Facilitating local energy transitions in a multi-level context

A study of factors that facilitate energy transitions at the local level and corresponding modes of governance through which the European Commission can support these transitions

Master thesis European Governance
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Abstract

Europe's energy system is currently unsustainable and a transition to renewable energy is therefore of utmost importance. While searching for ways to bring about this complex transition, academic scholars and European actors are increasingly emphasizing the importance of the local level. However, despite increased recognition on its importance, the question of how to successfully engage the local level in Europe's energy policies has remained under-researched. It is in light of this knowledge gap that the aim of this thesis was to explore ways in which the European Commission can facilitate energy transitions at the local level, in order to stimulate Europe's transition to renewable energy. This thesis took a two-fold approach to answering this question. First, an empirical study was conducted in order to identify what factors play a facilitating role in bringing about energy transitions at the local level. The results indicated that many factors play or might play a facilitating role and that local authorities consider a municipal strategy, financial resources and expertise particularly important. Then, the identified factors were discussed in the context of the three modes of climate governance as formulated by Kern (2014): hierarchical, vertical and horizontal governance. This indicated that the European Commission can engage with the local level both indirectly and directly in order to facilitate them in the transition. Direct engagement through the vertical governance mode appears highly promising as it allows the European Commission to contribute to important factors (e.g. financial resources and expertise), thereby strengthening local authorities' capacity realise the transition to renewable energy. However, it is argued that indirect modes of governance can also contribute in valuable ways, most importantly by fostering a favourable environment for renewable energy policies through the hierarchical governance mode and by supporting (trans-)national networks through the horizontal governance mode.

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List of Abbreviations

EC = European Commission
EU = European Union
GHG = Greenhouse Gas
LEC = Local Energy Co-operation
MLG = Multi-Level Governance
RE = Renewable Energy
RES = Renewable Energy Sources
RET = Renewable Energy Technology

1. Introduction

"This is where modernisation of Europe's economy starts" –
European Commission on the importance of the local level
for delivering the Energy Union – European Commission (2017)

Energy is a daily need in all European countries. The well-being of European people, industry and economy is dependent upon safe, secure, sustainable and affordable energy (European Commission, 2009). The energy system evolved over centuries, of which the last century witnessed a significant increase in energy production and consumption. This provided more comfort and individual freedom, but at the same time it has been and still is polluting the environment and depleting existing reserves (European Commission, 2009). Hence, Europe's current energy system is unsustainable and needs to reform (Kanellakis, Martinopoulous & Zachariadis, 2013).

Given the need to reform, the European Commission (EC) aims to establish a resilient Energy Union, with at its core an ambitious climate policy (European Commission, 2015a). In order to reach this, the Energy Union's policy focuses on renewable energy. The end objective is to cut EU emissions by 2050 with 80-95% below 1990 levels, but current policy is estimated to only reach a 40% reduction by 2050 (European Commission, 2018). In order to meet the target, a radical energy transition is required (IEA, 2014). However, transforming energy systems across the European Union (EU) is a highly complex task and has often been referred to as a wicked problem (Eckersley, 2018). In dealing with the complexity, the EC has emphasized the importance of the local level for delivering the Energy Union (European Commission, 2017b). In the "Second report on the State of the Energy Union", the EC states that in the EU cities are responsible for a quarter of all public expenditure and for almost half of public investment. European cities produce 68% of the EU's gross domestic product and 62% of the jobs (European Commission, 2017b). Hence, cities are considered key players in the transformation towards renewable energy. This opinion is shared by local leaders. Michel Lebrun, former president of the Committee of the Regions stated that "cities and regions are the key component in Europe's sustainable energy transition as they are responsible for creating favourable legal environments locally, raise awareness and capacity building and incentivise public-private partnerships through fiscal measures" (Committee of the Regions, 2016). Bruno Hranić, rapporteur of a CoR opinion on the 'Energy Union Governance and Clean Energy' argued that the Energy Union can only succeed with a multi-level governance model. He emphasized the importance of planning and reporting the commitments, achievements and know-how of cities and regions (Crous, 2017). The increased attention for the role of the local level in the transition to renewable energy is a phenomenon which can be placed in a wider context. The academic discourse increasingly regards local governments across the global, especially those of cities and urban areas, as strategic arenas for climate change policies like renewable energy (Betsill

et al., 2015; Bulkeley, 2010; Castán-Broto, 2017; Dahlmann, Kolk &Lindeque, 2016; Dannevig, Rauken & Hovelsrud, 2012; Fuhr, Hickmann & Kern, 2018; Jänicke & Quitzow, 2017; Schönberger, 2013; Eckersley, 2018).

1.1 Research question

Despite a growing recognition on the importance of the local level for reaching the European Energy Union's renewable energy goals, little systematic research has been done on actual ways in which the local level can be engaged so as to facilitate the Energy Union in reaching these goals. The EC itself is unclear at this point. They emphasize the importance of the local level and envisage a partnership with this level in order facilitate the transition to renewable energy, but furthermore the EC remains unprecise as to how they would like to involve cities in their energy policy. This thesis addresses this policy and research gap by posing the following central research question: *In what way can the European Commission facilitate energy transitions at the local level in order to stimulate Europe's transition to renewable energy?* Although the local level can be understood as any sub-national level, it will in this thesis refer to municipalities.

In order to answer the research question, this thesis will draw on the work of Kern (2014), who describes three modes of climate change governance in the EU. EU climate governance, of which renewable energy policies are a central element, is a combination of these three modes and the specific combination of the modes determines policy outcomes. Each mode of governance is associated with certain roles and activities of EU institutions, as well as their relation to national and sub-national governments. Understanding these relations contributes to a better understanding of the outcomes of governance processes, thereby providing insights about the ways in which the EC could facilitate energy transitions at the local level (Kern, 2014; Fuhr et al., 2018). Hence, looking at the research question through the conceptual lens of these modes of governances helps to the answer the central research question. However, it is not enough to understand the forms that relations between the EU and sub-national authorities can take; it is imperative to also have knowledge on factors that play a role in bringing about energy transitions at the local level. When these factors are identified, it is possible to link them to the different modes of governance. This in turn allows one to draw inferences on the value of each mode in relation to the central research question. In other words, discussion facilitating factors in the context of the modes of governance, contributes to a better understanding of roles and activities for the EC through which energy transitions at the local level can be facilitated.

Given the aforementioned, the first sub-question of this thesis is: *What factors facilitate energy transitions at the local level?* The term 'facilitating factor' will refer to any factor which stimulates, provides, or promotes the planning and implementation of renewable energy policy. A literature review will be carried out for the purpose of identifying facilitating factors from the academic discourse. These factors will subsequently be tested in a cross-sectional

research design, in which it is measured to what extent the factors are present in Dutch municipalities. An online questionnaire and secondary sources will be used to measure the factors.

