are yet to be answered. In the following chapter the empirical findings disclose answers for the second research question: What modes/forms of Public-Private-Community-Partnerships regarding ownership and management of Renewable Energy Technologies in Energy Cooperatives, do emerge in Amsterdam?

Chapter 4: Empirical Data

In this section the data gathered during the fieldwork is displayed. First, by presenting the case studies selected for this research. Thereafter, the data gathered either from the study sample and the different respondents from the public and private sectors it is organised and displayed under four themes that are based on the topics from the theoretical construction chapter. Within each theme data from all the respondents is displayed. In order to access the data of each respondent in separated texts, Annex 3 provides the transcripts of the interviews as well as its dates and interviewees.

Presentation of the cases

Table 4 presents and describes the cases and the organisation interviewed from the different sectors. The purpose of the description is to make the reader familiar whit each organisation before going into detail with the empirical data.

Community Sector	
Energy Cooperative	**Description**
Zuiderlicht	It is an energy cooperative organized and established under the cooperative model. The objective of this cooperative is: to produce and consume renewable energy at local level, to provide knowledge and information to its members regarding energy savings, and energy saving campaigns. By now, the cooperative has 60 members and it is currently running two renewable energy projects. This cooperative focuses on Solar PV panels, both on members' roofs and in solar projects. (F. Boon, interview, 2014).
NDSM Energie	NDSM Energie is an established energy cooperative placed in one shipyard area in Amsterdam. 60 members integrate NDSM Energie, these members are companies within the area, and they represent 60 out 400 of the companies established in the region of the shipyard. The objective of the EC is to be self-sufficient and start from the bottom-up in terms of RE generation. One of its objectives is to generate renewable energy to match electricity demand in the shipyard area. By the moment this cooperative has filed the permits for the construction of on-shore windmills but the resolution by the authorities is still pending. (van Eijk, interview, 2014).
Evergreenergy	This is the case of an emerging energy cooperative, which is in the initiative phase. Although Evergreenergy is not formally constituted and registered as a cooperative, it works in the practice as an energy cooperative. Evergreenergy started as a local initiative in a neighbourhood in Amsterdam Zuidoost, and its first task was to bring members of the neighbourhood together and create environmental awareness. The idea of creating the energy cooperative was suggested but locals did not follow the motion. The main reason was the financial resources. Nowadays, Evergreenergy has two members (households) that have Solar PV Panels' installations on their roofs. Evergreenergy explains that the awareness campaign in the neighbourhood spread out the idea of having solar PV panels on households' roofs. After this awareness campaign, it was explained that more solar PV panels' installations could be seen on the roofs within the neighbourhood. (Kruisheer, interview, 2014).

Amsterdam Energie	Amsterdam Energie is a constituted renewable energy cooperative established under the terms the cooperative model. One of the aims of this cooperative is that 'people may have influence on what they consume'. This cooperative is focused on Solar PV panels. (Steenwinkel, interview, 2014).
Zonnepanelen op het dak van Waternet	Zonnepanelen op het dak van Waternet is a constituted energy cooperative started by the workers of the water company denominated Waternet. The aim of this cooperative is Solar PV Panels' deployment on the roofs of Waternet's facilities. The EC started because of the awareness of the opportunity that the roofs of Waternet provide for renewable energy production. One of the goals of this cooperative is to reduce the conventional energy demand of Waternet and replace it with a supply of renewable energy gathered by solar PV panels. (Heemskerk, interview, 2014).
Onze Energie	Onze Energie is a constituted energy cooperative that has around 250 members. This cooperative is planned to run, operate, own, and manage, only windmills. By the moment this cooperative has filed the permits to build windmills, but the resolution is still pending. (Hort, interview, 2014).
Private Sector	
Company	**Description**
Lens Energie	Lens Energie B.V., is a company that owns the product 'Herman de Zonne Stroom Verdeler' (Herman). The product 'Herman' is a software that combined with hardware installations in buildings, facilitates renewable energy distribution within a building. Herman is a product for smart distribution of solar energy on common roofs. This product enables members within the same building to manage its own renewable energy production and to decide how this energy is distributed among households in the same building. (Brester, interview, 2014).
Alliander	Alliander is the holding company from which two business units derivate: Liander and Liandon. The network company of Alliander is responsible for the energy distribution in some areas in the Netherlands, included the city of Amsterdam. Alliander's expertise is the operation of complex private energy grids and installations. Besides Liander and Liandon, Alliander has a third business component within its network of companies. The third component is denominated EBA Emerging Businesses Area. (van Hest, interview, 2014).
Hoom	Hoom is one of the EBA projects of Alliander, and this is a consultancy and advising initiative for local renewable energy and energy saving measures. Hoom is focused on providing its services at the neighbourhood scale, such services and products include: soil and crawl space insulation, cavity walls insulation, solar water heaters, and solar panels. Such services are also aimed for EC. (Frietman, interview, 2014).

LDE Program	The LDE program is a platform of knowledge exchange between Alliander and Energy Cooperatives, that aims to facilitate local renewable energy projects by providing technical and expertise information about grids and RET. (Vissinga, interview, 2015).
Public Sector	
Organisation/Department	**Description**
The Economic Affairs Department	One of the responsibilities and activities of The Economic Affairs Department is to deal with the relationships regarding EC. Part of the objective of the Economic Affairs Department is to work as a facilitator and intermediary between EC and possible investors. As well as to act as a back-up for EC and bring confidence to investors or any interested one. Currently this department supports Windmills, CHP, isolation measures and Solar PV Panels projects. One of the aims of this department is to provide coaching and knowledge to EC regarding: legal matters and organizational models. Also, a goal is to provide subsidies and loans for renewable energy projects and initiatives. (van de Wiel, interview, 2014).

Table 2. Description of the cases and organisations interviewed.

Public-Private-Community-Partnerships for Energy Cooperatives in Amsterdam

Chapter 3 presented 'what Public-Private-Community-Partnerships are and what they mean for Energy Cooperatives in terms of ownership and management of Renewable Energy Technologies'. Now we can move further into finding empirical answers regarding 'what modes/forms of Public-Private-Community-Partnerships regarding ownership and management of Renewable Energy Technologies in Energy Cooperatives do emerge in Amsterdam'. Therefore, in the upcoming sub-chapters the data gathered during the data collection period aims to answer the latest query. The data is organised and displayed under the following themes: Renewable Energy Communities, Ownership and Management of Renewable Energy Technologies, Co-provision in the Renewable Energy System, and PPCP. These themes are based on the main insights taken from the theoretical framework.

4.1. The Renewable Energy Communities in Amsterdam

This sub-chapter displays the data gathered regarding how the renewable energy community initiatives from the study sample are organised. More precisely, the type of organizational model each initiative has. Thereafter, information is displayed about the members and its population size. Moreover, information is found regarding membership and members participation in the EC studied. Furthermore, data about how the EC are managed is also shown (there is a clear difference between the management of the EC and the management of the RET in the EC). At the end of this section, there is a summing up part that remarks the main findings from this theme.

4.1.1. The form of the initiatives

The energy cooperative model is the most prevalent organizational model regarding renewable energy community from the sample studied in Amsterdam. Also, from all the initiatives approached but for some reason were not included in the study sample (because they were not willing to participate or were in a very initial phase) all of them claimed to be energy cooperatives. Zuiderlicht, NDSM Energie, Amsterdam Energie, Zonnepanelen op het dak van Waternet, and Onze Energie are all constituted as Cooperatives under the Dutch regulations (Boon; van Eijk; Steenwinkel; Heemskerk; Hort, interview, 2014). However, Evergreenergy is the only renewable energy initiative that is not

formally (in legal terms) constituted as a cooperative but it states to function in the practice as an EC (Kruisheer, int, 2014).

4.1.2. The Members and the size of the Energy Cooperatives

Different types of members were found among the EC. These differences largely vary in the number of members in each cooperative, and in the composition of its members. While Evergreenergy is made out of two households in the same neighbourhood that mainly wanted to: be independent from the large energy companies, create environmental awareness in the neighbourhood and save energy (Kruisheer, int, 2014). NDSM Energie is a cooperative integrated by 60 members that are all companies (legal persons) within a shipyard area sharing the idea of being self-sufficient and being bottom-up initiatives in terms of RE generation (van Eijk, int, 2014). Onze Energie is an energy cooperative formed by approximately 250 members (natural persons) (Hort, int, 2014). Amsterdam Energie is an energy cooperative formed by both legal and natural persons. In Amsterdam Energy within the segment of legal persons the following type of members are found: local shops, pubs, and local businesses that want to join the cooperative (Steenwinkel, int, 2014). In contrast, Zonnepanelen op het dak van Waternet is an EC started by the workers of the water company denominated Waternet. In this energy cooperative members are (so far) only workers of Waternet. Zonnepanelen op het dak van Waternet started because of the environmental awareness of Waternet and its employees, but also because of the awareness of the opportunity that the roofs of Waternet provides for renewable energy production (Heemskerk, int, 2014). And, Zuiderlicht is nowadays formed by 60 members differentiated between: one-euro-members and full-members (Boon, int, 2014).

It is found that the composition of EC in Amsterdam goes beyond the civil society. Some EC are also integrated by legal persons or the combination of both natural and legal persons. Also, it is found how in some cases EC were born for very specific bi-lateral purposes as in the case of Waternet, in which the community sector and the public-owned water company wanted to reduce the energy consumption of the water company processes by generating local renewable energy. Then, Zuiderlicht also illustrates another differentiation in its members, which will be discussed in detail under the heading 'Management of the Energy Cooperatives'.

4.1.3. Members' participation in the Energy Cooperatives

Regarding members' participation in the cooperative model, EC that are formally constituted use the shares scheme in order to certificate each member's participation. NDSM Energie, Amsterdam Energie, and Zonnepanelen op het dak van Waternet issue shares to their members based on each member economical participation (van Eijk; Steenwinkel; Heemskerk, int, 2014). In NDSM Energie there is a clear distinction regarding the size of the capital investment needed from each member in order to get shares in the cooperative, which must be proportional to the size of each company businesses (van Eijk, int, 2014). On the other hand, there are three clear examples from the study sample that do not issue shares certificates. Evergreenergy does not issue any kind of share or certificate for the economic participation of its members in the initiative since it is not formally constituted as a cooperative (Kruisheer, int, 2014). Zuiderlicht on the other hand, uses a loans scheme. This cooperative explains that by using shares members would find it easier to trade the shares with outsiders of the cooperative whenever members want to quit the energy cooperative, and by using loans members do not find it attractive to trade with debt-rights contracted with the cooperative (F. Boon, int, 2014). Although Onze Energie is formally constituted as an energy cooperative, it has not issued shares certificates yet for its members (Hort, int, 2014).

Either shares or loans, both represent a way to certificate the capitalization by members in the energy cooperatives. By definition and theory, neither energy cooperatives nor Community Energy mandates to issue or hold any kind of participation certificates. On the other hand, cooperative theory and law contemplates the issuing of these certificates as a formality for member's participation in cooperatives. Also, for the case in which loans are preferred over shares because of the lock-in effect for the transmissibility of the certificates that the former is supposed to ensure, there exist the option to agree and adopt during a General Meeting the 'right of first refusal'. By doing so, there is an obligation for noticing the members of the EC the intentions to trade the shares and give them the priority to buy the

shares subject to trade As Amsterdam Energie and Zonnepanelen op het dak van Waternet already do. (Steenwinkel; Heemskerk, int, 2014). This right of first refusal may provide the EC an option to keep the civil-rooted empowerment that characterises this kind of initiatives.

4.1.4. Management of the Energy Cooperatives

Regarding the management of the EC all of them provide data about how the initiatives deal with the administration of the cooperatives and its daily tasks. Differences were found between formal procedures for the management and simpler forms of management. From the study sample all the EC, except Evergreenergy, are administrated by a Board of Managers, which is in charge of operating the daily tasks for running the cooperatives. The Board of Managers in the EC works under a volunteer-basis, therefore its members do not receive any payment for the activities performed. (Boon; van Eijk; Steenwinkel; Heemskerk; Hort; Kruisheer, int, 2014). For more expertise operations and expertise decisions, hiring of external services of management was also found (van Eijk; Heemskerk, int, 2014).

The empirical data also found that in the EC, except Evergreenergy, there is a General Meeting, which is the maximum authority within the cooperative organizational model and it is formed by the sum of all its members. The General Meeting is in charge of the decisions-making process regarding the affairs of the EC. On the other hand, Evergreenergy does not have a formal decision-making process since it is not a formally constituted cooperative. Therefore, decisions are taken whenever needed and without any kind of procedure or formality defined (Boon; van Eijk; Steenwinkel; Heemskerk; Hort; Kruisheer, int, 2014). The General Meeting is one of the ways in which the EC ensure: the empowerment of the decision-making, the democratization of decisions, and the control of the EC by its members.

Regarding the decision-making process in the study sample, members of the cooperatives do have participation rights in the General Meeting. Becoming a member grants voting rights in the General Meeting, which follows the rule one-member-one-vote, regardless the size of the shares (applies the same rule for the size of the loan certificate in Zuiderlicht). The General Meeting takes place two times a year, except for Onze Energie in which the General Meeting takes place once per year (Boon; van Eijk; Steenwinkel; Heemskerk; Hort, int, 2014). In contrast, Zuiderlicht makes a clear distinction among its members; only full members that invest capital in the cooperative are allowed to participate in the decision-making process. Hence, one-euro-members are excluded of the decision-making process. One-euro-members are only allowed to participate in the activities performed by the cooperative and to be provided with the cooperative's services (Boon, int, 2014).

4.1.5. Summing-up

The empirical findings displayed in this theme showed that population size varies from cooperative to cooperative (from two members to up to 250 members). Any of the EC studied manifested the number of members as a limitation for its emergence or development. Moreover, there is no restriction in literature found for the minimum or maximum size of population for EC or implications regarding the size of EC.

Under this theme the study of the EC found similarities with the Energy Community literature review. The EC studied, as well as the Community Energy literature review, evidence that this organisational form enables communities to get involved in supply-and demand-side sustainable energy initiatives (Walker & Devine-Wright, 2008). Moreover, these EC exhibit a high degree of ownership and control of the cooperatives as the literature of Walker and Devine-Wright (2008) argues. It can be distinguished from the EC studied a double role by their members, which are simultaneously members and users of the EC. Also, members of EC are users and investors in the EC, in which the investments come from the community sector (e.g. NDSM community in the shipyard). Furthermore, these EC are owned by their users (under the quality of users-investors) rather than owned by conventional businessmen, as well as the literature review by Huybrechts and Mertens (2014) addresses. The EC studied match the conceptualisation for EC that this research defined for. Although some EC are conformed by natural persons, legal persons or both; all of them were initiated and are managed by actors from the local civil society.

As well, regarding the management of the EC the majority has a Board of Members and organises a General Meeting for the decision-making process. But regardless the General Meeting, all the EC have the power and control in the decision-making process in each energy cooperative by following the principles of democratization and 'one-member-one-vote'. Regarding the last point, there is one exception from the EC studied that makes a distinction between full-members and euro-members and the kind of decision-making rights granted within the cooperative. Which it may contradict the idea behind CE literature, specifically the statement of high degree of control of the renewable energy means by its members (Walker & Devine-Wright, 2008). On the other hand, this distinction about types of members and rights may support the cooperative model theory that states that voting rights are allocated to each member according to the amount of his/her transactions (Huybrechts & Mertens, 2014). The one-euro-members do benefit collectively from the outcomes generated by the energy cooperative related to: access to local renewable energy, energy savings advise, knowledge, and networking.

4.2. Ownership and Management of the Renewable Energy Technologies in the Energy Cooperatives in Amsterdam

Data about two dimensions of ownership and one dimensions of management of the RET is addressed in this section. At the end of this section, there is a summing up part that remarks the main findings from this theme. Regarding the property rights on the ownership of the RET in the EC, two dimensions can be distinguished: (1) the property rights on the ownership of the RET and (2) the rights on the outcomes generated by the RET.

4.2.1. Ownership dimension: the property rights on the ownership of the Renewable Energy Technologies

For the first dimension I found that for the formally constituted EC follow the rule of the cooperative model, which says the members are the owners of the cooperative and the cooperative is the owner of the assets within the cooperative. Members are together the co-owners of the cooperative and as a result co-owners of its assets, in which the RET are included (Boon; van Eijk; Steenwinkel; Heemskerk; Hort, int, 2014). For the case of Evergreenergy householders are not co-owners of the RET among them, each household is fully-owner of their own RET installed (Kruisheer, int, 2014).

On the same track of the first dimension (property rights on the ownership of the RET) the empirical data found that in the case of Zuiderlicht currently runs and owns two renewable energy projects (consisting in solar PV panels farms to be finished next year) besides the RET installations on members' roofs (Boon, int, 2014). For the case of Zonnepanelen op het dak van Waternet, solar PV panels are not allocated on members' roofs, instead members are the owners of the sum of solar PV panels installations on different locations of the water company facilities (Heemskerk, int, 2014). Amsterdam Energie owns the RET installed on members roofs and does not own further solar PV panels or windmill projects (Steenwinkel, int, 2014). In Evergreenenergy, each member owns their own solar PV panels' installation on their own roofs (Kruisheer, int, 2014). While NDSM Energie and Onze Energie do not own yet any kind of RET project or installations, since both wait for the permission resolution from the provincial government for windmills projects (van Eijk; Hort, int, 2014).