After the identification of factors that facilitate energy transitions at the local level, the focus of this thesis will turn to the modes of governance. The second sub-question is: *Given the facilitating factors that have been identified, what modes of governance can contribute to the facilitation of energy transitions at the local level?* By systematically comparing the identified factors with the characteristics of each mode of governance, it is analysed how the factors relate to each mode and it will be discussed which modes and associated activities of the EU would be expected to contribute to the facilitation of energy transitions at the local level.

1.2 Societal and academic relevance

The societal relevance of this thesis follows from the importance of Europe's transition to renewable energy. This transition is important for two reasons. First, greenhouse gas (GHG) emissions, which are to a large extent linked to energy, are not compatible with the EU and the global objective of limiting global climate change to a temperature increase of 2°C. The EU has committed itself to this objective, because climate change poses a threat across the globe to ecosystems, socio-economic sectors and human health. In order to reach the EU goal of cutting GHG emissions with 80-95% by 2050, energy use needs to become more efficient and the production should become almost emission-free (European Commission, 2015a). The current system is not able to meet these demands. A transition to a system relying on renewable energy would help to overcome this problem, as renewable energy sources (RES) that meet domestic energy requirements have the potential to provide energy services with close to zero GHG emissions (Panwar, Kaushik & Kothari, 2011). Secondly, it is imperative to make the shift to a system functioning on renewable energy for the sake of securing a stable energy supply. The overall import dependency of the EU is around 54%, including suppliers from politically unstable regions. In addition, there is a gradual depletion of fossil fuel resources and rising global competition for energy resources. We thus see several factors that challenge the security of energy supply in Europe. RES can be used to produce energy again and again within the EU borders. Hence, renewable energy makes it possible to greatly reduce Europe's energy dependency from third countries and fossil fuel sources (Panwar et al., 2011). Despite its importance, the transition to renewable energy is taking place slowly and the EU is not on track to reaching its 2050 objectives (IRENA, 2018). It is therefore of utmost importance to explore ways in which the transition can be accelerated. As the role of the local level in the energy transition has so far not been systematically researched, this thesis can make an important societal contribution. The conclusions and policy recommendations that follow from this thesis could provide European policymakers with relevant insights as to how they can engage with the local level in a way that facilitates the energy transition. Furthermore, by identifying factors that facilitate energy transitions at the local level, the results of this thesis contribute to a better understanding of local energy transitions. In formulating renewable energy policies, local

policymakers can potentially draw on the findings of this thesis for additional scientific evidence to strengthen their policy choices.

In terms of academic relevance, this thesis contributes to filling a research gap in the renewable energy and climate change literature. In the literature, it is on the one hand increasingly recognised that the local level holds great potential for realising Europe's energy goals (Bulkeley, 2010; Castán-Broto, 2017; Dannevig et al., 2012; Schönberger, 2013; Eckersley, 2018). On the other hand, despite increased attention, the topic is still largely understudied: various scholars have analysed the opportunities and obstacles for renewable energy policy, but their focus has largely been on the international, supranational and national levels of governance (Schönberger, 2013; Castán-Broto, 2017). This is problematic, for it suggests that measures to improve local renewable energy policy are limited to the idea of being 'local' solutions, thereby ignoring the influences and roles of policies and actors outside the local arena (Bulkeley & Betsill, 2005). What's more, studies that did focus on the municipal level, predominantly concentrated on technical and economic potential (Eckersley, 2018; Schönberger, 2013; Schreurs, 2008). These studies unravel the economic incentives for investors to switch to renewable energy, the economic consequences of the energy transition, and the specific technological difficulties related to switching to renewable energy. What has been receiving less attention is the governance component of the transition to renewable energy, meaning the impact of politics and policy choices of the local level (Eckersley, 2018; Schönberger, 2013; Schreurs, 2008). As a consequence, in trying to make the transition to a sustainable energy system, it is unclear in what way policy options for local authorities could be employed in an optimal way. The lack of systematic research on local renewable energy policies is all the more unfortunate, because in recent years municipalities in different parts of the EU have increasingly become interested in promoting renewable energy (IEA, 2009; Schönberger, 2013; Eckersley, 2018). In conclusion, there is need for research on processes that shape local capacity and political will for sustainable development policies at multiple sites and scales of governance (Bulkeley & Betsill, 2005; Gustavsson, Elander & Lundmar, 2009; Hanssen, Mydske & Dahle, 2013; Monii & Raes, 2008). This thesis follows up on this recommendation by exploring what factors facilitate local governments in bringing about the transition to renewable energy and how the EC could contribute to this. By conducting a literature view, this thesis contributes to the academic literature by bringing together factors from a wide range of academic disciplines. In addition, by empirically testing the factors identified in the review, this thesis allows for a better understanding of the relevance of the identified factors.

By examining ways in which the EU can support local transitions to renewable energy, the results of this thesis are also of interest to the academic discourse on EU – local level relations in a more general sense. Various scholars have pointed out emerging patters of interaction between local and European levels over the past two decades (De Rooij, 2002; Guderjan, 2015; Kern 2014; Marshall, 2005; Schultze, 2003). On the one hand, local levels can bypass the

national level to gain their own direct channels of access to EU agenda-setting and policy-making. On the other hand, the EU embodies a new identity which impacts on the local level top-down through its legislation. What's more, common social and political challenges require joint efforts and coordination of policy instruments, expertise and capacities across various levels. It is for this reason that European policymakers are expressing a strong interest in enhancing cooperative relations with the local and regional level (European Commission, 2014b; Guderjan, 2015). Despite the emerging patters of interaction between the local and EU level and the interest of EU policymakers in cooperative relations, not much is known about this phenomenon. Apart from studies about the Europeanisation of local government, the complex relation between local government and the overall evolution of European governance has remained understudied (Guderjan & Miles, 2016). Hence, there is a knowledge gap in European integration studies as regards the bigger picture of local-supranational relations in the EU. This thesis analyses relations between the supranational and local level in the EU and thereby makes a contribution to the literature on European integration. Although the focus will be on the field of renewable energy, the results on local and supranational relations could serve as an example for other policy areas.

1.3 Reader's guide

This thesis is structured as follows. In section 2 the context in which this thesis takes place will be discussed by providing background information on renewable energy policy in the EU, as well as explaining the increased attention for the role of the local level in relation to Europe's energy transition. Section 3 is divided into two parts. Section 3.1 elaborates on the modes of governance and section 3.2 includes a literature review on facilitating factors for local authorities in the transition to renewable energy. This will be followed by section 4, which outlines the methodological approach for answering the research questions and a justification of the chosen methods. In section 5 the results of the empirical analysis are presented and section 6 discusses the meaning of these results in the context of the modes of governance. Section 7 concludes on the main findings by answers the research questions and reflects upon the limitations of this thesis. Section 7 also includes recommendations for future research.