The empirical data found that the ownership of the RET in the EC studied is not subject to co-ownership by actors different than members in each cooperative (Boon; van Eijk; Steenwinkel; Heemskerk; Hort; Kruisheer, int, 2014). Meaning that there is not an external investor keeping part of the ownership of the RET out of the cooperative model. Or, the opposite case, there is no cooperative which owns part of the RET or part of a RET project and the remaining part is independently kept and own by a non-member of a cooperative.

4.2.2. Ownership dimension: the rights on the outcomes generated by the Renewable Energy Technologies

For the second dimension the empirical data supports that regarding the outcomes of the RET in the EC, the energy generated by these technologies is also subject to ownership rights. In principle, if one has the full-ownership or the full-property rights on a good, in this case the RET, then the fruits derived from the good do belong as well to the full owner(s) of the RET. In the case of the members in cooperatives, members are the owners of the cooperative, the cooperative is the owner of its assets included the RET, and therefore the members are the owners of the RET and its outcomes. As a result, cooperatives can decide on the outcomes generated. The EC studied respond to this argumentation with two clear exemptions. NDSM and Onze Energie which have not renewable energy production yet, and Zuiderlicht which makes a distinction between one-euro-members and full-members in which the former does not have voting rights neither economic participation on RET in the EC. Therefore, these one-euro-members cannot decide neither benefit from the RET outcomes.

After the renewable energy is generated in the EC, this energy may take different destinations. It can be either consumed at source or sent back in to the grid and bought by an energy company. In the case of Evergreenergy, Zonnepanelen op het dak van Waternet, and Amsterdam Energie the renewable energy is consumed at source (Kruisheer; Hort; Steenwinkel, int, 2014). For Zuiderlicht, some of its renewable energy production is sold to Green Choice and its members consume the rest (Boon, int, 2014). In the case of Zonnepanelen op het dak van Waternet, the renewable energy is not consumed by its members even though they are the owners of this outcome. Instead, Zonnepanelen op het dak van Waternet has an energy provision agreement with Waternet for the supply of the renewable energy that is locally consumed within Waternet facilities. For Zuiderlicht and Zonnepanelen op het dak van Waternet there is an ownership transfer of the renewable energy produced to their respective buyers (Heemskerk, int, 2014).

Another outcome generated by the RET in the EC is financial income. Zuiderlicht and Zonnepanelen op het dak van Waternet have an income from the sales of renewable energy. Therefore, members of these two cooperatives are the owners of this income. In the case of Zonnepanelen op het dak van Waternet as a result of the renewable energy transaction the income is either re-invested or divided among its members (Heemskerk, int, 2014). In Zuiderlicht, the loans certificates are paid by the cooperative to its members in the form of interests of the principal debt (Boon, int, 2014). On the other hand, in the cases that there is not a direct income for the sales of renewable energy, there may be savings for the conventional energy that was not consumed and therefore is not paid. Either the repayment of interests or dividends both are subject to the approval of the General Meeting, which can also approve the re-investment of capital in the cooperatives as the empirical data found in two cases. (1) Zuiderlicht states, members may decide between gaining income or investing in more RET capacity and increase economic savings in their energy bills. Also, Zuiderlicht explains that by using the loans scheme members are able to have higher returns than with a shares scheme due to taxation strategies that the former scheme allows (Boon, int, 2014). (2) For the case of Amsterdam Energie, it is explained that whenever the cooperative has profits, this income is always re-invested in the cooperative as established in its bylaws (Steenwinkel, int, 2014).

Regarding the ownership of the RET in Evergreenergy initiative, the solar PV panels installations were possible by using the 'bedrijfzoektbuur' scheme. Every household in the Evergreenergy initiative is the owner of the outcomes generated by the RET, and the renewable energy outcome of the solar PV panels is directly consumed by each member. The capital resources for the financing of the RET installation came from 3 sources: municipal subsidy, personal savings, and a private initiative (Kruisheer, int, 2014). Both the subsidy and the personal savings resources do not represent a further debtor obligation. The financing covered the half of the money required for the solar PV panels project. The ownership of the solar PV panels kept on the hands of the private initiative until the principal debt and its interests are fully paid to the creditor. The debtor, who is as well the end-user of the solar PV panels pays the financing based on the energy-savings made as a result of the RET. The payback period for this project is 6 years, which also brings the property rights of the solar project to the debtor party (Kruisheer, int, 2014).

Although EC may collectively benefit from the outcomes generated by their means of renewable energy production as the literature review points out, it may be the case that benefits from this outcomes are limited somehow. The empirical data found the example of Zuiderlicht, which explained that one of the legal limitations for EC is that are not allowed to trade energy (Boon, int, 2014). This implies that if EC have surpluses of renewable energy they cannot trade this energy with another cooperatives, citizens, neighbourhoods or its own members. Therefore, an intermediary is needed and this intermediary must be allowed to trade with energy, for instance Green Choice in the case of Zuiderlicht (Boon, int, 2014). As a result, this fact conditions the free disposition of the renewable energy produced in the EC. Meaning that the disposition of the ownership of the RET outcomes is limited. Zuiderlicht explains that taxation over the renewable energy sent back in to the grid and the consumption of renewable energy later on, does not represent a business case to people willing to invest in renewable energy (Boon, int, 2014).

4.2.3. Management

Regarding the management of the RET and its outcomes the EC studied reveal different forms of dealing with administration. Although NDSM Energie and Onze Energie are not producing renewable energy yet, both have become formally established as EC (van Eijk; Hort, int, 2014). Therefore, for both NDSM Energie and Onze Energie there is not management for the means of renewable energy production or for the production itself. Moreover, regarding technical operations and expertise roles related to EC, NDSM Energie states that they are 'amateurs in energy... but learning everyday...' Therefore, the technical knowledge is taken externally, for instance for filing the application for the windmills permits (van Eijk, int, 2014).

The empirical data also found an example in which the management is divided in specializations. In Amsterdam Energie the management of the RET is divided in two working groups: the workgroup for windmills and the workgroup for solar PV panels. Both of them conformed by volunteers. The first one works on finding locations in the districts in the nearby. The job is to find and deal with both: opposition for future projects and support from communities and local businesses. Moreover, the working group for solar PV panels is conformed by the respondent and a lawyer, and they are in charge for advising members regarding regulations, business strategies and taxation affairs related to the RET (Steenwinkel, int, 2014). On the other hand, in the rest of the EC studied there are not specialized divisions for the management of the RET. Regarding the volunteering basis in in the EC studied, Zuiderlicht explained that volunteers get tired and demotivated with the time. Therefore, this energy cooperative is working in a next step in its operation, which is to look for a business model that generates money to pay to the Board of Managers (Boon, int, 2014).

In the case of Evergreenergy there is not a complex management of the RET due to its members individually consume at source the renewable energy gathered from the sun by the solar PV panels (Kruisheer, int, 2014). In the case of Zonnepanelen op het dak van Waternet, this cooperative has signed a services provision contract with another energy cooperative (Zon op Nederland) for hiring administrative services about: know-how and expertise for running the energy cooperative. Also, activities such as tax calculations and the calculation of dividends for the members of Zonnepanelen op het dak van Waternet, are included in the administrative services (Heemskerk, int, 2014).

Also, regarding the findings about the RET outcomes; in some of the EC studied communities of locality and communities of interest were found (Walker, 2008). Communities of interest were found in Amsterdam Energie and Zuiderlicht due to the fact that members do not live in the same neighbourhood but they are all equally concerned about renewable energy procurement. On the other hand, in Evergreenergy communities of locality were found due to its members live in the same neighbourhood and want to address local renewable energy co-production issues. For Onze Energie it cannot be concluded that they fit under the description of community of locality or interest due to its very start-up phase. For Zonnepanelen op het dak van Waternet and NDSM Energie, both were found as communities of locality with a remark. In Zonnepanelen op het dak van Waternet its members do not live in same place where they produce and consume the renewable energy produced. This is because of the renewable energy is meant to be consumed by Waternet. In NDSM Energie, should be

clarified that its members are companies or industries willing to reduce its conventional energy consumption by replacing it with renewable energy generation at local level. Indeed NDSM Energie is a community of locality but instead of people consuming the energy there are businesses doing so.

The empirical data identified outcome, process and alternative dimensions, regarding the management of the RET and its outcomes in some of the EC studied (Walker & Devine-Wright, 2008). For instance, NDSM Energie stated that it is important for them to bring the companies from the shipyard together in the cooperative as well as the communities in the area (van Eijk, int, 2014). Meaning that there is an interest in the process dimension about how the cooperative is organised. In other words, this energy cooperative is more concerned about who participates in the cooperative. As well, Zonnepanelen op het dak van Waternet aims for workers of Waternet to join the cooperative (Heemskerk, int, 2014). On the other hand, Zonnepanelen op het dak van Waternet may also fit under the outcomes dimension description due to its members are also concern about where the benefits are distributed. In other words, even if the outcomes of the RET cannot be consumed directly by its members, they are concerned about the place they work and the conventional energy savings that Waternet may have. Therefore, Zonnepanelen op het dak van Waternet may also be identified under the alternative dimension, in which members agreed in a project that brings benefits for Waternet and the community.

4.2.4. Summing-up

The data gathered and displayed under this theme from the EC studied, brings diverse answers depending on each energy cooperative situation. However, similarities are also present between the EC. Examples were found in which the EC do not own any kind of RET yet, and therefore any direct outcome neither generated nor managed. On the other hand, examples were also found about EC that own RET and its outcomes and these outcomes are subject to the members' decision. Also, the empirical data shows that the management of RET and outcomes is not an activity yet in some EC due to some initiatives are in a very preliminary phase. While also examples are provided about EC that already have specialised divisions for the RET management.

The empirical data found that income and energy are some of the outcomes generated by the RET in the EC studied, as well as Seyfang et al (2013) did in their literature. The empirical data found, as well as the literature review previously suggested, that EC were owned in different levels. From the EC studied it was found that they are fully owned by the community and there is not co-ownership between the community and the private sector. Either the ownership of the RET, or the cooperatives or the outcomes generated by the EC, are all under the ownership of the EC and their members. There is also a case in which members of an energy cooperative are not co-owners between them of the RET, and each member owns individually his/her means of renewable energy production.

4.3. Co-provision of the Renewable Energy System in Amsterdam

Within this theme the data gathered regarding Co-provision of the renewable energy system in Amsterdam is displayed. This data exemplifies the co-provision role in Amsterdam between the public, private and community sectors. Under the last heading there is a summing up paragraph that remarks the main findings from this theme.

The empirical data found under this theme that the public, private and community sectors are co-providing the utility service system for renewable energy. Evidence was found from the three sectors: public, private and community. For instance, the public sector (the Economic Affairs Department in the Municipality of Amsterdam) deals with the relationships regarding Energy Cooperatives (EC). Part of the objective of the Economic Affairs Department is to work as a facilitator and intermediary between EC and the private sector. As well as to back-up EC and bring confidence to possible investors from the private sector (van de Wiel, int, 2014). The department also stated that currently the municipal government supports EC in windmills, CHP and solar PV panels' projects (van de Wiel, int, 2014). To do so, the Municipality of Amsterdam through the Economic Affairs Department provides subsidies and loans for renewable energy projects and initiatives. Also, the department assists EC with

coaching and knowledge regarding legal matters and organizational advice (van de Wiel, int, 2014). From the private sector, Alliander and its branch companies, also co-provide the utility service system for renewable energy. Alliander N.V., is a public owned company in which the Dutch provinces and municipalities either directly or indirectly hold its shares (Alliander, 2015). Therefore, Alliander has a public and private role in the renewable energy co-provision. On the one hand, in its public role Alliander is an executor of the policies and needs from the Dutch provinces. On the other hand, Liander operates the energy grid based on what is required by law and the public authorities (private role). From the community sector, EC are self-generating renewable energy by their means of production.

The three sectors are co-providing the renewable energy system. Between the private and community sectors, the EC studied share the provision of electricity with the conventional energy producers in Amsterdam. The public sector is acting as a facilitator, advisor and grantor of resources for the accomplishment of renewable energy projects at community level. It is found that due to the current RET are intermittent in terms of renewable energy supply, co-provision is affected in EC. Zuiderlicht argues that consumers need a constant supply of renewable energy and at the moment this cooperative cannot provide its members with this service. Moreover, Zuiderlicht explains that 'this is the kind of service (we) would like to provide and don't have it yet, (we) don't have this expertise, that's why we have a partnership with Green Choice' (Boon, int, 2014). Zuiderlicht states that the partnership consists in providing constant supply of renewable energy to the members of Zuiderlicht (not exclusive) and granting 50 euros annually to Zuiderlicht for every member serviced by Green Choice (Boon, int, 2014). Therefore, this is one way how renewable energy is co-provided when intermittency of supply is a constraint.

Some EC are playing and intermediary role between their members and the renewable energy companies. This is the case of Zuiderlicht, Onze Energie, and Amsterdam Energie, which stated that by having a memberships in one of these cooperatives members can get access to renewable energy supply. This energy comes from each cooperative production or by the renewable energy companies that are backing-up the EC (Boon; Hort; Steenwinkel, int, 2014).

Also, the empirical data found more evidence of the co-provision role. Amsterdam Energie states that one of its aims is that 'people may have influence on what they consume, a connexion between the product bought and you...' How people co-shape the energy system by consuming and producing renewable energy is one of the main objectives for Amasterdam Energie (Steenwinkel, int, 2014). Also, it can be highlighted an active role of this cooperative when trying to have influence on the renewable energy they consume and produce.

One of the objectives of Waternet is to be supplied by renewable and locally produced energy in order to decrease the conventional energy consumption for its water services provision (Heemskerk, int, 2014). In order to accomplish this objective Zonnepanelen op het dak van Waternet has two goals. The first is to decrease the conventional energy demand of Waternet by consuming renewable energy produced at source. To do so, the supply of renewable energy is gathered by solar PV panels installed at source on the facilities' roofs of Waternet (Heemskerk, int, 2014). Although members of this cooperative do not consume directly the renewable energy produced, the idea is that the company in which they are working for consumes the energy. Therefore, the co-provision role can also be highlighted. Then, the second goal is to show environmental commitment by reducing conventional energy consumption in the operational activities of Waternet and by creating awareness of the potentiality of renewable energy (Heemskerk, int, 2014). Therefore, the effects of the second goal goes beyond the energy cooperative by co-shaping people's behaviour and spreading this behaviour out of the cooperative.

Although Zuiderlicht, or any other energy cooperative, could provide with renewable energy to all its members, at the moment it is not economically viable to produce renewable energy, then put it back in the grid and then sell it to the members. According to Zuiderlicht, the reason is because if one does so, then taxes have to be paid (Boon, int, 2014). Zuiderlicht states that people are willing to pay for using the grid, because you really use the grid, but *'we don't want to pay taxes on energy we produce*

ourselves, we want to pay for the services, like using the grid, that's very normal, or for the use of the infrastructure. We invest in our own energy production... For example, if you have a garden where you grow vegetables yourself, you don't pay taxes on consuming your own vegetables. We have the same feel when you grow your vegetables and you put your own solar panels and produce energy' (Boon, int, 2014). Moreover, Zonnepanelen op het dak van Waternet agrees that one of the main limitations to both scale-up and spread-out renewable energy projects is the national legislation regarding taxation. Although this cooperative states to be enthusiastic about larger and more roof projects, it argues that the taxation regime does not provide a cost-effective incentive for the members of Zonnepanelen op het dak van Waternet in order to scale up the cooperative (Heemskerk, int, 2014). Based on these examples and according to the experiences of these two EC, it can be said that taxation policy affects the co-provision role. This affection may support the co-provision role by making parties more inevitable dependant on each other or discouraging EC for the scaling-up of further projects.

NDSM Energie' objective is to match the local energy demand of its members in the shipyard with local renewable energy supply. Renewable energy gathered through on-shore windmills is the aim of NDMS Energie. This cooperative has already started on-going projects to include communities in the cooperative and in the renewable energy initiative (van Eijk, int, 2014). Onze Energie is closely working together with NDSM Energie by pursuing shared environmental goals (van Eijk; Hort, int, 2014).

The empirical data also found evidence of the co-provision role in the case of Evergreenergy, which explains that this initiative has produced renewable energy at local level and spread out its environmental commitment in the neighbourhood (Kruisheer, int, 2014). Although members of the neighbourhood were not enthusiastic to formally participate within a cooperative model, the environmental awareness produced during the lobbying for the cooperative made some locals to independently install solar PV panels within the neighbourhood. Therefore, the awareness campaign co-shaped the renewable energy system at neighbourhood-scale, in the way neighbours consume energy and from where they get it. Also, this case is an example of co-provision regarding how households can consume local renewable energy intermingled with conventional energy and at the same time to produce its own local renewable energy.

4.3.1. Summing-up

Under this theme the data showed how the EC studied, the public, and private sectors co-provide the renewable energy system in Amsterdam. The data found that co-provision may be affected by the intermittency of the renewable energy supply by means of the RET in the EC, but this fact can also be a stimulant for new co-provision relationships between EC and other actors (private sector) within the renewable energy system. Also, environmental awareness campaigns were opportunities to spread out a behavioural change regarding renewable energy consumption and production. By changing mind-sets, the renewable energy system may be co-shaped in to a system in which all actors co-provide the system. Regulations and legislations are seen as main limitation to both scale-up and spread-out renewable energy projects and go further in the renewable energy co-provision. It was also found that some EC are networking among them and others are partnering with other sectors from the public and private sectors, which was identified as well by Seyfang et al (2013) as a factor that influence the emergence and development of CE.

What this co-provision evidence adds to the construction of the concept PPCP, is the collaborative and inter-dependent relationship among the three sectors in the service provision of renewable energy within the utility system. It was evidenced that in the relationships between the public, private and community sectors, co-provision roles are present. Although, the relationship between the Dutch provinces and the grid operator is formal, networking between EC and the supporting relationship between the public and the community sectors can be seen as informal.

4.4. Public-Private-Community-Partnerships for Energy Cooperatives in Amsterdam

The Energy Cooperatives (EC), the public and private organisations studied in Amsterdam, evidence ways of Public-Private-Community collaboration. These partnerships are found in three different relationships: community-private, community-public, and public-private-community. The data collected that evidences the three partner relations is displayed in the upcoming sub-titles. Theme 4 brings insights from the first three themes and also new data is displayed. The reasoning behind is because the three first themes construct the PPCP (theme 4). Under the last heading there is a summing up paragraph that remarks the main findings from this theme.

4.4.1. Public- private-community

The empirical data found examples of PPCP between the EC studied and actors from the public and private sectors. Zonnepanelen op het dak van Waternet can be understood as a tripartite formal binding contractual relationship between the public-owned company Waternet and the community sector represented by its workers. Zonnepanelen op het dak van Waternet has a contractual relationship with the public-owned company 'Waternet' for the (co)provision of renewable energy, and all the production generated by the solar PV panels is for the consumption of Waternet (Heemskerk, int, 2014). This is possible by allowing the workers community of Waternet to install solar PV panels on the roofs of Waternet's facilities (Heemskerk, int, 2014). Then, the transaction of renewable energy generates an income for the energy cooperative, which after subtracting costs is either re-invested or divided between members (Heemskerk, int, 2014). It can be distinguished a clear allocation of roles between the members of this PPCP, in which the public-private is responsible for matching its energy demand with the renewable energy production by the energy cooperative. As well Waternet is responsible for permitting the energy cooperative to use the roofs of one of Waternet's facilities. It can be also distinguished the active role of the workers community, which invest in renewable energy production for the consumption of Waternet.

The empirical data showed examples of PPCP in the case of Amsterdam Energie. This energy cooperative has a bilateral binding contractual relationship with the public sector and bilateral relationships with the private for the co-provision of renewable energy. Amsterdam Energie states that it has cooperation with the public and private sector (Steenwinkel, int, 2014). The energy cooperative explains that they receive the subsidy 'Stimulering Duurzame Energieproductie' (SDE), which is granted yearly and it is based on the EC' productivity (Steenwinkel, int, 2014). Moreover, Amsterdam Energie explains that the Municipality of Amsterdam has a program for sharing investments risks (regarding RET). In detail, this program is about bearing the initial costs for the permit's application fees of wind turbines, paid by the public sector and in behalf of the EC (Steenwinkel, int, 2014).

Also, Amsterdam Energie collaborates with Alliander, and within this cooperation their main goals are: to build a community of people involved with the energy problems of Amsterdam, to sell green energy, to make green energy a business, to start renewable energy installations, and to reduce conventional energy consumption (earn the most of carbon exhaust) (Steenwinkel, int, 2014).

For the mentioned collaboration between Alliander and Amsterdam Energie, the former uses one of its branch companies denominated 'Hoom' (Steenwinkel, int, 2014). Hoom is in charge of the community affairs on behalf of Alliander's businesses (Frietman, int, 2014). One of the main objectives of Hoom is to engage local communities, municipalities and Hoom in working together for local renewable energy initiatives (Frietman, int, 2014). Therefore, Hoom and Amsterdam Energie have a partnership relation to approach communities willing to participate in renewable energy projects in which co-provision of renewable energy may also fit. Amsterdam Energie states that people trust the cooperative because it does not have a very commercial face rather than the big energy companies (Steenwinkel, int, 2014). Within this partnership, Amsterdam Energie works as the front-face for communities, and its main role is to approach people in the communities (Steenwinkel, int, 2014). It also works as a facilitator, organizer and promoter in order to bring people together for Hoom businesses (Steenwinkel, int, 2014). Amsterdam Energie explains that for this partnership Hoom works as the back-up office for Amsterdam Energie, and in exchange the latest receives 30 euros for each costumer brought to Hoom businesses (Steenwinkel, int, 2014). Also, this partnership works as a

knowledge-exchange relation in which both parties collaboratively participate by learning from the communities' needs (Steenwinkel, int, 2014). Amsterdam Energie argues that 'we do not provide a mass-product, thus very specific solutions for each costumer are needed… Hence, the need to collaborate' (Steenwinkel, int, 2014).

From the findings regarding Amsterdam Energie and Hoom mentioned above, the following can be distinguished. There is a clear allocation of roles between the two actors regarding the tasks each partner has to do and the benefits that each one receives. It can be also distinguished the double role of Amsterdam Energie, one role as an energy cooperative and the other as a connector between communities and businesses.

The empirical data shows examples of PPCP from Alliander. Although Alliander is not an energy cooperative, it is a key player in the energy system in which EC interact. The empirical data will show how the public, private and community sectors are partnering for the renewable energy provision.

Alliander is a key player in the energy system in The Netherlands and it is also a key player for possible public-private-community partnerships. The network company of Alliander is responsible for the energy distribution in some areas in the Netherlands, including the city of Amsterdam. Alliander's expertise is the operation of complex private energy grids and installations (Alliander, 2009). Regarding the ownership of Alliander N.V., the Dutch provinces and municipalities either directly or indirectly hold its shares. This explains the public and private role of Alliander in its grid operator role. Moreover, Alliander is administrated by a Management Board that is in charge of running the day-to-day businesses (Alliander, 2015). Besides Liander and Liandon, Alliander has a third business component within its network of companies. The third component is denominated EBA (Emerging Businesses Area). This branch of Alliander is the entity developing energy services for end-users of the energy grid. Under end-users it is also included the EC (van Hest, int, 2014).

Among the different companies under the 'EBA', the most outstanding for this research are: EXE, TIPPIQ, MPARE, HOOM and DGO. All of these companies are projects already established and in a start-up phase. For the Public-Private-Community relation, the DGO project is the most suitable. Therefore, the remaining EBA's projects are best addressed under the relationship Private-Community and discussed later on (van Hest, int, 2014).

DGO (Duurzame Gebiedsontwikkeling) is a project committed with the sustainable development of areas and neighbourhoods. The aim of DGO is to look for areas and work on sustainable development by advising and investing in energy infrastructure in order to improve the current situation of the selected areas (van Hest, int, 2014). DGO states that this commitment is only possible by partnering with governments, business and end-users. Moreover, DGO is a way to connect providers of renewable energy, with governments and the end-user of renewable energy (Alliander DGO, n.d.). Under end-users the EC are also included (Alliander DGO, n.d.). Furthermore, DGO states that governments play an important role in this project because municipalities are often owners, co-owners, or co-investors in sustainable infrastructural developments (Alliander DGO, n.d.). Therefore, by bringing the three actors together the public-private-community-partnerships are possible.

Another example of PPCP in which Alliander is involved is the Lokaal Duurzaam Energie (LDE) Program. The LDE program is an Alliander's initiative aiming for local renewable energy. The LDE program is a platform of knowledge exchange between Alliander and EC. The aim is to facilitate local renewable energy projects. Technical and expertise information is provided to EC about grids and RET (Vissinga, int, 2015). The LDE Program has a help desk in which EC and consumers can consult the grid operator regarding information related to local renewable energy (Vissinga, int, 2015). Also, LDE collects feedback from the users and EC, regarding the services provided in order to gain insights about the local renewable energy services provision (Vissinga, int, 2015). Moreover, the LDE Program also participates with Enexis, Steren and Hier Opgewekt by doing an online platform in which consumers can find the costs of Solar PV Panels' installations and the costs of connections from all of the Grid Operator Companies. This is a cost calculator application for Solar PV Panels and

connections, which aims to speed-up the communication between the grid operators and the users (Vissinga, int, 2015).

The relationship between the LDE Program and the EC can be categorised as an informal binding relationship in which the former (a branch of the public-owned grid operator company) provides an space for local renewable energy advise for the community sector. The public-owned nature of Alliander (the holding company) brings a double role to the LDE Program (public-private). Therefore, this partnership can be considered tripartite. The nature of this partnership is the facilitation of local renewable energy co-provision by giving expertise advises to the EC. When EC ask for expertise advice, it can be said that these show interest and a more active role about the system co-provision.

Also, evidence of PPCP was found in the role that The Economic Affairs Department of Amsterdam plays for EC. This public authority works as a facilitator and intermediary between EC and possible investors or collaborators, which may be from the public and private sectors (van de Wiel, int, 2014). As well, the Economic Affairs Department states that another role is to act as a back up for EC. Being the back up for EC brings confidence and credibility to its possible investors (van de Wiel, int, 2014). Meaning that, the role the Economic Affairs Department play can trigger the emergence or development of the EC by bringing confidence to any possible investor from the private sector (e.g. creditors, partners, investors). In brief, Amsterdam is acting as facilitator and partner in the governance of renewable energy rather than a simple regulator entity.

4.4.2. Public-Community

The empirical data also shows evidence of bilateral PPCP between the public and the community sectors. In this section, examples from Amsterdam Energie, Onze Energie and the Economic Affairs Department are addressed.

There is a bilateral binding contractual relationship between the public and community sectors, in which the EC and the Economics Affairs Department facilitates the co-provision of the renewable energy system by sharing investments and risks regarding RET deployment. According to Amsterdam Energie, one of the difficulties to start a windmill project is the risk involved in the building permit. It is described as an expensive procedure in which project's designs and planning are needed to present in advance for the permit's application (Steenwinkel, int, 2014). Therefore, a large initial investment is needed before getting the building permit for the windmills. Amsterdam Energie explains that the municipal government of Amsterdam has a program for sharing this risk (Steenwinkel, int, 2014). The municipality bears with the pre-application fees requirements and permit's application fees on the behalf of the EC. Amsterdam Energie explains that with this programme the EC only have to concern about the project and the municipality about the planning and application fees (Steenwinkel, int, 2014). As well, Onze Energie states that the Municipality of Amsterdam provided assistance to this energy cooperative for the pre-investigation and requirements to apply for the building permits for windmills. The assistance included advice and finance of the requirements for filing the windmill's permit. Moreover, Onze Energie explains that the municipal permissions were approved but the provincial one is still pending (Hort, int, 2014).

In the other hand, The Economic Affairs Department states that this is the governmental entity that deals with the relationships with EC (van de Wiel, int, 2014). The department argues that currently the municipal government approaches EC in different forms. By financing project related to windmills, CHP and solar PV panles. Also, the Economic Affairs Department approaches EC by providing knowledge about legal matters, and information about organizational models (van de Wiel, int, 2014). Moreover, the Municipality of Amsterdam thru the Economic Affairs Department provides subsidies and loans for renewable energy projects and initiatives. The department explains that more often the loans scheme is replacing the subsidies scheme due to the latest able the department to give financial continuity to the program (van de Wiel, int, 2014).

The Economic Affairs Department also explains that there are already plans for wind-farms, which are still waiting for resolution by the provincial government. The Economic Affairs Department states that

once these projects are approved one of the requirements for the development of these wind-farms, is that inhabitants in the locality must be included in the project's participation. The Economic Affairs Department states that by doing so, the municipality does not only approach the communities by granting subsidies or giving loans, the municipality also attempts to approach communities by developing renewable energy projects in the localities (van de Wiel, int, 2014).

The relationship between the mentioned public authority and the EC from the community sector evidences a bilateral PPCP, in which both parties aim to co-provide the renewable energy system by defining roles between them and by working on a more active co-provision role. In both cases, the EC show commitment about RET capacity and introduce financing matters as a limitation that the municipality addresses. Uncertainty was detected as the major concern for windmills' permits, but coordination and understanding between the parties made possible to have symmetric and efficient information about the common 'co-provision' goal. By financing the permits (which is pointed as a risky and expensive for EC) the municipality ensures both continuity to the renewable energy projects and continuity to the co-provision role.

4.4.3. Private-Community

Under the private-community binding relationship, the empirical data found evidence for PPCP. There is a formal partnership between some of the EC studied and the renewable energy companies for the constant supply of renewable energy to the members of the former. Asmsterdam Energie and Zuiderlicht explain that due to the legal restriction for reselling energy directly by the EC to its members, they use renewable energy companies as intermediaries to provide with a constant service to their members (Steenwinkel; Boon, int, 2014). This intermediary relation makes possible to the EC to provide, without intermittency, with renewable energy to its members. As already mentioned, there is also a rewards scheme for each member of the EC brought as client for the renewable energy companies. Therefore, this relationship has two effects: to bring constant renewable energy supply to the community sector and an income for EC paid by the renewable energy companies (Steenwinkel; Boon, int, 2014).

From this example, it is found how the private and community sectors cooperate in order to co-provide the renewable energy system. Since not all the EC can provide with a constant service to its members, then the renewable energy companies may provide a back-up service to the members of the EC. Also, the EC studied dealt with the renewable energy companies the constant service to their members in exchange for bringing new costumers (from the EC to the companies). Which is also an evidence of how the parties allocate responsibilities, roles and benefits between them by bringing coordination and understanding of their desired goals.

Another evidence of PPCP that the empirical data found is the case of NDSM Energie with the people in the local communities and the private sector. NDSM Energie states that there exists a partnership with the private and community sector. First, NDSM Energie represents a partnership between the pool of companies (private sector) sharing the same industrial area in a shipyard in Amsterdam and the energy cooperative. This energy cooperative is the sum of private entities with a common commitment to produce and consume renewable energy at source (van Eijk, int, 2014). Moreover, NDSM Energie has also a bilateral binding relationship with the community sector.

NDSM Energie is also partner with different actors in the community sector. For this partnership, locals in the neighbourhood of the shipyard were approached by the EC in order to involve their participation within the EC (van Eijk, int, 2014). Although, the aim of this EC is to attract companies as members, the local community sector is also allowed to participate and invest in the cooperative (van Eijk, int, 2014). NDSM Energie describes this strategy as a way to integrate people in the project and get them involved with renewable energy in the area. Communities in the proximity can invest capital, get share(s) participation, get an economic income in return based on the renewable energy production subject to the outcomes obtained from the RET operation, and be granted with equal rights as the company members do (van Eijk, int, 2014).

From this example about the relationship between NDSM Energie and the community sector, the democratization of collaboration between both parties can be highlighted. In this democratic collaboration it is remarkable the involvement of the local communities in to the energy cooperative. But also evidence of communication, understanding, transparency, and reciprocal information is found by the empirical data as the following empirical data addresses. Another way to include the local communities by NDSM Energie was by using compensation mechanisms. For example, when the permit's application for the windmills installations was filed, the EC organized a meeting to consult communities in the proximity about people's opinion and support (van Eijk, int, 2014). Also, an article explaining the NDSM Energie project was published in the local newspapers (50000 copies) and distributed among communities. The article also asked for complaints and opinions regarding the project. The EC receive two complaints about the projects and both were related to the location of the project without objection to the environmental goals (van Eijk, int, 2014). Therefore, after negotiations NDSM Energie promised to compensate communities near the project with the construction of a park in order to create compensation value (van Eijk, int, 2014). The energy cooperative argues that communication with communities has worked positively and it has improved plans and decision-making so far by giving people a chance of speech (van Eijk, int, 2014). In the other hand, the empirical data found a similar example in the energy cooperative Onze Energie, which organised a signatures' collection for getting communities support for the establishment of the energy cooperative as a way to include local community in the cooperative (Hort, int, 2014).

Also, NDSM Energie is working on a local outsourcing scheme to include members of the local communities in the management of the cooperative (van Eijk, int, 2014). The Board of Managers is working to create room for internships in the cooperative and allow local people to practice and develop technical skills by operating the RET of the energy cooperative (van Eijk, int, 2014). By implementing this scheme NDSM Energie attempts to enhance its partnership with the community sector, and deal with local solution for the technical management of the RET in the EC (van Eijk, int, 2014). By including communities in the cooperative management, NDSM would strength the democratization of collaboration and decision-making in favor of a PPCP.

The empirical data found evidence of a partnership between two EC: NDSM Energie and Onze Energie. These two EC are working together in knowledge exchanging, and planning a corporate partnership between them (van Eijk; Hort, int, 2014). Meaning that by the moment the bilateral partnership among them is informal and the future plans are to become formally partners in corporate terms. Also, Onze Energie states that this cooperative and NSDM Energie are collaboratively working to get one windmill built (Hort, int, 2014). Which provides evidence of their role in co-providing the renewable energy system by partnering for getting the permits for RET capacity.