2. Context

2.1 Renewable energy in the EU

As was written in the introduction, renewable energy is at the heart of the Energy Union's policy. Renewable energy comes from sources that provide energy which is "continually replenished by nature and derived directly from the sun (such as thermal, photo-chemical, and photo-electric), indirectly from the sun (such as wind, hydropower, and photosynthetic energy stored in biomass), or from other natural movements and mechanisms of the environment (such as geothermal and tidal energy)" (Ellabban et al., 2014, p. 749). The RES can be turned into usable forms of energy by renewable energy technologies (RET). Energy that is derived

from fossil fuels, waste products from fossil sources, or waste products from inorganic sources are not considered renewable energy (Ellabban et al., 2014).

The EC has set quantifiable targets up to 2020, the 20/20/20 targets, in the Renewable Energy Directive (Directive 2009/28/EC). This directive sets a binding target of 20% final energy consumption from RES by 2020. Member States have to commit to reaching their own national renewable targets, which range from 10% for Malta to 49% for Sweden. Furthermore, it is required to have at least 10% of transport fuels come from RES by 2020. All Member States adopted national renewable energy action plans, and progress towards national targets is measured every two years when Member States publish national renewable progress reports. In the action plans, Member States have to include sectorial targets for electricity, heating and cooling, and transport. In addition, they outline the policy measures which they plan to implement, the RET they expect to employ, and the way in which they plan to make use of co-operation mechanisms (European Commission, n.d.). The report of 2017 states that on the whole, the EU has achieved a 16% share of renewable energy in 2014 and that most Member States are well on track to reach their 2020 binding renewable energy targets (European Commission, 2017a). By now, targets have also been set for 2030:

- "A 40% cut in greenhouse gas emissions compared to 1990 levels;
- At least a 27% share of renewable energy consumption;
- At least 27% energy savings compared with the business-as-usual scenario" (European Commission, 2014a).

Finally, the long-term goal set by the EU is reducing GHG emissions by 80-95%, when compared to 1990 levels, by 2050 (European Commission, 2011).

2.2 Challenges in the transition to renewable energy

Although it is a hot topic and Member States are adjusting their policies, a real transition to renewable energy has not taken place in the EU and the share of RE differs greatly per Member State (see Figure 1). In some Member States, renewable energy is already becoming dominant: in Sweden, the energy demand is met with just over 50% renewable energy and in Finland this is about 40% (Schiermeier, 2018; Eurostat, 2017). Other high scoring countries are Latvia, with a 37.2% share renewable energy in 2016, as well as Austria (33.5%) and Denmark (32.2%) (Eurostat, 2017). Many other Member States are lagging behind, of which Luxemburg, Malta and the Netherlands registered the lowest proportions of renewable energy (5,4% in Luxemburg and 6% in Malta and the Netherlands). The variations can be explained by various factors: different starting points, national available resource potential, current and planned policies, and national market conditions for renewable energy (IRENA, 2018). Although the variations between countries are expected to persist until 2030, they are also likely to become smaller as Member States with lower initials shares have the potential to grow faster (IRENA, 2018). Thus, most Member States, and therefore the EU as a whole, are in line of reaching their 2020 targets. However, there are serious concerns as to whether the same can be said about the 2030 and 2050 goals (EEA, 2017; Klessmann, Rathmann, & Ragwitz, 2011). A study of the

International Renewable Energy Agency (IRENA) shows that existing plans and projects of Member States falls short to deliver an aggregate 27% share of renewable energy in 2030 (IRENA, 2018). This means that additional effort is required to align long-term energy system trends with the 2030 and 2050 decarbonisation goals.

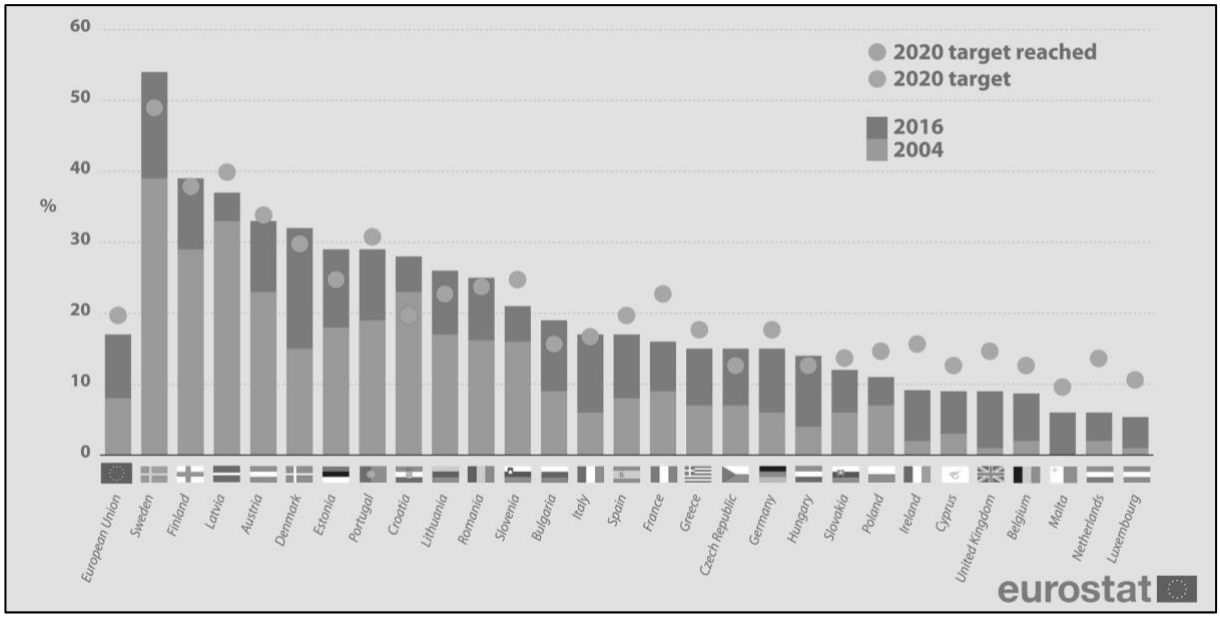


Figure 1. Share of energy from renewable energy sources in the EU Member States (in % of gross final energy consumption). Source: Eurostat (2017).