The empirical data also shows evidence for bilateral partnerships between the private and community sectors, in which Alliander participates with several business projects that aim to include or partner with the community sector in facilitating the co-provision of renewable energy. Alliander uses its network companies from the EBA in order to approach the community sector. EXE, TIPPIQ, MPARE and HOOM are examples of projects in which Alliander attempts to make a business case by approaching the communities' needs. Table 5 displays the answers gathered about these businesses.

EBA	Information
EXE (Energy Exchange Enablers).	This service works as a back up for EC for assisting them to become their own energy suppliers. By aggregating the energy supply of EC, this service will measure the energy produced and consumed within EC. By doing this, the service will enable members in EC to exchange energy between them, and will also enable them to trade with the energy by doing transactions among members in EC (van Hest, int, 2014). Moreover, the idea behind EXE is to introduce new business models that aim for smart energy, to support costumers (including EC) demand for smart energy and to enable energy systems for smart grids (van Hest, int, 2014); (Energy Exchange Enablers, n.d.).
TIPPIQ.	It is a service designed for enabling consumers to have online access to their home addresses and to what is happening around consumers' homes (tippiq, 2014). It is as well a benchmarking tool for comparing consumers' energy consumption with other consumers using TIPPIQ (van Hest, int, 2014). This is also a tool that makes energy-related topics communication possible between users. This communication has two possible dimensions: communication by one user and the locality (neighbourhood) and person-to-person communication (van Hest, int, 2014). The energy data exchange is protected and requires the users' permission for sharing information (van Hest, int, 2014); (Tippiq, 2014).
MPARE.	This is an energy data platform that allows data sharing among its users. It is also intended to provide energy data to third parties. Permission of users is required for sharing energy data with other parties. Users can also have access to its own energy data or to share it with other parties. This is a benchmarking tool that enables users to compare energy consumption in the neighbourhoods. It also engages users in responsible energy consumption and stimulates improvements regarding energy consumption. One example is by making possible energy-battles among neighbourhoods participating in the MPARE platform. As well, MPARE is intended to gain insights for energy consumption and production (van Hest, int, 2014).
HOOM.	It is a consultancy and advising initiative for renewable energy and energy saving measures (Hoom, 2014). Hoom is focused on providing its services at the neighbourhood scale (Frietman, int, 2014). Services and products provided by HOOM include: soil and crawl space insulation, cavity walls insulation, solar water heaters, and solar panels (Hoom, 2014). Moreover, HOOM makes a services offer to clients in which local providers from the neighbourhoods are included (Frietman, int, 2014). Hoom is explained as a way to: promote the energy transition in the Netherlands, work with communities, and build energy efficiency (Frietman, int, 2014). One of the main objectives of Hoom is to engage local communities, municipalities and Hoom in working together for local renewable energy initiatives (Frietman, int, 2014). The way Hoom works with EC is by following three steps. First, Hoom measures what is needed in a location and and gets to know people's wishes. Second, a services offer is presented to communities in which different solutions and different providers are suggested. The services offer includes one local provider from the community. Third, the services are performed and then the results are tracked (Frietman, int, 2014).

Table 3. Emerging Business Areas of Alliander

From the empirical data regarding the emerging business areas (EBA) of Alliander, examples of PPCP are found between the private and community sectors. These EBA are emerging projects, which may work as PPCP, either as formal or informal bilateral relationships between the private sector and the EC. These projects may enhance the co-provision of renewable energy between communities/EC and the grid operators, by enabling the exchange of energy within EC. Also, communication and understanding is possible between the sectors involved by sharing data regarding energy patterns of

consumption and production, which makes possible efficient and symmetric sharing of information. Therefore, the sectors can simultaneously co-provide the renewable energy sector with knowledge and with renewable energy exchange.

The empirical data found a similar service than 'EXE' by Alliander, which may provide similar opportunities to EC. Lens Energie B.V., is a company that owns the product 'Herman de Zonne Stroom Verdeler' (Herman). The product 'Herman' is a software that combined with hardware installations in buildings, facilitates renewable energy distribution within a building. Herman is a product for smart distribution of solar energy on common roofs. This product works for common roofs in buildings or Housing Associations by managing with Herman the solar PV panels' production. This product enables members within the same building to manage its own renewable energy production and to decide how this energy is distributed among households in the same building. By using an Internet application, members-users of Herman can control their own energy production and distribution among members-users. Members-users from one building may elect one administrator of the Herman software and the administrator elected will be in charge of the software's operation. Also, by using Herman software the users can monitor how many euros, kWh and C02 savings are being gained by using Herman. This product provides an option for house-owners, renewable energy associations, housing associations and energy cooperatives to deal with the distribution of renewable energy produced by solar PV panels. Lens Energie states that there exists the option for renewable energy associations to participate with one professional investor or an Energy Services Company (ESCO) in a renewable energy project (using the Herman product) (Brester, int, 2014).

Herman could represent an option for EC in terms of renewable energy distribution for their members. The way Herman and the EC could partner is by providing a service that allows the latest to manage the RET outcomes allowing distribution within the EC (more precisely within the same building). By adopting the Herman product in the EC, the latest need to operate and control the distribution software by giving access to energy to their members based on each cooperative decisions (this is up to the participation of each member in each energy cooperative). However, Lens Energie prefers to contract with initiatives constituted under the 'Association' model, rather than the cooperative model (Brester, int, 2014).

4.4.4. Summing-up

This theme links major findings from the last 3 themes and also displays data about the empirical findings for PPCP (and not displayed before). This theme exemplified how the themes (1) Renewable Energy Communities, (2) in terms of Ownership and Management of Renewable Energy Technologies, (3) Co-provide the Renewable Energy System, by (4) doing partnerships between the Public, Private and Community, in other words PPCP. In this theme, co-provision played an important role on binding the public, the private and the community sector in co-providing the renewable energy system. It was also shown how the different sectors are partnered between them in either bilateral or tripartite relationships, also either formal or informal relationships. This theme provided empirical data about the forms of PPCP between the EC studied and the public and private sectors, using as a spotlight the literature review and the PPCP theoretical construction for displaying the results.

Tripartite formal binding contractual relationships were found between the public-owned companies and the community sector. Also there are examples of actors being partners in more than one bilateral relationship with different actors from the public, private or community sectors. As well, an example of a community-community partnership is addressed in which each energy cooperative is also a partner, separately, of the public sector.

Informal bilateral partnerships were found between the private and the community sectors. From the private sector, specifically the grid operator, the EBA projects exemplify the attempts to develop energy services for end-users of the energy grid, intended to include the community sector as a partner. As well, the LDE program tries to engage actors from the three sectors in a platform of knowledge exchange that aims to facilitate local renewable energy projects. Bilateral Public-community partnerships were also evidenced. Specifically, the role of the Economic Affairs

Department of Amsterdam was addressed, in which the department works as a facilitator and intermediary between EC and possible investors or collaborators.

Intermediary roles were identified within the private-community partnerships, as a result of the legal restrictions for reselling energy directly by the EC to its members, which may be also understood as interdependency roles. Also, the empirical data evidences double roles in some actors from the PPCP, which were acting as public-private actors or private-community actors. Finally, clear allocation of roles between the actors involved in the PPCP is found (either tripartite or bilateral) regarding the tasks each partner has to do and the benefits that each one receives.

4.5. Conclusion of the empirical chapter

Through the different themes the empirical findings were organised and revealed what is happening in the EC studied regarding PPCP. The literature review and the theoretical construction for PCPC were the spotlight for the empirical data display. After displaying the empirical data under the four themes, examples of PPCP were found. The PPCP theoretical model found in bilateral partnerships and tripartite-PPCP. As well, either formal or informal tiding relationships among members of the PPCP were found. Different roles, responsibilities and benefits allocation were found in the PPCP. Similarities were found between the empirical data displayed under the first theme and the Community energy literature. Data about the management and ownership under PPCP was also address. Co-provision is a role played in the EC studied and in the PPCP in which they belong. As well, regarding levels of participation (ranging from passive to active roles) in the co-provision role and the PPCP were found, and these were found as active roles. In brief, the forms of Public-Private-Community-Partnerships regarding ownership and management of Renewable Energy Technologies in Energy Cooperatives, were empirically shown.

The EC studied, as well as the Community Energy literature review, evidence that this organisational form enables communities to get involved in supply-and demand-side sustainable energy initiatives. As well, the EC studied evidenced a high degree of ownership and control of the cooperatives. Members of the EC studied evidenced to have a double role, which are simultaneously members and users of the EC. Moreover, these EC are owned by their users (under the quality of users-investors) rather than owned by conventional businessmen. Member of the EC regardless formalities, they have the power and control in the decision-making process in each energy cooperative by following the principles of democratization and ‘one-member-one-vote’.

Regarding the ownership and management of the EC studied, examples were found in which the EC do not own any kind of RET yet, and therefore any direct outcome neither generated nor managed. Also, examples in which the management of RET and outcomes is not an activity yet in some EC due to some initiatives are in a very preliminary phase. And even examples in which EC already have specialised divisions for the RET management. Financial income and energy were found as the main outcomes generated by the RET in the EC studied. Both, the EC and their outcomes are fully owned by the community. Evidence from communities of locality and interest was addressed, as well as evidence for outcomes, processes and alternative dimensions.

Regarding co-provision, it was addressed by the empirical data how the three sectors co-provide the renewable energy system in Amsterdam. Also, it was addressed how co-provision may be either affected or stimulated by the intermittency of the renewable energy supply by means of the RET in the EC. Evidence supports that regulations and legislations are seen as main limitation to both scale-up and spread-out renewable energy projects and go further in the renewable energy co-provision. As well, intermediary and facilitator roles were explained within the EC studied in the co-provision role. Lastly, co-provision is intended to be, for this research, the inter-dependent relationship among the three sectors in the service provision of renewable energy within the utility system.

Then, the empirical data gathered for the PPCP integrated major findings from all the themes and displayed them in a way to answer what are the PPCP for EC. This theme exemplified how the themes (1) Renewable Energy Communities, (2) Ownership and Management of Renewable Energy Technologies, (3) Co-provision in the Renewable Energy System, and (4) PPCP are matched together. In this theme, co-provision played an important role on binding the public, the private and the community sector in co-providing the renewable energy system. It was also shown how the different sectors are partnered between them in either bilateral or tripartite relationships, also either formal or informal relationships. Intermediary roles were identified within the private-community partnerships, as a result of the legal restrictions for reselling energy directly by the EC to its members, which may be also understood as interdependency roles. Also, the empirical data evidences double roles in some actors from the PPCP, which were acting as public-private actors or private-community actors. Finally, clear allocation of roles between the actors involved in the PPCP is found (either tripartite or bilateral) regarding the tasks each partner has to do and the benefits that each one receives.

The order of the themes enabled to add-up information from the three first themes (renewable energy communities, ownership and management of renewable energy technologies, and co-provision in the renewable energy system) in to the fourth one (PPCP). Within the last theme, data from the first three themes came again in order to answer what forms of PPCP are in Amsterdam regarding ownership and management of RET in EC. Therefore, the empirical research question 'What modes/forms of Public-Private-Community-Partnerships regarding ownership and management of Renewable Energy Technologies in Energy Cooperatives, do emerge in Amsterdam?' is answered but it is yet to be answered 'What insights for energy policy in Amsterdam in the field of Public-Private-Community-Partnerships for Energy Cooperatives regarding ownership and management of Renewable Energy Technologies assets can be learnt when combining both the theoretical and empirical findings? Therefore, Chapter 5 reflects the knowledge gathered from both the theoretical and empirical chapters.

Chapter 5: Discussion

The results presented in Chapter 4 principally indicate the modes of PPCP that were found for EC in Amsterdam when analyzing the case studies with the spotlight of the theoretical construction from Chapter 3. Chapter 5 combines both streams of data in a discussion section. The aim of this chapter is to answer what kind of insights for energy policy in Amsterdam in the field of Public-Private-Community-Partnerships for Energy Cooperatives regarding ownership and management of Renewable Energy Technologies are learnt when combining these two sources of data. Regarding the organisation of the information within Chapter 5, the themes structure come again in order to bring ordered information. Thereafter, a reflection on the research design and its implication is also addressed. Then, Chapter 6 concludes this research and provides policy recommendations.

Reflection of the empirical findings and the theoretical framework

5.1. The Community Energy in Amsterdam

Comparing the Energy Cooperatives (EC) studied with the Community Energy literature by Walker (2008), which argues that there are different models of ownership in Community Energy (e.g. associations, community charities, etc.), from the study sample the energy cooperative model stands out among the EC studied in Amsterdam. From these EC studied, the majority are formally constituted as cooperatives. Also, the EC revealed to have different population sizes varying from cooperative to cooperative, and it goes from two members to up to 250 members. Neither the literature review nor the EC studied, manifested the number of members as a limitation for its emergence or development.

From the EC studied a double role by their members can be distinguished, which are simultaneously members and users of the EC. Also, members of EC are users and investors in the EC, in which the investments come from the community sector (e.g. NDSM community in the shipyard). Furthermore, both the empirical and theoretical data found that the EC are owned by their users (under the quality of users-investors) with some exceptions, rather than owned by conventional businessmen or third parties (Huybrechts & Mertens, 2014). However, there is a case in which the cooperative is made out of companies aiming for matching their energy demand with renewable energy supply. Although they are not per se actors from the civil society, they are members of the same industrial community and they are users-investors of the energy cooperative and the means of production. EC may not mean organisations managed and started exclusively by people from the civil society, otherwise the concept needs to be open to alternative configurations. The energy system (including the EC) is an emerging and changing phenomena, which as the literature review suggested, has been the most evolving and changing sector regarding provider–consumer relations (van Vliet, 2012), in which new configurations and meanings for EC-renewable energy may fit. As well, the case of Zonnepanelen op het dak van Waternet reveals that is not always the case that investors in cooperatives are users of the principal outcome of the cooperative. As this case shows the user of the renewable energy is Waternet and not precisely Zonnepanelen op het dak van Waternet. However, both the cooperative and Waternet belong to the same community (all people directly related to Waternet as for example the workers and the company itself). Therefore, the members of this cooperative do not consume directly the energy but is mean to be consumed by the place in which they work. In other words they are working on making more sustainable the energy they use in order to perform Waternet's job.

The literature review and the empirical data show similarities regarding the objectives, activities and outcomes of the EC. Some of the objectives of the energy communities in Amsterdam were similar to what the literature from (Seyfang et al., 2013) suggests, for instance: energy independence from the large energy companies, income generation and empowerment of the communities. As well, some activities are similar between both sources of data, for instance: environmental awareness at local scale, energy savings, and energy generation. Lastly, outcomes produced by the energy communities

in Amsterdam were similar to what literature from (Walker & Devine-Wright, 2008) found, for instance: sense of being self-sufficient and a sense of being bottom-up initiatives in terms of RE generation, renewable energy knowledge exchange, and collective procurement of local renewable energy.

As well, regarding the management of the EC the majority has a Board of Members (volunteers-basis) and they call for a General Meeting for the decision-making process, as the cooperative theory suggests. But regardless the General Meeting, all the EC have the power and control in the decision-making process in each energy cooperative by following the principles of democratization and 'one-member-one-vote'. Regarding the last point, there is one exception from one energy cooperative studied that makes a distinction between full-members and euro-members and the kind of decision-making rights granted within the cooperative. Which it may contradict the idea behind Community Energy literature, specifically the statement of high degree of control of the renewable energy means by its members (Walker & Devine-Wright, 2008). On the other hand, this distinction about types of members and rights may be supported by the cooperative model theory, which states that voting rights are allocated to each member according to the amount of his/her transactions (Huybrechts & Mertens, 2014). Therefore, the clear distinction between the members that (1) benefit from all the services provided by the EC excluding the voting rights, and the members that (2) receive all the benefits including the voting rights.

5.2. Ownership and Management of the Renewable Energy Technologies

5.2.1. Ownership dimension: the property rights on the ownership of the Renewable Energy Technologies

Regarding the first dimension the empirical data found that the formally constituted Energy Cooperatives (EC) follow the rule of the cooperative model which says the members are the owners of the cooperative and the cooperative is the owner of the assets within the cooperative. Members are together the co-owners of the cooperative and as a result co-owners of its assets, in which the RET are included. As the literature may suggest, by owning RET the EC studied play a more active role in the renewable energy system. The deployment of Renewable Energy Technologies (RET) by the EC make them co-owners, co-investors, co-regulators, and co-shapers of the renewable energy system, in which other actors from the public and private sectors also participate (van Vliet & Chappells, 1999). Moreover, being co-owners of the renewable energy system in terms of RET capacity enables EC to provide the utility system with renewable energy. By doing so, EC evolve into a more horizontal role with the public and private sectors in terms of renewable energy co-provision and a more horizontal relation in the co-configuration of the system (van Vliet, 2012).