2.3 The role of the local level in the energy transition

In looking for ways to speed up the transition to renewable energy, the EC is increasingly expressing interest in the role of the local level. In fact, academic scholars and policymakers around the globe are increasingly emphasizing the importance of the local level, especially cities and urban areas, as strategic arenas for climate change action (Betsill et al., 2015; Bulkeley, 2010; Castán-Broto, 2017; Dannevig, Rauken & Hovelsrud, 2012; Schönberger, 2013; Eckersley, 2018). Urban areas are places with a large concentration of GHG emissions, due to the energy demand of buildings, waste, water and services, as well as industrial processes that are usually centred in or near urban areas. Given the fact that an increasing proportion of the world's population lives and works in cities, cities are important subjects to focus on. Hence, the 2015 Sustainable Development Goals included an explicit urban goal and the 2015 Paris Agreement for Climate Action emphasized the importance of subnational levels for the implementation of its goals (Castán Broto, 2017). Climate change action is a broad concept, referring to both mitigating and adaptation policies, but much of the literature also covers or is closely related to the energy transition, as renewable energy is a central element of mitigating policies.

In addition to the large concentration of GHG emission in urban areas, another rationale explaining the increased attention for local governance specifically, is the assumption that this

level can help to overcome the gap between national or international policy goals and its implementation deficit (Castán Broto, 2017; Jäncike & Quitzow, 2017). After all, it is the level with most knowledge of local effects and needs, and therefore able to develop an appropriate policy that fits in the nation-wide renewable energy policy (Dannevig et al, 2012; IPCC, 2007). In addition, although the local level is to a large extent bound by policies formulated by higher tiers of government, this does by no means imply that it is unable to influence policy outcomes. Local leadership can involve or politicise a topic at the local level by defining issues as distinctly local (Scholten, 2013; Schultze, 2003). This way, policies are not just implemented, but they are set on the agenda and formulated by local governments themselves. This is important, as local governments are able to influence the energy transition in various ways. Although the extent to which local governments can exert influence varies per region, it generally includes energy supply and management, transport, land use planning, and building regulations (Bestill & Bulkeley, 2006). All of these are sectors that will be affected by the energy transition (IRENA, 2018). Furthermore, local governments are in a good position to foster and further facilitate with relevant stakeholders, encouraging public participation, and lobbying national governments (Betsill & Bulkeley, 2006; Schönberger, 2013).

3. Theoretical framework

The foregone section has outlined the context in which this thesis is placed. Now, this thesis will turn to a theoretical part, as the aim of this section is to build a theoretical framework for the analysis. In section 3.1, Kern's modes of governance and their relation to the central research question will be explained. In section 3.2, it will be discussed what factors have been identified in academic literature to be facilitating local governments in the transition to renewable energy and how they relate to the three modes of governance. At the end of this section, an overview of the facilitating factors is presented (see Table 1).

3.1 Modes of governance

3.1.1 Multi-level governance and renewable energy policy

Before elaborating on Kern's modes of governance, it is important to first shortly introduce the multi-level governance (MLG) perspective, as this perspective lies at the heart of the modes. The MLG perspective is one of the few approaches that explicitly recognises the importance of the local level in the multi-level structure of the EU (Guderjan & Miles, 2016). This approach gives expression to the interaction between various actors, both private and public, that interact between and within the various government layers in the EU. The MLG approach points to a vertical and a horizontal dimension of governance (Hooghe & Marks, 2003). The vertical dimension refers to the interaction between international, national, regional and local policymakers and government bodies. The horizontal dimension refers to distributed responsibilities between national government departments, statutory bodies and other non-governmental groups (Bache & Flinders, 2004). MLG scholars emphasize the importance of

taking into account processes at multiple sites and scales of governance (Bulkeley & Betsill, 2005; Gustavsson et al., 2009; Hanssen et al., 2013; Monii & Raes, 2008). This does not imply that national governments are not considered important, it implies that the state no longer monopolizes European policy-making (Hooghe & Marks, 2001; Paterson, Humphreys & Pettiford, 2003).

In the realm of climate change and renewable energy policies, MLG scholars have argued that the policies are embedded in a multi-level context and hence the existence and impact of various layers of governance in the EU is of particular relevance to this policy area (Betsill et al., 2015; Bulkeley & Betsill, 2005; Fuhr et al., 2018; Gustavsson et al., 2009). However, the importance of the multi-level context is not always appreciated for in the academic discourse, as many analyses of local sustainability policy ignore the ways in which economic, social and political processes across different levels and systems of governance interact. This is problematic, for it suggests that measures to improve local renewable energy policy are bound by the idea of being 'local' solutions, thereby ignoring the role and influence of policy and politics outside the local arena (Bulkeley & Betsill, 2005). MLG scholars have therefore proposed to also take into account processes which shape local capacity and political will for sustainable development policies at multiple sites and scales of governance (Bulkeley & Betsill, 2005; Fuhr et al., 2018; Guderjan & Miles, 2016; Gustavsson et al., 2009; Hanssen et al., 2013; Monii & Raes, 2008).

3.1.2 Modes of governance

This thesis focuses on renewable energy policy in the multi-level system of the EU. It is assumed that the implementation of EU renewable energy policy at the local level changes local policies and that local renewable energy policy influences the development of EU renewable energy policy (Kern, 2014). This is a Europeanisation perspective on EU-local level relations. Europeanisation is a bi-directional process (Kern & Bulkeley, 2009; Marshall, 2005). On the one hand, it involves top-down processes, in which "changes in policies, practices, preferences or participants within local systems of governance arise from the negotiation and implementation of EU programmes" (Marshall, 2005, p. 672). On the other hand, it involves bottom-up processes: "the transfer of innovative urban practices to the supranational arena, resulting in the incorporation of local initiatives in pan-European policies or programmes" (Marshall, 2005, p. 672). Although the extent to which bottom-up Europeanisation takes place might differ, in most EU policy areas there is a continuous process of bi-directional influence (Schultze, 2003; Marhall, 2005). It is in this system of MLG and bi-directional Europeanisation that Kern (2014) identifies three modes of climate governance. First, Kern argues that MLG implies that EU programmes are eventually implemented at local and regional levels. When this happens through a top-down approach, meaning authority is concentrated on the highest government level and sub-national authorities are mere executers of policies, Kern refers to this as hierarchical climate governance. However, she argues that in the realm of climate change

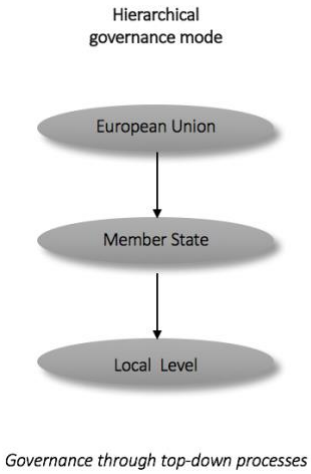
policy, this top-down approach needs to be complemented with a bottom-up approach. The local level, mostly cities, have tried to alter the effects of hierarchical climate governance by establishing direct links with EU institutions. This is a form of vertical climate governance, in which the local level affects the supranational level and vice versa. In addition, a third form of climate governance has emerged. Local authorities have developed various tools to facilitate knowledge transfer among themselves. Here, EU institutions play either no role at all or merely facilitate, for example by funding projects. This is called horizontal climate governance (Kern, 2014).