5.2.2. Ownership dimension: the rights on the outcomes generated by the Renewable Energy Technologies

For this dimension the empirical data supports that regarding the outcomes of the RET in the EC, the energy generated by these technologies is also subject to ownership rights. In principle, if one has the full-ownership or the full-property rights on a good, in this case the RET, then the fruits derived from the good do belong as well to the full owner(s) of the RET. However, the literature review suggest that the ownership of the outcomes generated by the RET, (Walker, 2008) can be owned in different levels. The empirical data found that in the EC studied, these outcomes are only full-owned by the EC and there was not evidence of co-ownership with the private sector.

5.2.3. Management dimension: management of the Renewable Energy Technologies

The forms of management of the RET and its outcomes varied from specialised management to less complex ways of management. Regarding the RET outcomes in some of the EC studied, when combining the empirical and theoretical data, communities of locality and communities of interest are found (Walker, 2008).

Communities of interest were found in Amsterdam Energie and Zuiderlicht due to their members do not live in the same neighbourhood but they are all concerned about renewable energy procurement. Meaning that their main concern is not the place in which energy is produced, the concern is the shared interest in renewable energy. On the other hand, in Evergreenergy communities of locality were found due to its members live in the same neighbourhood and they do address local renewable energy co-production. Meaning that their main concern is the local attribute of renewable energy production and consumption. As also the literature review suggests, other dimensions for community may emerge named alternative dimensions.

For Zonnepanelen op het dak van Waternet and NDSM Energie, both communities of locality and interest were found for each one. Meaning that these cases may also fit in the description of the alternative dimension. In Zonnepanelen op het dak van Waternet its members do not live in same place where they produce and consume the renewable energy produced. This is because of the renewable energy is meant to be consumed by Waternet. In NDSM Energie, should be clarified that its members are companies or industries willing to reduce its conventional energy consumption by replacing it with renewable energy generation at local level. Indeed NDSM Energie is a community of locality but instead of people consuming the aim is that the industries and companies in the shipyard do so.

The empirical data identified outcome, process and alternative dimensions, regarding the management of the RET and its outcomes in some of the EC studied (Walker & Devine-Wright, 2008). For instance, NDSM Energie stated that it is important for them to bring the companies from the shipyard together in the cooperative as well as the communities in the area (van Eijk, int, 2014). Meaning that there is an interest in the process dimension about how the cooperative is organised. In other words, this energy cooperative is more concerned about who participates in the cooperative. As well, Zonnepanelen op het dak van Waternet aims for workers of Waternet to join the cooperative (Heemskerk, int, 2014). On the other hand, Zonnepanelen op het dak van Waternet may also fit under the outcomes dimension description due to its members are also concern about where the benefits are distributed. In other words, even if the outcomes of the RET cannot be consumed directly by its members, they are concerned about the place they work and the conventional energy savings that Waternet may have. Therefore, Zonnepanelen op het dak van Waternet may also be identified under the alternative dimension, in which members agreed in a project that brings benefits for the community (workers community, energy cooperative community, and Waternet community), without being too much concerned about processes and outcomes dimensions.

5.2.4. Management dimension: management of the outcomes generated by the Renewable Energy Technologies

The EC studied, as well as the Community Energy literature review, evidence that this organisational form enables communities to get involved in supply-and demand-side sustainable energy initiatives (Walker & Devine-Wright, 2008). Moreover, these EC exhibit a high degree of ownership, control of the cooperatives, as well as they collectively benefit from the outcomes generated by the RET, as the literature of Walker and Devine-Wright (2008) argues. However, according to the empirical data, legislation is seen by EC as a limitation for the free-disposition of the renewable energy surpluses, which needs to be traded with an intermediary allowed to trade with energy rather than freely disposed and re-distributed between the members of the EC. Meaning that the management of the outcomes generated by the RET is related with what public policies allow. As a result, this fact may intervene in both the management and the ownership of the RET in the Community Energy in Amsterdam.

Different from the theoretical conceptualisation in the literature review for EC, the renewable energy derived from the RET in the EC studied was not always aimed for the consumption of people living in the vicinity of the place where the renewable energy was generated. However, this should not mean that the EC in which their members do not consume their own outcomes at local level do not belong to the Community Energy. In fact these kinds of EC do belong to the Community Energy, as the literature review describes these grass-root initiatives as a way of organisation in which communities get involved in the supply-and demand-side of renewable energy, among other things. In which, local

consumption of the RET outcomes by a targeted consumer different than the cooperative, and decentralised generation are both still present, regardless who benefits from the outcomes.

The data discussed under this theme from the EC studied, brought diverse answers depending on each energy cooperative situation. However, similarities are also present between the EC. It is worthwhile to acknowledge that EC phenomena are in some cases an emerging phenomena, in which some of them do not own RET or do not manage RET due to their start-up phase. On the other hand, it is also worthwhile to acknowledge the valuable contribution from the EC studied which are already in a mature phase.

5.2.5. What is next for the Energy Cooperatives and the Renewable Energy Technologies they own and manage in terms of Public-Private-Community-Partnerships?

After discussing the theoretical and empirical findings under this theme, it is time to think about 'how are the EC connected with the PPCP regarding ownership and management?' As the theory for Public-Private-Partnerships (PPP) suggests, these aim to facilitate private sector involvement in technical, managerial and financial resources, for the provision of public services such as infrastructural development (The World Bank Group, 2012). For the aim of this research the community dimension was included as key factor for the PPCP. If more RET deployment is needed for achieving the energy and environmental goals of the City of Amsterdam, then EC can stimulate this energy transition towards decentralised production and consumption of renewable energy. It is comparable the role of the private sector within PPP for the analysis of the community sector within the PPCP. The community sector in the PPCP (as well as the private sector in the PPP) may facilitate financial, managerial, and technical resources for the co-provision of the renewable energy system. The Community sector may contribute to the system by: deploying RET capacity in a decentralised way, bearing the costs of it, bearing the management tasks for it, and greening the grid. Or in other words, by dealing with part of the ownership and the management of RET within the renewable energy co-provision system.

5.3. Co-provision

This section discusses the binding co-provision role between the public, private and community sectors in the renewable energy system. As Miller et al (2013) suggested in the literature review, energy systems are more than technical issues, the concept goes beyond pipes, refineries and fuels, but also includes a social dimension that considers humans who design technologies (which means more than technological devices and includes knowledge); societies and neighbourhoods that co-provide the system within a binding relationship between the public and private sectors.

The renewable energy system that the Energy Cooperatives (EC), the public and private sectors co-provide in Amsterdam is understood as the result of a collective provision of renewable energy services by means of Renewable Energy Technologies (RET) through both local-scale Community Energy and large-scale infrastructures of distribution (Chappells et al., 2000). In which, the different sectors bring different inputs for the co-provision relation. Large-scale infrastructures are related to the private sector, while the decentralised RET in the local-scale to EC from the community sector. Also, large sources of renewable energy may come from the private and community sectors. Within the co-provision role among the three sectors generation, distribution, and consumption of renewable energy were distinguished. Also, this co-provision is intermingled with the conventional energy system, which brings a back-up role to the intermittent means of renewable energy supply.

The co-provision role is understood as a binding relation between the public utilities, energy policies and the EC when they aim for sharing the renewable energy provision. The public, private and community sectors are becoming more actively involved in the co-provision role. The private sector is actively involved by exploring new business cases in which community can be integrated, as the Emerging Business Areas (EBA) from Alliander evidence. The Public is becoming more involved by intermediating among parties, granting subsidies and loans, and by facilitating and informing the

parties about local renewable energy options. And the Community Energy is getting more involved in the co-provision role by deploying RET capacity in a decentralised context and by spreading out environmental awareness through the communities. Also, energy cooperatives network between them for knowledge exchange or even by planning shared RET projects. When the three parties work for the same objective, it is shown that sectors become more involved into the co-provision of the renewable energy system. When adding the (1) empowerment feature of Community Energy, (2) the public policies aiming for decentralisation and renewable energy production by communities and (3) the quest for new business cases by the private sector in which communities can be included, then it can be said that the three parties have a more horizontal relationship.

Intermittency of the means of renewable energy production, more than a problem, it can also be an stimulant for the co-provision relationship, because parties are still dependent on each other and they do complement to each other. However, among the EC studied in Amsterdam regulations and legislations were seen as main limitations to both scale-up and spread-out renewable energy projects and go further in the renewable energy co-provision. Meaning that in order to upgrade co-provision more coordination and communication may be needed between the public and community sectors to address what is seen as limitations.

The three sectors are acting as intermediaries within the co-provision of the renewable energy system. The public sector, municipality, is acting as a facilitator between the EC and actors from the private sector (investors and creditors). The private sector, the (renewable) energy companies, is acting as a bridge to connect members of the EC with constant supply of (renewable) energy. The community sector, the EC, is playing an intermediary role between the end-users and the energy companies or grid operators also for the provision of renewable energy to its members.

Regarding the co-provision of the RET (ownership and management) by the three actors, they are not co-owning or co-managing RET within the EC-scale. But, they do co-own and co-manage the renewable energy system (in which RET are included).

Co-provision tides the public-private-community sectors into an inter-dependent partner relationship in which shared energy-environmental goals are present. Co-provision brings the partners together into a relationship in which the ownership and management of RET within the renewable energy system is shared among them. Co-provision unifies the Community Energy phenomena, with the energy companies and their emerging business cases for renewable energy, with the public authorities and public policies. But further than co-provision, the partners may need to define the terms of the PPCP.

5.4. What can be learnt about Public-Private-Community-Partnerships for Energy Cooperatives when reflexing the theoretical and empirical data?

On the quest for PPCP, evidence was found in bilateral and tripartite relationships, either formal or informal. The Community sector was always present in the relationships. The PPCP found in this research, are so because of three actors are involved in the partnership or, in some cases one of the actors (or two) have a double role. Bilateral partnerships were also found in this research, and these may be understood as partnerships that are missing one step or one actor before becoming tripartite PPCP.

Regarding the tripartite PPCP in which one of the actors has a double role, it can be for instance that the utility companies are private entities looking for new business cases in which communities can be involved, but at the same time are utility companies publicly owned by provincial or municipal holders. Therefore, one actor is representing and performing roles from two different sectors, and by doing so enabling tripartite PPCP. Other examples are found in which the three different actors from the three sectors were involved in the co-provision of the renewable energy system.

Regarding the bilateral relationships cases, these are examples of partnerships in which the community sector is already included, and only one actor is missing in order to get the tripartite PPCP. Although

the aim of this research is to explore the PPCP for Energy Cooperatives (EC), it is found that not all the EC studied are part of a tripartite partnership. However, is worthwhile to analyze these cases because of the insights that can provide for further tripartite PPCP. Also, by networking and intermediation it may be possible to connect the bilateral partnerships in to tripartite PPCP. Regardless whether or not the three actors are under a tripartite PPCP or a bilateral relationship, within the renewable energy system the three actors are already closely dependent and this may facilitate the opportunities to partner. For instance, the private and community sectors are directly dependent on energy public policies, as well communities are dependent on the energy services (back-up) and the grid operator, also the private and public sectors are dependent on the effects of the decentralized deployment of RET by EC.

Also, intermediary roles played by the sectors can be understood as ways to end with hierarchical or end-users relations. Intermediary roles are understood as connectors of shared interests and ambitions among the sectors, as matchers of (potential) partners in the co-provision of the renewable energy system. Therefore, these intermediary roles are understood as trigger factors for a more horizontal partner's relation in which power is redistributed or aligned among the actors.

The PPCP framework was founded in Community Energy, Ownership and Management, and Co-provision themes. Each of these themes adds meaning to the PPCP. As proposed at the beginning of this research, a community dimension is missing on the regular PPP, therefore Community Energy theory aimed to fulfill this gap. Also, this literature brigs empowerment, decentralization, and control from the community sector into the PPCP subject of this research. Moreover, ownership and management are features brought by the community energy (also by the public and private) regarding the RET in the EC. But this RET in the EC are part of a system; these means of production and this organizational model interact with a large socio-technical system which is the (renewable) energy system. So, the Community Energy owns and operates RET within the renewable energy system which is co-provided by the private and public sector as well. In which the public sector sets the rules of the game and supervise the energy system. And then, the private sector operates the public grid, it produces energy, transmits it and distributes it. However, the community sector also produce energy and distribute it among its members instead of merely energy consumption by end-users. Also, the private sector evolves into a more community-oriented business perspective for the involvement of communities needs in the provision of energy services. Then, the public sector goes further than only a supervising and regulator role, the public sector has a more active role as a facilitator and intermediary for the accomplishment of the energy-environmental targets. In brief, within the PPCP their members co-provide the renewable energy system by co-owning and co-managing RET (as well as environmental awareness tools), in which decentralized and renewable means of co-production (from the community sector) interact with large-scale and back-up socio-technical systems of energy production, transmission, distribution, and production (organized by the public and private sectors).

From the literature review, principles suggested by other PPCP found in literature may provide insights for current and further development of PPCP for EC in Amsterdam. These principles may apply for the development of current (and emergent) PPCP and for further PPCP. Principles such as inclusiveness, transparency, interactiveness and continuity may improve the stability of the (bilateral or tripartite, formal or informal) contractual relationships between the public, private and community sectors in the co-provision of the renewable energy system in Amsterdam. These principles may ensure that partnerships are completely represented in a tripartite-basis, in which reciprocal and transparent communication is present, decisions are taken in a democratic-basis, redistribution of power brings a more horizontal relationship, and a partnership in which contractual stability can be achieved. It is shown by the empirical data how some actors attempt to include all the interested actors in the decision-making processes. Also, sharing of ideas and ambitions between parties make possible to have clear (transparent) understanding. Interaction between the three parties was also found by the empirical data showing how they deal with the co-provision of the renewable energy system. However, continuity in my view cannot be measured yet. Because this implies that the partnerships have worked after a period of time and thereafter continuity can be analysed or evaluated. It is a matter of time for exploring the principle of continuity within the current PPCP.

In the EC studied, there were bilateral and tripartite cases, but under a broader perspective the public, the private and the community sectors evidenced collaboration in the co-provision of renewable energy system of Amsterdam. Energy Cooperatives were pointed as a solution for the up-take and deployment of more RET capacity, which may help to reduce the large share of fossil-fuel based energy consumption and production and its environmental consequences. From the empirical data, examples of EC showed how communities are getting involved in these grass-root initiatives by spreading out environmental awareness and by raising the share of renewable energy co-production. Moreover, new business areas dedicated to EC may improve both the PPCP and the energy-environmental problem. As well, public policies in which voices from the three sectors are heard may bring the City of Amsterdam a step closer for the successfully achievement of its energy-environmental goals.

5.5. Reflection on the research design and implications

- Due to the very emerging phenomena, interviews were the most suitable data collection method. Meaning that there is not sufficient Energy Cooperatives population to conduct questionnaires or quantitative data. Moreover, this research was never meant to produce quantitative knowledge. Once the PPCP phenomena for EC mature enough, it would be worthwhile to conduct a quantitative study to explore different issues than the ones addressed by this research.

- One of the goals of this research was to study five Energy Cooperatives. When contacting EC in Amsterdam, frequently the contact persons answered that the cooperatives have not started to operate yet. Some of them had already a website and were even registered in umbrella websites for renewable energy projects or in printed publications. Some of these EC were very enthusiastic to participate in the research but they disclose in advance that they have not done anything yet or that they are planning to start a cooperative. On the other hand, some already established EC did not want to participate in the research due to they are very busy. Although the goal of this research was to study 5 EC, I managed to study 6 cases. I could not choice my cases, therefore I studied the cases that allowed me to do so. However, this does not mean that my cases were not rich in information or were not purposively selected. It means that I study a very heterogeneous sample, varying from very simple cooperatives to more complex ones and from very emerging cooperatives to already established ones. Therefore, this may mean a holistic (and non-biased) view of the whole phenomena of PPCP for EC in Amsterdam.

- Respondents had a very negative attitude towards the taxation regulations for the feed-in tariff; this attitude may blur somehow the objectiveness of the answers about the relationship of the respondents with the public sector.

- The RET found in the EC studied were Solar PV Panels and projects for Windmills, other RET were not found and therefore not studied

Chapter 6: Conclusions

6.1. Conclusions regarding the answers of the research questions

Public-Private-Community-Partnerships (PPCP) were suggested as one solution for urban energy and climate change problems that have raised scientific and political concerns about the need of a larger capacity of Renewable Energy Technologies (RET). Cities, as in this case Amsterdam, have prioritized in the political agendas a shift towards more sustainable metropolis in which the sustainable management of energy is a key factor. In the City of Amsterdam the share of renewable energy production/consumption is still far from accomplishing their environmental targets. According to the ambitions stipulated in the Energy Strategy 2040 of Amsterdam, by 2025 the 25% of electricity must be generated sustainable and by 2040 Amsterdam aims to reduce by 75% its CO_2 emissions, however in 2010 the share of renewable energy produced in Amsterdam was 5.8%. This research suggested that the inclusion of a Community dimension in the current energy system, in the current Public-Private-Partnerships (PPP) and in new PPCP can bring a decentralised solution for the uptake of RET within the urban context, and it can enable the co-provision of the renewable energy system by the public, private and community sectors. Moreover, the inclusion of the community sector in the renewable energy system by means of PPCP may be seen as both a way to facilitate the decentralised deployment of RET capacity and as a way to get involved the community sector in the supply and demand sides of renewable energy. Which implies that to some extend communities bear the costs, the management, and the ownership of a share of the RET in cities as in the case of Amsterdam. As well, the community sector is brought as a new actor for the PPCP, which brings more democratic and horizontal participation among the three sectors. It is important to remark that the Community sector is brought as partner into the relationships, which is different to the traditional view of end-users/community as consulted parties. The Community dimension aims for redistribution of power among the sectors that enables horizontal relationships rather than top-down relations in which members of communities are seen only as energy-connections with a single consumer role. As well, coordination between the three sectors is essential in order to align information and interests regarding the RET deployment and the co-provision of the renewable energy system. It can be concluded that top-down and bottom-up approaches in the energy system could remain (e.g. because the public sector still regulates the energy system or because local initiatives still emerge) but vertical coordination among the three sectors may be a way of organizing roles, responsibilities, rights and decisions for further PPCP.