MLG scholars suggests that renewable energy governance does not follow the traditional distinction between local, national and global environmental politics (Bulkeley & Betsill, 2005). Instead, it involves 'spheres of authority', in which multiple overlapping and interconnected horizontal spheres of authority are involved in governing particular issues (Bulkeley & Betsill, 2005). It is precisely this point that Kern aims to address with the modes of governance. The model recognises the different spheres of authority that are involved in climate change policy. It proposes three modes of governance, through which it is able to characterise the interaction between the spheres of authority. They help to identify the nature of the relationship and the associated roles for EU institutions and policies, i.e. hierarchical, cooperative, or facilitative. This way, the modes contribute to breaking down a state-centric understanding and to better characterise the relationships between different actors horizontally across and vertically between different levels of government (Fuhr et al., 2018). Kern (2014) argues that it is the combination of these three modes of governance that determines policy outcomes. This means that it is important to know how the various modes and their associated roles for EU institutions and policies relate each other and to policy outcomes. To this end, in section 3.2 the modes of governance are linked to various factors that are identified in the literature as facilitating local transitions to renewable energy. Before turning to this section, each mode of governance will be discussed in more detail.

Hierarchical governance

A hierarchical governance mode involves a process of top-down implementation of EU decision in the Member States (see Figure 2). This mode of governance is characterised by top-down relations among the different government levels. Governmental actors at the EU and national level play a dominant role, as they have the authority for policy-making. They can steer and control sub-national authorities through their authority, power and capacity to harmonise policy. Civil society and local authorities have a limited influence on policy-making. Local authorities implement European legislation, but they have no direct access points in EU decision-making procedures. Local authorities are regarded as part of a hierarchically structured nation-state and hence one once could say that in this perspective cities are considered as objects, rather than subjects. Hence, Member States are gatekeepers, in the sense that only national government actors interact with the EU level. No direct links are established between the local and EU level: the relation between the EU and local level is

hierarchical and indirect, as it goes via the national governments of Member States (Kern, 2014).



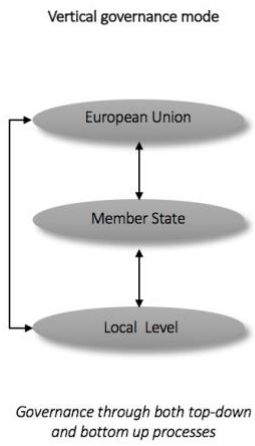
	Hierarchical governance
Main role of cities	Implementing EU legislation
Levels involved	EU, Member States, sub-national levels
Dynamic between levels	Top-down
EU-local relations	Indirect relations, Member States 'gatekeepers'
State-local relations	Hierarchical, local authorities as part of the Member States
Differences between local authorities	All local authorities, affected differences along national and regional lines
Role for EU policies and institutions	Hierarchical

Figure 2. Visual representation and table with characteristics of the hierarchical governance mode. Source: Adapted from Kern (2014).

Vertical governance

The vertical governance mode is a form of cooperative governance in which direct ties between local authorities and EU institutions are established (Kern, 2014). It combines the top-down perspective on Europeanisation with a bottom-up perspective, thereby giving expression the bi-directional nature of the Europeanisation process. Its institutional design is characterised by flexibility and interdependent relations between different government levels. In fact, national governments may be entirely bypassed: through lobbying and networking the local level can establish direct links with EU institutions. Note here a crucial difference between vertical and hierarchical governance, which is the assumption that in vertical governance direct links between the local and EU level can be established (see Figure 3). It is important to note that in this mode of governance, hierarchical governance may still play a role, but next to it interdependent relations among the authorities at different levels of the governance system may emerge. This means that competences are shared between governments at different levels and top-down decisions are (partly) replaced by joint decision-making within formal and informal networks. An example of formal link between the local and EU level, is the Committee of the Regions, which provides local representatives with the opportunity to access EU policy-making (Guderjan & Miles, 2016). Although the relations between different government levels can take many forms, the most common forms of are direct lobbying by sub-national governments to influence decision-making, and the development of collaborative programmes between institutions of different government levels. Also, EU funding programmes are a central component of this mode of governance. They would generally involve a funding programmes with a multi-actor approach, involving cooperating actors ranging from private companies to local and regional governments (Kern, 2014). Furthermore, transnational networks are also typical for the vertical governance mode. These are institutionalised forms of networking,

which often establish direct links with EU actors. Through these links and cooperative form of governance, transnational networks enable European cities to actively pursue multi-level strategies within the multi-levelled EU context.



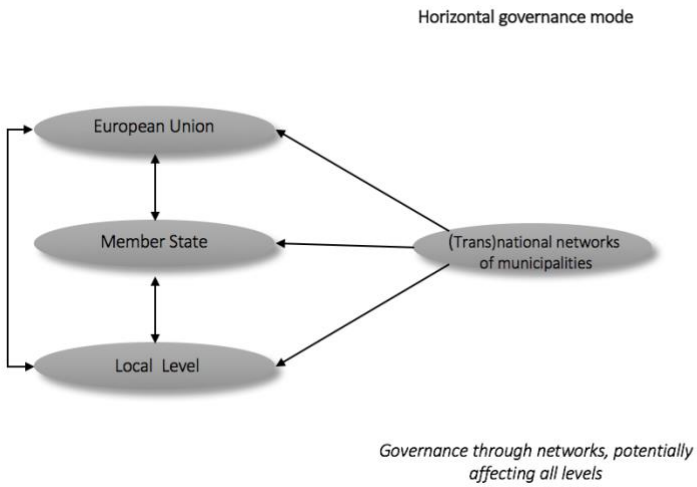
	Vertical governance
Main role of cities	Lobbying and by-passing Member States
Levels involved	EU, sub-national levels
Dynamic between levels	Top-down and bottom-up
EU-local relations	Direct relations, lobbying, consultation, and agreements
State-local relations	Para-diplomacy, state-local relations loosen
Differences between local authorities	Pioneers dominate associations and networks
Role for EU policies and institutions	Co-operative

Figure 3. Visual representation and table with characteristics of the vertical governance mode. Source: Adapted from Kern (2014).