What are Public-Private-Community-Partnerships and what do they mean for Energy Cooperatives in terms of ownership and management of Renewable Energy Technologies? In order to give answer to this research question, this study built a theoretical framework in order to define what are the PPCP and what they should mean. Therefore, PPCP were defined as binding tri-directional contractual relationships for the co-provision of utility services by the public, private and community sectors, which in practice is an emerging way of partnership in the City of Amsterdam as empirically proven by this research. The PPCP framework was used to analyze Community Energy (regarding the Community dimension), from which a sample of Energy Cooperatives in Amsterdam was selected for the research study. The PPCP framework suggested that different roles, responsibilities, ownership, management, and accountability could be allocated among the partners within PPCP. PPCP may mean for EC a way to spread out and scale up their activities regarding renewable energy co-provision. By partnering with interested sectors (each one with specific expertise), partners can bring in to the relationship what they can do best (e.g. regulation, capital and flexibility). Partnerships can open the reach of networking by the different sectors involved and Communities can either bring more members to the cooperatives or provide more renewable energy at the local level. By partnering, it is also possible to get to know each sector's needs and therefore it is easier to find a tripartite solution. For instance the case of Waternet and Zonnepanelen op het dak van Waternet, by having transparent communication about their needs they came up with the idea of a cooperative run by employees in order to match energy demand and supply at local level by means of RET.

PPCP were defined as a binding contractual relationship, either formal or informal, between the public

sector, the private sector and community-rooted initiatives. This research found examples of formal and informal PPCP. The contract relationships can be either bilateral or tripartite and always including the community sector, as empirically shown within this research study. The nature of this binding contract was the co-provision of utility services, for this case renewable energy, by the public, private and community sectors. PPCP allocate responsibilities, roles, ownership, and management among the three participant partners. Within PPCP some of the partners showed to have double roles. For instance the community sector may have an user-investor role and a co-provider role, due to community-rooted initiatives invest in their own RET capacity but are still users of the public grid and utility services. But also some other examples were found in which one actor has a public-private role (the double role of public-owned companies), which facilitated the tripartite relationships. Also, PPCP varied regarding the level of involvement of the parties in the utility system co-provision between more passive roles to more active service co-provider roles. Within PPCP is seen a shift from the end-user/hierarchical relation in to a more partners' relation, in which parties work on the supply-and-demand-side of local renewable energy co-provision.

Regarding the use of the theoretical framework 'PPCP', it can be concluded that the framework was suitable for analyzing the possible forms of collaboration between the three sectors. Indeed, as the introductory chapter of this research suggested, it was expected to find out either bilateral or tripartite relationships. The idea of this framework was to understand and explore how these partnerships work and why by using it as the spotlight for the data analysis. And then, the research aims to provide insights for the current PPCP found and for further PPCP. This research proposed the PPCP framework, especially the contributions by the Community Energy, as a metropolitan solution for the energy and environmental problems. After conducting this research study and using the PPCP framework to do so, is still a query whether or not this framework may work when using it to study other utility systems or other metropolitan problems.

The PPCP framework is not exclusively for the benefit of the community sector, also the private and public sectors can benefit from this. Increasing awareness of energy consumers and energy-climate targets by cities are being understood by new business models/cases provided by the private sector. Consumer and co-producers demand new energy related products and services, which may be provided either by the energy companies (or the grid operator as shown in this research) or by the energy cooperatives. Also, the public sector can benefit from these partnerships. Further RET deployment, as the energy-climate targets state, will imply different types of investments. Could be financial, labor, organizational, or land (regarding the place to allocate the RET) investments. As well it is predicted by literature that the share renewable energy will increase in the next decade. So, if governments by themselves bear with these issues, then it gets a heavier task for them. But since this PPCP framework suggests that the costs of RET deployment are bear by the three sectors, this can divided efforts in a tripartite basis. As the theoretical framework suggests, one of its aims is to shift from end-user/hierarchical relations in to a partnership relation. In which rather than either only top-down approaches or only bottom-up approaches regarding the renewable energy system, the three sectors cooperate into a more vertical-horizontal coordination that aims for tripartite partnerships

What modes/forms of Public-Private-Community-Partnerships regarding ownership and management of Renewable Energy Technologies in Energy Cooperatives, do emerge in Amsterdam? During this research the empirical data focused in supporting how, specifically, ownership and management of the RET are allocated among the members of the PPCP in Amsterdam, showing that the RET are co-owned and co-managed at the utility-system-scale by the three actors and not at the cooperatives-scale. Therefore, the renewable energy system is subject to (co)ownership, (co)management and (co)provision of its means of renewable energy production by the three sectors. Double roles are possible among the members of the PPCP, due to their double roles, double qualities or because they represent two different sectors within the partnerships as the empirical data addressed from the cases of Zonnepanelen op het dak van Waternet and the case of Alliander (regarding the LDE program and the EBA). These double roles are considered important for PPCP, since these can facilitate the tripartite relationship. Also, the theoretical framework suggested that the three partners get involved in the PPCP by different levels of participation ranging from passive roles to more active service co-

provider roles. Therefore, it can be concluded that the three sectors studied in this research are actively involved in the co-provision of renewable energy. As well, the objective of the PPCP framework was to shift from an end-user/hierarchical relation in to a more horizontal relation, in which parties work democratically on the supply-and-demand-side of local renewable energy co-provision.

Inclusiveness, transparency, interactiveness and continuity were suggested as elemental features for the stability of both the current PPCP and bilateral relationships aiming for PPCP. The evidence found regarding these principles showed that the three sectors are already working on including each sector's collaboration in the renewable energy system (e.g. communities of practice platforms, LDE, and EBA). Also, by disclosing the three parties visions and goals it is possible to have transparency. Regarding interactiveness, it was found from the EC studied, the public and private sectors that it exist reciprocal interaction among the three sectors for discussion renewable energy related topics. However, continuity as an element for contractual stability of PPCP is something that could not be measured or observed by this research at this specific time. Therefore it is still a question, for further research, what are the measures to ensure the continuity of PPCP projects over time? Perhaps for the case of Zonnepanelen op het dak van Waternet, the continuity of the project can be measured based on the contractual clauses for the energy provision between them. But for the rest of the cases it may not apply the same reasoning.

It is shown by the empirical data how some actors attempt to include all the interested actors in the decision-making processes (for instance the EBA and LDE program of Alliander or Zonnepanelen op het dak van Waternet). Also, sharing of ideas and ambitions between parties make possible to have clear (transparent) understanding. Interaction between the three parties was also found by the empirical data showing how they deal with the co-provision of the renewable energy system. However, continuity in my view cannot be measured yet. Because this implies that the partnerships have worked after a period of time and thereafter continuity can be analysed or evaluated. It is a matter of time for exploring the principle of continuity within the current PPCP.

The Energy Cooperatives studied do not find the current regulation (regarding taxation) as suitable for triggering the uptake of RET. Probably this perception can affect the uptake of the PPPC organizational model by the cooperatives. However transparency and interaction may help the three parties to understand the reasons behind taxation and to it may help to find a stable solution for this concern.

What do we learn from this research? On the quest for PPCP, evidence was found in bilateral and tripartite relationships, either formal or informal. Regarding the formal tripartite PPCP it is concluded that this form of partnership was possible because of double-role quality of some sectors. About the bilateral partnerships found in this research, it can be concluded that there is not a direct link yet to match the different partners under a tripartite relationship. Meaning that more intermediation needs to be done in order to gather a tripartite relationship between the public, private and community sectors. The bilateral relationships should mean evidence of the community sector already collaborating either with the public or private sectors. The study-case of Zonnepanelen op het dak van Waternet represents a good example (successful case) of a formal tripartite PPCP that worked out because of the environmental awareness of the community sector and the double-role (and double-interests) of the public-owned company 'Waternet'. As well, the close interaction between the related parties from Waternet and the cooperative made possible to include all the relevant parties for the accomplishment of the project.

Intermediary roles were identified and discussed in this research. Intermediaries were found within the private-community relationships, as a result of the legal restrictions for reselling energy directly by the Energy Cooperatives to its members, which may be also understood as interdependency roles. Moreover, the facilitator role was distinguished within the public-community relationship due to the public sector's interests on supporting renewable energy projects. It is concluded that intermittency of the means of renewable energy production represents an interdependency relationship among the sectors within the renewable energy system. Therefore, intermittency and interdependency may

represent stimulants for further partnerships. The three sectors are still closely dependent to each other, one sector may function as a back-up for other, and other sectors may work as complements for other sectors. Decentralized deployment of RET by Energy Cooperatives may need more coordination with the private initiatives (e.g. new businesses, grid operators, energy companies) and the local authorities in order to address all parties needs and challenges (this may represents environmental, economic, social or technical requirements).

From the Energy Cooperatives studied, it can be concluded that Communities of Locality, Communities of Interest, and the Interest, Outcomes and Process Dimensions, are all present in the Community sector in Amsterdam. There is evidence of cooperatives which are concerned about who participates in the initiatives and evidence about cooperatives more concerned about the outcomes generated by these initiatives. Moreover, evidence also proves that sometimes the community sector can put aside locality, interests, outcomes or process concerns if something beneficial can be achieved. This should mean the openness of the community sector for possible further PPCP for Energy Cooperatives in terms of ownership and management of Renewable Energy Technologies.

From the six Energy Cooperatives studied, it was explained how the cooperatives partner with the public and private sectors. Also, it is shown the willingness of cooperatives to partner with other sectors within the renewable energy system. Some Energy Cooperatives have succeed more in finding partners than other as the study cases support. For instance, two Energy Cooperatives fit under the description of PPCP (a tripartite relationship), two of them have more than one bilateral relationship (either with the public or the private sector), and the other two have each one only one bilateral relationship.

By adopting the PPCP model in current or further renewable energy-related projects, the Community dimension can bring many benefits into the relationship as for examples:

- Improve decentralised renewable energy generation.
- Improve local renewable energy production and consumption, matching locally and sustainably demand and supply.
- Increases environmental awareness by including people and cooperatives in the supply and demand sides of renewable energy.
- It addresses a more efficient renewable energy system by reducing environmental costs and social costs. As well it reduces and divides by three the economic costs, energy loses, transaction costs, operational costs, labour costs, and land costs involved in RET deployment.
- Improves communities' cohesion and tri-sectorial cohesion (public, private and community).
- Facilitates the decentralised installation of RET due to people in the city can deploy these technologies at home level (on the roof). Otherwise this process could be more complicated for the private and public sectors due to they may have to deal with finding many locations for further deployment.
- If more cooperatives acquire RET (but also the public and private sectors), then the benefits of economies of scale may apply.
- Enable the co-provision role in a tripartite basis.

As the objective of this research indicated, through the steps of this study I aimed to contribute to the scientific literature regarding Energy Cooperatives and the possible modes of Public-Private-Community Partnerships regarding the ownership and management of their Renewable Energy Technologies. When collecting and analysing the empirical data, similarities were found with the theoretical inputs for the PPCP construction. Although, some of the cases studied did not provide evidence of tripartite PPCP (yet) it can be concluded that PPCP do exist in Amsterdam. It can be concluded that one of the constraints for more PPCP-for-EC phenomena is related with the legal restrictions for the direct re-sale of renewable energy surplus are seen as constraints for the uptake of more RET and for running more EC, which may also hamper possible PPCP.

PPCP imply that the three sectors define what is the optimal growth of RET in the City of Amsterdam.

Thereafter, this size of growth need to be incentivized and steered in order to get and equilibrium between efficient supply and the efficient demand of renewable energy within the urban boundaries of Amsterdam. Moreover, PPCP imply that the three sectors are always participating in the co-provision of the renewable energy system regardless the level of involvement in it (passive or active). Although an active level of involvement may sound positive, it is needed to acknowledge that some parties may play less or more active roles than other (naturally). And these do not imply that PPCP effects or goals may be diminished.

Through the different themes under which this research was conducted, it was shown how the (1) Renewable Energy Communities, deal with the (2) Ownership and Management of Renewable Energy Technologies, by getting involved in the (3) Co-provision in the Renewable Energy System, under the organizational form of (4) Public-Private-Community-Partnerships. Based on the theoretical, empirical, and reflexive answers that this research provided for the research questions the following policy recommendations are suggested.

6.2. Policy Recommendations

Through the different chapters in this research, answers for the theoretical, empirical and reflection research questions have been addressed. Moreover, by reflexing the data insights for energy policy in the field of Public-Private-Community-Partnerships for Energy Cooperatives regarding ownership and management of Renewable Energy Technologies are recommended. The following policy recommendations apply for tripartite PPCP or bilateral relationships that may become tripartite PPCP.

I recommend to the City of Amsterdam to:

- In order to accomplish the city goals, I recommend to strength its intermediary role and try to match the community sector with the private sector for further PPCP.

- Incentivize organizational models in which tripartite relationships are addressed. This can be achieved by setting models of tripartite contracts in which rights, obligations, responsibilities, ownership, and management tasks are clearly allocated. This may guarantee certainty over the continuity of the PPCP. Moreover, parties can agree and draft in detail how are they going to interact, collaborate, which specific actors are included and which not, and can also disclose all relevant information related to the partnership relationship.

- Join and support current bilateral relationships between the private and community sectors.

- Organize and get more involved into Communities of Practice, in which actors from the three sectors can get in touch and discuss about further PPCP.

- To use Communities of Practice or informational technologies to create a platform in which Intermediation, Transparency, Interactivennes, Inclussiveness and Continuity can be ensured. The reasoning behind this platform is that the governments can play an important role by connecting actors from different sectors (public, private, community) with shared interests on renewable energy projects. The governments can play an intermediary role by connecting people and facilitating the development of projects. As well, from the private sector new business cases can emerge in which this king of intermediation services are provided. Also, communication and awareness are important features among the three sectors for the PPCP, and this does not only mean environmental and climate change communications and awareness. It is crucial to have transparent communication about the parties interested to work on renewable energy projects, as well as to make sure that counterparts are also aware that these platforms exist. There is already evidence of these platforms, for instance: Hieropgewekt and bedrijfzoektbuur. However, this platform (including the three sectors) may facilitate and trigger the linking of motivated actors with potential opportunities for developing renewable energy sectors. By creating databases of actors willing to participate in projects, participants

can have access to information about who is interested, what for, and how actors may participate. About interactivennes, the idea is to share knowledge, discuss energy-environmental issues, and to present new renewable-energy ideas. This is a way in which tripartite PPCP can be created or enhanced, by creating a platform that allows tripartite interaction that makes possible the exchange of knowledge and concerns. As well, it is needed to ensure the continuity of the PPCP projects and to avoid that the actors withdraw from the partnerships. This issue was identified as a common pitfall in literature from PPCP/4P for another kind of projects. Finally, the governments should aim for tripartite metropolitan solutions, in which the three sectors are empowered and therefore democratic solutions are available. Measures to make sure that the three actors are always included in the metropolitan solutions are needed in order to ensure the inclusivennes feature of the PPCP. If the City of Amsterdam aims to accomplish the ES2040 goals, then it is important to make sure that communities (as well as the private sector) are included in the measures to achieve the energy-environmental goals.

- Reconsider legislation. Taxation and regulations restricting the re-sale and re-distribution of renewable energy surplus are seen as limitations for scaling up and spreading up renewable energy projects. By allowing either the re-sale or re-distribution of this surplus, the uptake of RET, the energy cooperative model and the PPCP may be enhanced. Although not all the legislation depends on the municipal government, this can lobby on the provincial and national authorities.

- Transparency. Permissions for windmills are seen as bureaucratic procedures, and as something not really wanted to happen. Transparency may bring understanding among parties about whether or not windmills are under the public administration scope.

I recommend to the Private Sector to:

- Develop business cases that allow the three different sectors either to own or manage RET by being partners.

- Develop strategies or technologies to enable and make possible redistribution and direct resale of the surplus of renewable energy produced by Energy Cooperatives.

- Adopt as part of their corporate policy the inclusion of communities in their business cases.

- Open and stimulate reciprocal communication with the community and public sectors.

I recommend to the Energy Cooperatives to:

- Take advantage of the openness of this sector to collaborate with other sectors or between cooperatives. Being concerned about collective benefits between the three sectors is a plus, rather than being an exclusive community sector (alternative dimension of Community Energy). Alternative dimensions were suggested by the literature review in which communities are less concerned about who participates in the initiatives or where the outcomes of the initiatives are allocated whenever collective benefits are gained.