Horizontal governance

The horizontal governance mode refers to a process of knowledge transfer and learning among local authorities themselves (Kern, 2014). In the EU, knowledge transfer and learning among local level authorities generally takes place through networking. Three forms of networking can be distinguished in the EU: (1) bilateral networking between two local authorities, usually cities; (2) project networking of a limited number of cities that may be supported and funded through national or EU programmes; (3) multilateral networking of local authorities (Kern & Bulkeley, 2009). In these networks, participation is not necessarily limited to local authorities of the same Member State. Many examples can be found of networks including local authorities of different Member States. For these networks to be of value and enable meaningful knowledge transfer and learning are, three elements are of importance: (1) the transferability of new approaches across cities, (2) the existence of transnationally oriented policy entrepreneurs, e.g. internationally engaged mayor, and (3) appropriate institutional arrangements that facilitate knowledge transfer (Kern, 2014). In this mode of governance, the EU can either play no role or merely a facilitative role. The EU can play a facilitative role, in the sense that they can fund these networks. However, they could also be involved more substantially, and assist in the development of an approach for systematically supporting the transfer of knowledge and best-practices. Not only do these networks provide for policy transfer and learning, but many also try to access national and EU decision-making actors in order to influence the decision-making process. Hence, Kern (2014) argues that these networks are a combination of vertical and horizontal governance, as they have two main functions: on the one hand lobbying at national and EU level, and on the other hand facilitating knowledge transfer and learning among Member Cities (see Figure 4). However, in the horizontal mode of governance, the initiation and governance of networks lies with local authorities and EU institutions are not substantially

involved. Furthermore, given that the formal base of co-operation lies with a voluntary participation and agreements, the networks cannot and do not oblige its members to reach certain targets or implement specific measures. The networks rely on soft forms of governance. Although networks in the vertical governance mode also rely on soft forms of governance, EU actors might be more substantially involved in the organisation and rules of the network, thereby having a better position to steer participants in preferred directions.



	Horizontal governance
Main role of cities	City networking
Levels involved	Sub-national levels
Dynamic between levels	Horizontal
EU-local relations	EU not directly involved, except as facilitator; funding
State-local relations	Para-diplomacy, state-local relations loosen
Differences between local authorities	Pioneers dominate associations and networks
Role for EU policies and institutions	Facilitative

Figure 4. Visual representation and table with characteristics of the horizontal governance mode. Source: Adapted from Kern (2014).

3.2 Literature review: Facilitating factors for local transitions to renewable energy

The purpose of this section is to relate the modes of governance and the academic literature on facilitating factors for the local level in the transition to renewable energy. A literature review was carried out for the purpose of identifying factors from the literature that are considered to play a facilitating role in local energy transitions. However, the transition to renewable energy is a highly complex process: technological, economic, political and social factors all influence the transition, both in direct and indirect ways. It goes beyond the scope of this thesis to consider all these different factors. Therefore, given the focus of the research question and Kern's modes of governance, this literature review will be limited to administrative and political factors. This means that economic and technical factors will not be considered.

The factors are discussed in the context of the mode of governance to which they are most central. As has just been discussed, each mode of governance is associated with certain characteristics that are particular to that mode of governance. On the basis of these difference, the factors identified in the literature review are discussed in the context of the mode to which they are most central. So, this literature review is structured according to the three modes of governance: hierarchical factors, vertical factors and horizontal factors. This categorisation should not be taken too strict: the modes of governance overlap to some extent and hence

each factor belongs to a greater or lesser extent to any of the three modes of governance. However, for the purpose of structuring the analysis it is helpful to make this categorisation, but in section 6 the meaning of the factors for other modes of governance will also be discussed if relevant. Paragraph 3.2.4 presents an overview of the discussed factors (see Table 1).

3.2.1 Hierarchical factors

In the realm of renewable energy policy, the hierarchical mode currently plays a limited role, because there is no direct link between EU renewable energy policy and sub-national levels. The Renewable Energy Directive sets targets for the Member States, but not for sub-national governments. Still, the local level is impacted by this Directive. Given the fact that meeting the objectives of the Renewable Energy Directive requires radical changes in the Member States' energy systems, Member States are put under pressure to develop successful policies. These policies will at one point will affect local authorities. What's more, the effects of the targets formulated by the EU may go further than the mere adoption of these targets by national governments. The targets signal to local authorities, businesses, innovators and other actors that the EU will go down the road of renewable energy, with the end objective of ending its use of energy from fossil fuels. Hence, although hierarchical governance by the EU is only indirectly affecting the local level, this could still have a profound effect on local authorities and the outcomes of their renewable energy policies. Given the top-down nature of this governance mode, the extent through which the EC can facilitate local energy transitions through the mode depends to a large extent on the importance of policies from higher government levels to lower government levels. In this regard, various factors have been identified from the literature which are (expect to be) playing a facilitating role in energy transitions at the local level. These factors will be discussed in the remainder of this section.

Supportive legislation

In the EU multi-level context, **supportive legislation from higher government levels** is very important for bringing about the energy transition (Burch, 2010; Eleftheriadis & Anagnostopoulou, 2015; Emilianoff, 2014; Kern, Koll, & Schophaus, 2004). Supportive legislation impacts local governance in two ways. First, when municipalities are not empowered to implement critical renewable energy policies, they have to wait for key pieces of legislation to pass at higher levels of government, before they can undertake action (Burch, 2010; Emilianoff, 2014; Negro, Alkemade & Hekkert, 2012). Secondly, supportive legislation can serve as a guiding instrument (Burch 2010). National policy and measures with respect to planning (e.g. improving energy efficiency standard standards of new buildings) and business (e.g. carbon reduction commitment) are important guidelines and drivers for local actors (Corfee-Morlot et al., 2009; Eleftheriadis & Anagnostopoulou, 2015; Steinbach, 2013). EU and national policy goals indicate for local authorities what direction their policy should take. Given that the transition to renewable energy is a highly complex matter, it helps local authorities greatly if national policies include a strategy as to how the policy goals are to be achieved. Furthermore, it strengthens legitimacy of local renewable energy policies. Finally, another reason for which

lack of proper planning or goal orientation is problematic, is that it usually means that there is no official body that measures performance on policy output and outcome indicators, neither is it likely that there will be official coordination of municipal activities (Hoppe, Van den Berg & Coenen, 2014).

Policy stability

In line with the importance of supportive legislation, **the stability of policy from higher tiers of government** is of crucial importance for the energy transition. Instability manifests itself in implementation problems at the local level, most importantly because it creates uncertainty about the future (Barradale, 2010; Biesbroek, Klostermann, Termeer & Kabat, 2011; Burch, 2009; Corfee-Morlot et al., 2009; Eisenack et al., 2014; Eleftheriadis & Anagnostopoulou, 2015; Essletzbichler, 2012; Hoppe et al., 2014; Lipp, 2007; Steinbach, 2013). It should be noted that the energy transition in inherently related to some levels of uncertainty. As the energy system is characterised by a large proportion of long-term fixed costs, these can only be recovered over the long-term. This time-span comes with uncertainty about future technologies, energy demand developments, market integration and rules, carbon and fuel prices, and availability of infrastructures (European Commission, 2011). These uncertainties are problematic, for it makes investors reluctant to invest in RET. Private investments in RET are key to the transition and many local policies for renewable energy focus on accelerating private investments, which will obviously benefit from reduced uncertainties. In addition, note that the concept of investors not only refers to private investors, but also local governments as investors. They will also be reluctant to invest time and financial resources into renewable energy policy if the future of the energy policy is uncertain. Higher tiers of government cannot control all these uncertainties, but they can decrease uncertainties as regards political and regulatory risks by formulating long-term renewable energy goals, showing commitment to these goals, and fostering legal and policy consistency (Barradale, 2010; Bruch, 2009; European Commission, 2011; Lipp, 2007; Lutz, Fischer, Newig & Lang, 2017; White, Lunnan, Nybakk & Kulisic, 2013).

3.2.2 Vertical factors

The EC's 'White Paper on European Governance' in 2001 formed the basis for direct co-operation between the EU and sub-national authorities as it stated "At EU level the Commission should ensure that regional and local knowledge and conditions are taken into account when developing policy proposals" (European Commission, 2001, p. 13). Thus, the emergence of the EU level has increasingly offered new opportunities to municipalities to influence policy and promote their interests (De Rooij, 2002). Generally, these 'new opportunities' for municipalities in the EU result from the following developments:

- A stronger formal position for local government in the EU through the establishment of the Committee of the Regions;
- Access to EU Structural Funds which partly fund projects and programmes in the Member States;

- The rise of several associations of municipalities in the EU and their participation in an informal EU network (De Rooij, 2002).

Schulze (2003) has argued that when cities begin to bypass national governments and start lobbying at the EU level, they develop from 'policy takers' to 'policymakers'. The extent to which opportunities are actually taken, if taken at all, depends on the national constraints municipalities are faced with (De Rooij, 2002). Clear examples of such constraints are the strengths of a municipalities constitutional position or the centralisation of competences. Generally, in Member States with strong regions, local authorities have closer constitutional and political links to their regional government and these local authorities usually develop stronger cooperative patters around European issues (Eckert et al., 2013; Kettunen & Kull, 2009). Hence, differences in national institutional arrangements lead to different consequences of European integration for municipalities in the various Member States. However, also within Member States the use of new opportunities varies considerably. These differences may result from large variations in resources (i.e. money, personnel, location and access to the national political arena) which are available to different municipalities (De Rooij, 2002). Larger municipalities with sufficient resources are more likely to institutionalise foreign relations and create an office for EU affairs (Kern, 2014). Smaller municipalities with insufficient resources could still access EU institutions, for example through city networks that represent their interests at the EU level (Kern, 2014). Thus, the extent to which the local level is taking up the initiative for bottom-up processes, depends greatly on their capacity to do so. In the realm of renewable energy policies, a broad variety of factor can be identified which are contributing to the capacity of local authorities. These factors which will be discussed in the remainder of this section. In addition, the importance of regional strategies for renewable energy is discussed in this section. Although a regional strategy might at first sight seem central to the hierarchical governance mode, it is generally more closely related to the vertical governance mode, as these strategies often evolve from, and have great potential for, co-operation between various levels of government (and other actors).

Autonomy

Local governments are embedded within their governmental jurisdictional scale and hence their capacity to take bottom-up action is constrained by the level of policy-making autonomy that is delegated to them by regional or national authorities (Bulkeley, 2010). Local autonomy refers to the degree of freedom local authorities enjoy from central direction. Municipalities that have specific competencies for policy making in sectors that are affected by the energy transition, are provided with important policy tools in the transition to renewable energy which local authorities with little autonomy lack (Bulkeley & Kern, 2006). By formulating policies and regulating energy supply and management, transport, planning and waste management, local government can exert significant influence over GHG emissions (Bulkeley & Betsill, 2005). In relation to municipal policies for renewable energy, it has been suggested that well planned and structured processes have a high change of leading to successful policy outcomes (Lutz et al., 2017). An important element of those plans are specifically formulated goals or targets,

which allow for monitoring and the assessment of renewable energy implementation processes (Lipp, 2007; Lutz et al, 2017). They help to oversee the complexity of the process, adjust if necessary and keep a sense of control over the implementation for he renewable energy policy. Also, they might contribute to higher satisfaction throughout the process (Blumer, Stauffacher, Lang, Hayashi & Uchida, 2013).

However, there is also research that shows that autonomy from higher government levels can constrain political action (Eckersley, 2018; Pierre, 2014). Eckersley (2018) showed how the growing independence of the Newcastle Council from central government weakened its capacity to achieve policy objectives. It forced the municipality more reliant on other societal actors in order to reach support for their objects and seek additional resources, as they did not have the capacity to reach the policy objectives alone. Thus, the vertical independence made the municipality more horizontally dependent (Eckersley, 2018). Furthermore, the delegation of autonomy is generally not that clear cut, as competences and responsibilities are generally distributed over different government levels. Hence, it has been suggested that it is rather **the combination of autonomy and capacity** of local authorities which determines the nature and scope of local governance arrangements (Pierre, 2014). Capacity refers to a "local authority's ability to achieve its policy objectives without having to rely on other actors for resources" (Eckersley, 2018, p. 141). Note the difference between autonomy and capacity: a subnational authority that enjoys significant autonomy, might actually be constrained in formulating renewable energy policies by a low capacity, due to for example a lack of resources.

Size and resources

The **size** of a municipality is in various ways related to its capacity to act on renewable energy policy. Larger municipalities are more likely to enjoy a higher capacity, both in terms of their ability to change their own power-generating operations and to allocate staff and financial resources to follow through on their GHG reduction commitments (Amundsen, Berglund & Westkog, 2010; Dannevig et al., 2012; Granberg & Elander, 2007; Scharp et al., 2011; Schultze, 2003). Dannevig et al. (2012) also found that larger municipalities are more likely to have stronger ties with higher tiers of government. A further finding in this regard, is that larger cities apply more often for EU-funding programmes (Schultze, 2003). As smaller municipalities do not apply or do not manage to compete with larger municipalities, there is an asymmetric allocation of grants (Granberg & Elander, 2007). This is an important insight, as research shows that environmental efforts are generally severely hampered in municipalities that have not been not receiving any grants (Corfee-Morlot, 2009; Eisenack et al., 2014; Granberg & Elander, 2007; Hecher, Vilsmaier, Akhaven & Binder, 2016). Sufficient **financial resources** are crucial for the actual development and implementation of renewable energy policy (Sharp et al., 2011; Hecher et al., 2016). From this, it logically follows that **financial support from EU and/or state governments** contributes to the capacity of local governments to implement renewable energy policies (Fidelman, Leitch & Nelson, 2013). The importance of financial resources for implementing renewable energy policy, stems from the fact that renewable energy projects

are associated with a longer payback period and higher investment costs as compared to traditional, i.e. fossil fuel, energy sources (Jacobsson & Jacobsson, 2012). The high investment costs predominantly result from the fact that RES require different technologies and therefore require adjustments to the current energy grid (Negro et al., 2012). This means that it takes relatively long before investors see a profitable return. The longer period entails that regulatory stability is very important for investors. Note that this relate back to the above discussed importance of institutional and regulatory stability. Policy instability adds to the high-risk profile of RET investments (Mitchell et al., 2011). Furthermore, most energy technologies that will dominate in 2050 are currently in an immature stage, which is another addition to the range of uncertainties (Del Río, Peñasco & Mir-Artigues, 2018). Apart from the perceived risks, the high initial construction costs and longer payback period can pose significant barriers to new firms that wish to enter the sector (Del Río et al., 2018; Eleftheriadis & Anagnostopoulou, 2015). In conclusion, the risks associated to investment in RES are three-fold: (1) technical risks, related to the question of whether the RET will function appropriately over an extended period of time; (2) political risks, mostly related to the question of the regulatory framework will remain stable; (3) and economic risks, related to the question of whether the expected profitability will be realised (Jacobsson & Jacobsson, 2012).