- Identify possible partners with double roles or representing two sectors (as in the cases of Zonnepanelen op het dak van Waternet and NDSM Energie). This feature may facilitate the PPCP. As well, I recommend promoting diversity in the composition of their members. Including other cooperatives as members, or actors representing two sectors as members. By doing so, transaction costs may be reduced and decisions may be more represented under a tripartite basis.

- Due to the fact that c-ownership of RET within the Energy Cooperatives by the community sector and another sector does was not supported by empirical data, I recommend to allow financial investments and co-ownership of the these RET as long as the Community does not lose control and power.

- The RET found in Amsterdam respond to an urban context, it is recommended to the Energy Cooperatives to invest in other RET projects in which also other sectors may be investing.

I recommend furthering researchers to:

- Use this framework to analyse other possible metropolitan solutions
- Use this framework to analyse problems or issues in the rural context
- Use this framework to analyse other utility services, like solid waste management, drinking water, wastewater, heating or gas.
- Use this framework and conduct research in a Southern country.

6.3. Fields for further research

It is possible that some private initiatives may improve the co-provision relationship by enabling the direct re-distribution of the renewable energy surplus by the EC to their members, which is seen as one of the main limitations for EC. Some private initiatives are already working on the business cases for enabling energy transfers or distribution by the EC to their members. If this has success, it may co-shape the way the renewable energy system is actually co-provided. Nevertheless, this is an area from which little scientific knowledge is found by now. Further research on the effects of these new enablers of energy exchange on the PPCP for EC and the co-provision of the renewable energy system may be worthwhile.

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Annexes

ANNEX 1: Inventory of Energy Cooperatives found in Amsterdam

	RENEWABLE ENERGY INITIATIVES
1	Amsterdam Energie
2	Delen= vermenigvuldigen
3	Energie NDSM
4	Evergreenergy
5	Gloei!
6	Groen licht voor Amsterdam RAI
7	Herman de Zonnestroom-verdeler
8	Mini Rondeel Eiland, Zuidas Amsterdam
9	Onze Energie
10	Schoonschip
11	Solar Green Point
12	STICHTING 1 MILJOENWATT
13	WeteringDuurzaam
14	Wij Krijgen Kippen
15	WINDCENTRALE
16	Zonnepanelen op het dak van Waternet
17	Zon op hey dak van de Praxis
18	Zon op Nederlands
19	Zuiderlicht

ANNEX 2. Content list.

Content list for the interviews with the energy-cooperatives:

- Community model (energy cooperative, association, alternative company)
- Objective (production and consumption of renewable energy at local level, information desk, promotion of renewable energy and energy savings, networking with initiatives)
- Source of the energy and purpose of the energy
- RET available
- Who is/are the owner(s)
- To who belongs the RET, and under what kind of ownership
- How is the initiative administrated
- Who manages the initiative
- Who has control over the RET and the decisions in the initiative
- How is involved the decision-making process (who is involved, what for)
- Who runs the RET, who is in charge of the technicalities
- What kind of income or benefits does the initiative has from the RET production.
- Who benefits from the outcomes generated by the RET (any kind of benefit)
- To who belongs the outcomes generated by the RET (energy, benefits, and more)
- What kind of income or benefits does the initiative has from the RET production.
- Is the initiative collaborating with another organisation
- Is the initiative a partner with the private or public sector
- What kind of partnerships does the initiative has with the private or public sector
- Are these partnerships related to RET, ownership of RET or management of RET
- Who participates and how in these partnerships
- How the process and outcomes are distributed regarding ownership and management of the RET.
- What kind of special arrangements exist between the three sectors regarding responsibilities allocation for the ownership and management of the RET
- What kind of terms and conditions are present for the ownership and management between the sectors
- Main challenges, concerns, and successful factors

ANNEX 3. Epilogue: The case studies.

Community Sector		
Energy Cooperative	**Interviewee**	**Date**
Zuiderlicht	Frank Boon	November 10, 2014
NDSM Energie	Keijen van Eijk	November 4, 2014
Evergreenergy	Jeroen Kruisheer	November 20,2014
Amsterdam Energie	Rolf Steenwinkel	November 18, 2014
Zonnepanelen op het dak van Waternet	Ingrid Heemskerk	November 24, 2014
Onze Energie	Marcel Hort	December 2, 2014
Private Sector		
Company	**Interviewee**	**Date**
Lens Energie	Christiaan Brester	December 1, 2014
Alliander	Marcel van Hest	November 25, 2014
Hoom	Roel Frietman	November 19, 2014
LDE Program	Lidy Vissinga	January 13, 2015
Public Sector		
Organisation/Department	**Interviewee**	**Date**
The Economic Affairs Department	Stephanie van de Wiel	November 18, 2014

Annex 3. The cases and interviews

Zuiderlicht Energy Cooperative

Zuiderlicht is an Energy Cooperative organised under the cooperative model. The objective of this cooperative is: to produce and consume renewable energy at local level, to provide knowledge and information to its members regarding energy savings, and energy saving campaigns. Also, one of the aims of Zuiderlicht is to produce and consume clean energy within 13 years from now in the metropolitan area of Amsterdam. This EC was established in 2013 and nowadays has 60 members, and it is currently running two renewable energy projects (consisting in Solar PV panels farms to be finished next year). Regarding the ownership of the cooperative, it follows the rule of the cooperative model: the members are the owners of the cooperative and the cooperative is the owner of the assets within the cooperative. Members are co-owners of the cooperative and as a result co-owners of its assets (included the RET). Zuiderlicht does not participate in co-ownership models regarding the property of the RET or the outcomes generated by these assets. On the other hand, the outcomes generated by its RET are sold to Green Choice under an agreement for the purchasing of the RE between Green Choice and Zuiderlicht. In this case the Zuiderlicht is the owner of the RET outcomes since the moment are generated and until the moment that are sold to Green Choice. As a result of this agreement, Zuiderlicht receives income which belong to the EC and therefore belong to its members. With the income gained from the RE sales the EC invests in more RET capacity, and also pays interests to the members as well as the loans and its interests (the loans and interests will be explained below). Zuiderlicht remarks that members are free to choose from whom they want to buy energy, as the law indicates.

In Zuiderlich two types of memberships are distinguished: One-euro-membership and the Full-membership. For the former, members get access to the EC' services by contributing with one euro to the cooperative. One-euro-members can attend the General Meetings of the EC but do not have voting-rights. On the other hand, they do have access to services such as: energy-savings knowledge and advice, Zuiderlicht's newsletter, support for buying RET, access to collective purchasing of RET for reduced prices, and admittance to all kind of meetings organized by the EC.

The second option of membership in Zuiderlicht is to become a 'loan's member'. Zuiderlicht explains that, legally, the EC does not work under a shares scheme. Instead, the EC works under a loans scheme. In order to capitalize the cooperative, members can invest in loan's certificates. Each loan is equivalent to 250 euros, and each member can invest in loan's units up to 20 loan's certificates. Each certificate establishes a creditor-debtor relationship and an obligation between the loan's members and Zuiderlicht, but also the loans are the mechanism to bring capital by the members for the cooperative. By holding loans' certificates, members receive both: full-membership rights and access to the decision-making process. The full-membership rights include the same rights than one-euro-members, plus the voting rights for the decision-making process in the General Meeting. By lending capital to Zuiderlicht members do participate in the decision-making process under the rule one-member-one-vote regardless the amount of capital invested (money lent).

Zuiderlicht expressed three reasons for using the loan's scheme: (1) taxation purposes, (2) to allow the cooperative to return to its members the initial investments (loans) after a period of ten years, and (3) to keep members (holders of loans' certificates) within the cooperative and avoid the trade of holder rights with outsiders. The members holding loan's certificates receive an annual interest that accrues from the debt obligation. Regarding the taxation goals Zuiderlicht argues that this scheme is more attractive to members because by using the loan's scheme the interests accrued from the debt can be deducted before paying taxes, and by using the shares scheme members receive dividends and the possibility for tax-deduction is after taxation.

Moreover, for using the loans scheme is because it allows Zuiderlicht to return the investments (loans) to its members after a 10-years-period. Thereafter, members may decide either to re-invest their capital or to withdraw it. Lastly, Zuiderlicht explained that the loans scheme allows member to stay within the EC and avoid trading with the loans certificates. The EC explains that using shares members would find easier to trade the shares with outsiders of the cooperative. And by using loans, then the members do not find attractive to trade with debt-rights contracted with the EC. Newcomers can invest directly in the cooperative using the loans scheme.

The EC is administrated by a Board of Managers, which is in charge of operating the daily tasks to run the cooperative, including the expertise roles of management. Also, it exists the General Meeting which is the maximum authority within the cooperative and it is formed by the sum of its members. The General Meeting is in charge of the decisions-making process regarding the affairs of the EC. Through this mechanism, the EC ensures both the empowerment of the decision-making process and the control of the EC by its members. The Board Managers work under a volunteer-basis, therefore its members do not receive any payment for the activities performed. Zuiderlicht explains that this situation represents a bottleneck for the cooperative, due to volunteers get tired and demotivated with the time, together with the fact that members of the Board of Managers have another personal activities. The EC states that a next step in its operation is to look for a business model that generates money to pay to the Board of Managers.

During the General Meeting, members voting rights can vote and agree about the outcomes generated by the cooperative, specifically by the RET. Members with voting right can either approve: to withdraw capital and return it proportionally to each member or re-invest the capital in the cooperative's objectives. Therefore, members may decide between: gaining income or investing in more RET capacity and increase economic savings in their energy bills.

One of the limitations of Zuiderlicht is related to the ownership of the RE produced by its own RET. Although, the EC is the owner of this outcome, the EC cannot directly dispose of the RET outcomes.

In other words Zuiderlicht cannot sell directly the RE produced to its members. Therefore, the ownership of this RE needs to be traded with an intermediary which is Green Choice, which is by law allowed to trade with energy. Then, the service of renewable energy is provided to the members of Zuiderlicht who are serviced by the supply of renewable energy, acting as co-providers but not as owners anymore.

Zuiderlicht wants to provide renewable energy to all its members, but at the moment it is not economically viable to produce energy, put it back in the grid and then sell it to the members. The reason is because then you have to pay taxes. Zuiderlicht states that people are willing to pay for using the grid, because you really use the grid, but *'we don't want to pay taxes on energy we produce ourselves, we want to pay for the services, like using the grid, that's very normal, or for the use of the infrastructure. We invest in our own energy production... For example, if you have a garden where you grow vegetables yourself, and you don't pay taxes on consuming your own vegetables, we have the same feel when you grow your vegetables and you put your own solar panels and produce energy.'*

Another limitation is the intermittency of renewable energy supply by means of the RET outcomes in the EC. Zuiderlich argues that consumers need a constant supply of renewable energy and at the moment this EC cannot provide its members with this service. 'This is the kind of service (we) would like to provide and don't have it yet, (we) don't have this expertise, that's why the partnership with Green Choice'. The partnership consists in providing constant supply of renewable energy to the members of Zuiderlicht (not exclusive) and granting 50e annually to Zuiderlicht for every member serviced by Green Choice.

NDSM Energie

NDSM Energie is an EC established in one shipyard area in Amsterdam. In the past the shipyard area was in bankruptcy and became a free zone for artists, later on the industry emerged there again, which is still present. In the shipyard region the idea of exploiting its renewable potential was already explored in 2006 by another renewable energy initiative. Thereafter, NDSM Energie was established under the cooperative model in May 2013. NDSM Energie is also an outcome of cooperation with Onze-energie, an EC. Nowadays, 60 members integrate NDSM Energie, these members are companies within the area, and they represent 60 out 400 of the companies established in the region of the shipyard. The objective of the EC is to be self-sufficient and start from the bottom-up in terms of RE generation. Moreover, there is a story of cooperation between the local government and the consortium of companies in the shipyard area.

The cooperative is yet to be investing in windmills in the shipyard area. The goal is to produce renewable energy to match the estimated demand of the members of the cooperative, which is approximately 683kWh. Although the cooperative is legally established, there is no resolution by the provincial government yet regarding the permits for the windmills installations since the application was filed.

In NDSM Energie, every member owns one vote regardless the size of the share. Two times a year the EC has a General Meeting, which is the higher decision making authority. The membership to NDSM Energie is not restricted to companies, also communities and anyone who shares the cooperative ideology nearby the shipyard area is invited to join. Every company that wants to be a member pays a capital injection, which is proportional to the size of the company. By investing capital in the cooperative, members receive a share in NDSM Energie. Regardless the size of the share, each member (shareholder) has voting rights in the General Meeting. The voting rights follow the rule one-member-one-vote. The General Meeting is the formal decision-making process in the cooperative and the higher decision making authority. The General Meeting is performed two times a year. The members of NDSM Energie own the cooperative and the cooperative is the owner of its assets, included RET.

Regarding the management of the EC, the Board of Managers is in charge of daily tasks of the cooperative, in words of NDSM Energie: 'the management of the daily businesses'. The Board of Managers rotates its members and attempts to include in it all members of the EC during a determined period. Regarding technical operations and expertise roles related to the EC, the NDSM Energie states that they are 'amateurs in energy... but learning everyday...' Therefore, the technical knowledge is taken externally, for instance for the foundation of the turbines, or the installation of the PV solar panels. The Board of Managers is integrated by 5 members, these members are in charge of making the EC a reality and make it work. Due to the work of the Board of Managers is in a volunteering basis, the way to compensate the performance of the Board of Managers is by granting them with shares in NDSM Energie if the project succeeds.

Regarding partnerships with the public-private-community sectors, NDSM Energie argues that these sectors are partners of the cooperative. For instance, the community sector was approached by the EC to involve its participation within the EC. Although, the aim of this EC is to attract companies as members, the community sector is also allowed to participate and invest in the EC. NDSM Energie describes this strategy as way to integrate people in the project and get them involved with renewable energy in the area. Communities in the proximity can invest capital, get share(s) participation, get an economic income in return based on the renewable energy production subject to the outcomes obtain from the RET operation, and be granted with equal rights as the company members. Moreover, another way to include community is using compensation mechanisms. For example, when the permit's application for the windmills installations was filed, the EC organized a meeting to consult communities in the proximity about people's opinion and support. Also, an article explaining the NDSM Energie project was published in the local newspapers (50000 copies) and distributed among communities. The objective was to handle one copy of the newspapers in each household in the area of the Northern part of Amsterdam. The article also asked for complaints and opinions regarding the project. The EC receive two complaints about the projects and both were related to the location of the project without objection to the environmental goals. Therefore, NDSM Energie promised to compensate communities near the project with the construction of a park in order to create compensation value. The EC argues that communication with communities has worked positively and it has improved plans and decision-making so far by giving people a chance of speech.

Also, NDSM Energie is working on a local outsourcing scheme to include members of the community in the management of the cooperative. The Board of Managers is working to create room for internships in the cooperative and allow local people to practice and develop technical skills by operating the RET of the EC. By implementing this scheme NDSM Energie attempts to enhance its partnership with the community sector, and deal with local solution for the technical management of the RET in the EC.

The private sector is also considered as a partner for NDSM Energie. Due to the location of the shipyard shared with 400 companies and industries, NDSM Energie is an outcome of cooperation among 60 out of these 400 businesses. The idea is to bring to NDSM Energie: capital for the project, local renewable energy to match the local needs and environmental commitment.

Amsterdam Energie

Amsterdam Energie is a renewable energy initiative constituted under the terms the cooperative model. One of the aims of this cooperative is that 'people may have influence on what they consume, connexion between the product bought and you..'

Ownership:
RE insolation, windmill, solar is not enough… not profitable

Financial resources:

Amsterdam Energie states that bringing capital and making profits in an EC is not an easy task. The cooperative explains that in order to bring capital to the project and continue with scaling it up, more activities different than volunteering have to be done. The cooperative explains that the largest amount of money comes from banks and subsidies. Regarding subsidies, Amsterdam Energie receives the SDE subsidy, which is received yearly and it is based on the productivity of the EC.

Future different ways to participate in Amsterdam Energie:
You own more companies or they own you..
Three public and 3 private granted, windmills… plan to start a BV and the private owners we will join and also the bank.

Risk:
Money is not the problem for wind farms… is very risky to ask for permission… expensive the design and planning requirements to apply for the project permission of windmills. A large investment is needed before getting the building permit.

Public bearing the risk:
The municipal government of Amsterdam has a program for sharing this risk. The municipality bears with the pre-application and permit's application fees on the behalf of the EC. Amsterdam Energie explains that, with this programme EC only have to concern about the project and the municipality about the planning and application fees.

From wind to solar:
Regarding solar PV panels Amsterdam Energie argues that regulations work easier for the EC. There are almost no exhaustive regulations, just rules for building and guidelines. Solar PV panels are not expensive anymore, each panel costs around 360 euros.

If you sign energy contract, we can deliver the energy to your home, in your bill you see what you consume and produce and then you pay the difference.

PV panels are easy to divide, due to are installed on the people's roofs, therefore easy to manage.

Members:
Members of Amsterdam Energie are legal and natural persons. Legal persons include local shops, pubs, and local businesses that want to join the cooperative. Amsterdam Energy states that members that have properties with visible windows facing the streets are more interested in becoming members of the cooperative. Amsterdam Energie explains that for local businesses, to have membership in the cooperative represents a 'green energy label' that enhances their reputation for consumers. On the other hand, natural persons are the members with environmental awareness and commitment willing to participate in renewable energy projects.

Management:
Amsterdam Energie is a cooperative in which its members participate by holding shares and injecting capital to in to it. The shares scheme works as the cooperative model indicates, one share per member, and one vote per share regardless the size of the share. The General Meeting takes place two times per year. As in the cooperative model, the General Meeting is the maximum decision–making authority in the EC. Amsterdam Energie is managed by a Board of Members formed by 5 members.

Amsterdam Energie has two working groups: the workgroup for windmills and the workgroup for solar PV panels. Both of them conformed by volunteers. The first one works on finding locations in the districts in the nearby. The job is to find both opposition for future projects and support from communities and local businesses. On the other hand, the working group for solar PV panels is in conformed by Rolf and a lawyer, and they are in charge for advising members regarding regulations, business strategies and taxation affair.

Ownership:
The cooperative is the owner of the assets and the EC is owned by its members. Members are the owners of the RET installed. Nowadays, the EC only has solar PV panels. Regarding windmills, the projects are waiting for the response of the authorities. Moreover, foundations for the windmill projects are already done. The outcomes generated by the solar PV panels belong to the EC, the electricity produced is sold to a renewable energy company. From which the EC also buys renewable energy for its members. Amsterdam Energie does not own any large solar project, the cooperative only owns the panels installed on members roofs. Whenever the EC has profits, these are always re-invested in the cooperative as established in its bylaws.

Right of first refusal:
The shareholders who would like to quit the cooperative are required, as written in the bylaws, to first offer and sell their shares to the members of the cooperative instead selling the shares to people from outside the cooperative, as the 'right of first refusal'indicates.

Cooperation. With the public and private
Amsterdam Energie has cooperation with the public and private sector. For instance, they work with the ECN foundation in an experimental project of solar PV panels. By doing so, Amsterdam Energie receives a subsidy from the 'Dutch Lottery'. Moreover, the project consists on developing Dutch technology for solar PV panels, with Chinese production, and deployment in the Netherlands. The way Amsterdam Energie participates on this project is by promoting the uptake of the mentioned solar PV panels.

Approach to communities:
Amsterdam Energie explained that it exist collaboration with Alliander, and within this cooperation their main goals are: to build a community of people involved with the energy problems of Amsterdam, to sell green energy, to make green energy a business, to start renewable energy installations, and to reduce conventional energy consumption (earn the most of carbon exhaust). For this collaboration Alliander uses one of its branch companies denominated 'Hoom'. Hoom is in charge of the community affairs on behalf of the Alliander businesses. Therefore, Hoom and Amsterdam Energie have a partnership relation to approach communities willing to participate in renewable energy projects. Amsterdam Energie states that People trust the cooperative because it does not have a very commercial face rather than the big energy companies. Amsetrdam Energie works as the front-face for communities and its main role is to approach people. It also works as a facilitator, organizer and promoter to bring people together for Hoom businesses. Amsterdam Energie explains that for this partnership Hoom works as the back-up office for Amsterdam Energie. In exchange for bringing people to Hoom businesses, Amsterdam Energie receives 30 euros for each person costumer brought. Lastly, this partnership works as a knowledge-exchange relation in which both parties collaboratively participate in a learning process. In words of the respondent: 'We do not provide a mass-product, very specific solutions for each costumer are needed...' Hence, the need to collaborate.

Evergreenergy initiative

This is the case of an emerging EC, which is in the initiative phase. Evergreenergy is on the road to become a formal EC, legally established, although is already working under the cooperative model. Evergreenergy started as a local initiative in a neighbourhood in Amsterdam. The first task of this cooperative was to bring members of the neighbourhood together in order to create environmental awareness among its members. Later on, the idea of creating an EC was suggested but locals did not follow it. The main reason was the financial resources. Thereafter, Evergreenergy resulted in an initiative with two households that managed to have Solar PV Panels' installations on their roofs. Evergreenergy explains that the awareness campaign in the neighbourhood spread out the idea of having solar PV panels on households roofs, even if people were not fully enthusiastic with formally participating in an EC, it was seen that households started to adopt solar PV panels on their roofs.

After this awareness campaign, it was explained that more solar PV panels' installations can be seen on the people's roofs within the neighbourhood.

Regarding the ownership of the RET in Evergreenergy initiative, the solar PV panels installations were possible by using the 'bedrijfzoektbuur' scheme. Every household in the Evergreenergy initiative is the owner of the outcomes generated by the RET, and the renewable energy outcome of the solar PV panels is directly consumed. Regarding the financing of the installations, the capital resources came from 3 sources: municipal subsidy, personal savings, and a private initiative. Both the subsidy and the personal savings resources do not represent a further debtor obligation. The financing covered the half of the money required for the solar PV panels project. The ownership of the solar PV panels kept on the hands of the private initiative until the principal debt and its interests are fully paid to the creditor. The debtor, who is as well the end-user of the solar PV panels pays the financing based on the energy-savings made as a result of the RET. The payback period for this project is 6 years, which also brings the property rights of the solar project to the debtor party.

Regarding the management of the RET in Evergreenergy, the decision-making process differs from the formally constituted EC. Instead, this is a bottom-up initiative that started from the praxis of an energy cooperative rather than the legal formalities of an energy cooperative. Moreover, due to the limited amount of members in the initiative, there is not an institutionalised decision-making process, neither shares nor participation schemes. All the affairs to be dealt regarding this renewable energy initiative are discussed directly between the two members.

The Economic Affairs Department of the Municipality of Amsterdam.

The Economic Affairs Department deals with the relationships regarding EC. The department stablished that currently the municipal government supports windmills, CHP and solar PV panels projects. Part of the objective of the Economic Affairs Department is work as a facilitator and intermediary between EC and possible investors. As well as to back-up EC and bring confidence to the investors.

Some of the main activities performed by the Economic Affairs Department regarding EC are to provide coaching and knowledge to EC regarding: legal matters and organizational models. The department states that this informational service is personalised due to there not a general solutions for all the initiatives, one solution does not fit all. Moreover, the Municipality of Amsterdam thru the Economic Affairs Department provides subsidies and loans for renewable energy projects and initiatives. The department explains that more often the loans scheme is replacing the subsidies scheme.

The municipality provides loans with low interest rates for RE projects, included EC. The idea behind is to support highly motivated projects and promote the professionalism of EC cases, as well as to promote business cases in EC. Nowadays, according to the Economic Affairs Department solar PV panels, are not as expensive as before. Therefore, in the past it was needed to subsidize the high prices of this technology in order to promote its deployment. But, now that solar PV panels are economically accessible for people, the municipality goes for bigger projects. Nowadays, the subsidies that remain prioritized are the ones for isolation technologies. Moreover, the subsidies for projects planning, is less common and the resources provided by the municipality for EC are nowadays provided within the loans scheme.

The Economic Affairs Department argues that loans allow giving continuity to the capital available for EC by the municipality. By having the repayments of the principal debt and its interests, the municipality can re-invest the money in financing more initiatives and support RET deployment in Amsterdam.

The Municipality of Amsterdam already has plans for wind-farms, which are still waiting for resolution by the provincial government. The municipality states that, once these projects are approved one of the requirements for developing these wind-farms, is that inhabitants in the locality must be included in the project's participation.

Zonnepanelen op het dak van Waternet, Energy Cooperative.

Zonnepanelen op het dak van Waternet is a renewable energy initiative started by the workers of the water company denominated Waternet. This initiative works under the organizational model of a cooperative. Zonnepanelen op het dak van Waternet is mainly about solar PV panels' deployment on the roofs of Waternet's facilities. In this EC members are, so far, only workers of Waternet. The EC started because of the environmental awareness of Waternet and its employees, but also because of the awareness of the opportunity that the roofs of Waternet provide for renewable energy production. The goals of this EC are: to match the energy demand of Waternet with a supply of energy gathered by solar PV panels, and to show environmental commitment by reducing conventional energy consumption in the operational activities of Waternet.

The members of this EC are the workers from Waternet willing to contribute and invest in the solar PV panels project. Workers can become members buy investing of shares in the cooperative. One solar PV panel represents the minimum unit of investment. Members are the owners of the EC, and the EC is the owner of its assets. Moreover, members are also the owners of the outcomes generated by the solar PV panels. Zonnepanelen op het dak van Waternet has a contractual relationship with Waternet for the provision renewable energy. All the production generated by the solar PV panels is for the consumption of Waternet. As a result, this transaction of renewable energy generates an income for the EC, which after subtracting costs is either re-invested or divided between members.

Members participate in the decision-making of the cooperatives. Being a member gives voting rights in the General Meeting, which follows the rule one-member-one-vote, regardless the size of each member's share. As well, if a member would like to withdraw from the cooperative, the rule of 'right of first refusal'applys, hence his or her shares must be first offered to the remaining members of Zonnepanelen op het dak van Waternet. This EC has signed a service contract with the energy cooperative Zon op Nederlands for hiring administrative services, know-how, and expertise for running the energy cooperative. Also, activities such as tax calculations and the calculation of dividends for the members, are included.

It is explained by Zonnepanelen op het dak van Waternet that one of the main limitations to both scale-up and spread-out this renewable energy project, is the national legislation regarding taxation. Although this EC is enthusiastic about future roof projects, taxation does not provide a cost-effective incentive for the members of Zonnepanelen op het dak van Waternet to scale it up.

Alliander (Holding Company)

Alliander is the holding company from which two business units derivate: Liander and Liandon. The network company of Alliander is responsible for the energy distribution in some areas in the Netherlands, included the city of Amsterdam. Moreover, it is administrated by a Management Board which is in charge of running the day-to-day business of Alliander. (Alliander, 2009). Besides Liander and Liandon, Alliander has a third business component within its network of companies. The third component is denominated EBA Emerging Businesses Area.

Liander it is a regulated company and it is also the owner of the grid. It is in charge of dealing with the energy tariffs and the maintenance of the grid. Liandon is the company dealing with the engineering affairs for the grid operation and the provision of energy consultancy. Under the scope of this

company are found the projects related with the engineering and consultancy for heat, electricity and gas projects. Lastly, the EBA is the umbrella area of Alliander for the start-up's projects. EBA projects are further explained as follows.

EXE (Energy Exchange Enablers). This service may work as a back up for EC for being their own energy suppliers. By aggregating the energy supply of EC, this service will measure the energy produced and consumed within EC. By doing this, the service will enable members in EC to exchange energy between them, and will also enable them to trade with the energy by doing transactions among members in EC. Moreover, the idea philosophy behind EXE is to introduce new business models that aim for smart energy, to support costumers (EC included) demand for smart energy and to enable energy systems for smart grids Alliander.

TIPPIQ. It is a service designed for enabling consumers to have online access to their home addresses and to what is happening around consumers' homes. It is as well a benchmarking tool for comparing consumers' energy consumption with other consumers using TIPPIQ. This is also a tool that makes energy-related topics communication possible between users. This communication has two possible dimensions: communication by one user and the locality (neighbourhood) and person-to-person communication. The energy data exchange is protected and requires the users' permission for sharing information.

MPARE. This is an energy data platform that allows data sharing among its users. It is also intended to provide energy data to third parties. Permission of users is required for sharing energy data with other parties. Users can also have access to its own energy data or to share it with other parties. This is a benchmarking tool that enables users to compare energy consumption in the neighbourhoods. It also engages users in responsible energy consumption and stimulates improvements regarding energy consumption. One example is by making possible energy-battles among neighbourhoods participating in the MPARE platform. As well, MPARE is intended to gain insights for energy consumption and production.

ALLEGO. It is a network of charging stations for electric vehicles, and its most recent outcome is the Charging Plaza for electric vehicles.

HOOM. It is a consultancy and advising initiative for renewable energy and energy saving measures. Hoom is focused on providing its services at the neighbourhood scale. Services and products provided by HOOM include: soil and crawl space insulation, cavity walls insulation, solar water heaters, and solar panels. Moreover, HOOM makes a services offer to clients in which local providers from the neighbourhoods are included. Insolation for houses financed within the energy bill.

DGO (Duurzame Gebiedsontwikkeling). DGO is a project committed with the sustainable development of areas and neighbourhoods. The aim of DGO is to look for areas and work on sustainable development by advising and investing in energy infrastructure in order to improve the current situation of the selected areas. DGO states that this commitment is only possible by partnering with governments, business and end-users. Moreover, DGO is a way to connect providers of renewable energy, with governments and the end-user of renewable energy. Under end-users is also included EC. Furthermore DGO states that governments play an important role in this project because municipalities are often owners, co-owners, or co-investors in sustainable infrastructural developments.

OSGP Open Smart Grids Platform. This platform aims to connect control-devices and infrastructural layers in public spaces. By using this platform it is possible to monitor objects in public spaces with an application that communicates with the infrastructure. One example is the recent project in collaboration with Amsterdam Smart City for the public lighting in Amsterdam. Moreover this platform enables municipalities to have control on public streetlights and to have also control on the personal that has control on the lighting system.

LDE Program

LDE program is part of the Community Practice, and this Community Practice is a platform of knowledge exchange in which the public sector brings different organisations from the public, private and community sectors together. The LDE program participates in this platform, which meets once every month. These meeting brings EC, municipalities, and Alliander toghether in order to share ideas, business cases, knowledge about RET and project of Alliander regarding local renewable energy.

LDE program, in fact, is a platform of knowledge exchange between Alliander and EC. The aim is to facilitate local renewable energy projects. Technical and expertise information is provided to EC about grids and RET.

Also, LDE collaborates with Enexis, Steren and Hier Opgewekt by doing an online platform in which consumers can find the costs of Solar PV Panels' installations and the costs of connections from all of the Grid Operator Companies. This is a cost calculator application for Solar PV Panels and connections that aims to speed-up the communication between the grid operators and the users.

LDE has a help desk in which EC and consumers can consult the grid operator regarding information related to local renewable energy.

Also, LDE collects feedback from the users and EC, regarding the services provided in order to gain insights about the local renewable energy services provision.

LENS Energie

Lens Energie B.V., is a company that owns the product 'Herman de Zonne Stroom Verdeler' (Herman). This product is a software which combined with hardware installations in buildings, facilitates renewable energy distribution within a building. Herman is a product for smart distribution of solar energy on common roofs. This product works for common roofs in buildings or Housing Associations by managing with Herman the solar PV panels' production. This product enables members within the same building to manage its own renewable energy production and to decide how this energy is distributed among households in the same building. By using an internet application, members-users of Herman can control their own energy production and distribution among members-users. Members-users from one building, may elect one administrator of the Herman software who is in charge of operate the software. Also, by using Herman users can monitor how many euros, kWh and C02 savings are provided by using Herman.

It was explained that there exist the option for renewable energy associations to participate with one professional investor or ESCO in a renewable energy project. Meaning that if a Housing Association in a building wants to install solar PV panels and use the product Herman, but the association requires an external financial investment then a third party may provide the financial resources.

Onze Energie

Onze Energie is an energy cooperative legally established. It has 250 members approximately, and all of them are natural persons. People pay 50 euros to become a member, and the memberships gives access to services such as: renewable energy and gas supply by Green-Choice, and to all the activities organised by Onze Energie. Onze Energie does not issue shares certificates to its members yet. The energy cooperative is administrated by a Board of Managers, which is integrated by five members. Moreover, a Surveillance Board supervises the Board of Managers. The General Meeting takes place once a year, and it is the maximum decision-making authority. During the General Meeting decisions are taken under the rule one-member-one-vote. By the moment Onze Energie does not own or manage

any RET. This cooperative is, so far, planned to run, operate, own, and manage, only windmills. Lastly, the ways and form of participation of Onze Energie with the public, private, and community sectors are described as follows:

Private-Community-Private: Onze Energie is a partner of NSDM Energie. The partnership consists in knowledge exchanging, and planning corporate partnerships between the two cooperatives. Also Onze Energie states that this cooperative and NSDM Energie are collaboratively working to get one windmill built. Onze energie highlights that they have been waiting for the provincial permission to continue forward with the windmill project.

Public-private: the municipality provided assistance for the pre-investigation and requirements to apply for building permits for windmills. The assistance included advice and finance of the requirements for filing the permit. Later on the municipal permissions were approved but the provincial one are still pending.

Private-Community: Onze Energie explains that it organised a signatures' collection for getting communities support for the establishment of the energy cooperative.

5.1.1. HOOM

HOOM is a branch company of Alliander and part of the EBA projects. Hoom is explained as a way to: promote the energy transition in the Netherlands, work with communities, and build energy efficiency. One of the main objectives of Hoom is to engage local communities, municipalities and Hoom in working together for local renewable energy initiatives. The way Hoom works with EC is by following three steps. First, Hoom measures what is needed in a location and to know people's wishes. Second, a services offer is presented to communities in which different solutions and different providers are suggested. The services offer includes one local provider from the community. Third, the services are performed and then the results tracked.