Expertise and specialised departments

Differences between larger and smaller municipalities have also been found in relation to **expertise**. This is important, as lack of expertise within authorities, especially at the local level, pose a significant obstacle to the deployment of RET (Boon & Dieperink, 2014; Bulkeley & Schroeder, 2008; Eleftheriadis & Anagnostopoulou, 2015; Lutz et al., 2017; Negro et al., 2012). There are various renewable energy systems, each of these systems can be configured in different ways, and these ways may differ along with the maturation of RET. This means that municipalities, and innovators for that matter, face highly complex choices. These choices make unfamiliar demands upon the municipalities in terms of planning control, skills provision, control systems, and infrastructure investments (Smith, 2007). Small municipalities are more likely to restrict themselves to minimum requirements (Corfee-Morlot et al., 2009; Hoppe et al., 2014). In a study to climate adaptation policies in Denmark, Dannevig et al. (2012) found municipal staff that is assigned with the responsibility of handling climate policies, are in smaller municipalities more likely to devote their time and capacity only to tasks that they are legally obliged to do. This means that, as long as laws and regulation do not require local authorities to reach certain renewable energy targets, renewable energy policies received less priority than other tasks. Alternatively, larger cities were more likely to have specialised departments for climate or environmental policy (Dannevig et al., 2012; Hoppe et al., 2014). Such departments are considered a facilitating factor, as they allow for the development of knowledge and expertise (Bulkeley & Kern, 2006). This is in line with findings from Hoppe et al. (2014), who found in a study of Dutch municipalities that the uptake and implementation of local climate policy was to a significant extent related to political will and power of a few to act. The latter referring to 'green' motivated and committed public officials, often members of the Green-

Leftist Party, that were equipped with sufficient committed staff members, who would remain in a post for years. Furthermore, they found that a lot of these staff members had a background in and membership of environmental NGOs (Hoppe et al., 2014).

Local acceptance

Local acceptance of renewable energy is crucial for the actual implementation of RET (Bulkeley & Kern, 2006; Hecher et al., 2016; Wüstenhagen, Wolsink & Bürer, 2007). Acceptance of renewable energy is important to foster continuity in the governance of local energy systems and to empower the legitimacy of policymakers' policies on renewable energy (Blanchet, 2015; Bulkeley & Kern, 2006). Due to local elections and the political sensitivity, renewable energy policies often suffer from short-term political interests. Local initiatives have the potential to enable local governmental actors to share the political and financial risks that are linked to the challenges of the energy transition (Anguelovksi & Carmin, 2011; Poize & Rüdinger, 2014). Furthermore, local acceptance of renewable energy is crucial as it reduces the chances of active opposition to the implementation of renewable energy policies and projects. This is important, as opposition to renewable energy policy is a major barrier to the deployment of RET (Eleftheriadis & Anagnostopoulou, 2015; Lange, O'Hagan, Devoy, Le Tissier & Cummins, 2018; Steinbach, 2013). In this regard, it important to differentiate between socio-political acceptance and community acceptance (Wüstenhagen et al, 2007). **Socio-political acceptance** of renewable energy policies is the broadest, most general level of acceptance. It refers to a recognition on the importance of RET and the acceptance of renewable energy policies by the public, key stakeholders and policymakers. Socio-political acceptance is important, as it equips local (and national) policymakers with legitimacy for their renewable energy policies. Once socio-political acceptance is assured, it is **community acceptance** which is crucial for effective implementation of renewable energy policy. Community acceptance refers to the specific acceptance of decisions and renewable energy projects in the municipality by local stakeholders, particularly residents and local authorities. At the local level, it is community acceptance in particular which is typically causing problems: it is here where Not In My Back Yard (NIMBY) problems unfold with people supporting renewable energy policies, as long as it is not in their own backyard (Wüstenhagen et al., 2007). This can be explained by the fact that certain forms of RES, like wind turbines or photovoltaic power station, are very present in the visual landscapes of a municipality. For example, wind turbines or photovoltaic power stations may intrude on cultural heritages, and those that are living in close proximity to wind turbines, may experience annoyances as result of the sounds that they produce (Firestone, Bates & Knapp, 2015). This poses serious challenges for local governments in ensuring community acceptance of renewable energy policies.

Community energy projects

Community energy projects refer to the involvement of citizens in local renewable energy projects or cooperatives. Such projects or cooperatives are important to mobilize capacity and political support within a municipality and thereby has the potential to influence the local policy

agenda and foster continuity in the governance of local energy systems (Blanchet, 2015; Hoppe et al., 2014; Saintier, 2017; Zahran, Brody, Vedlitz, Grover & Miller, 2008). Blanchet (2015) found that civic capacity in Berlin constituted an important actor by endorsing a role of political opposition, pushing local authorities to act on the future of the energy system and force them to put renewable energy on the political agenda. Van der Schoor and Scholtens (2015) also found that the creation of committed local energy organisations, with a vision and concrete goals, often stood at the start of a change processes in municipalities. They also found that these organisations had to regularly communicate with their local environment and secure municipal and/or regionals support in order to survive. To succeed in this, local energy organisations organised meetings and used websites and social media to both explain their added value and collect inputs from the community. This might explain their positive effect on local acceptance of renewable energy. In fact, many studies emphasise the positive impact of local energy organisations (also referred to as civic capacity, grassroots initiatives or community renewable energy projects) on local attitudes towards renewable energy, both by citizens and authorities (Hargreaves et al., *2013;* Rogers, Simmons, Convery & Weatherhall, 2012). An example of local energy organisations in a form which is regarded as a promising option to accelerate the production of renewable energy and increase energy efficiency are Local Energy Co-operations (LECs) (Agentschap NL, 2010; Boon & Dieperink, 2014; Blokhuis, Advokaat & Schaefer, 2012; Verbong & Geels, 2007). LECs are commercially independent and autonomous entities. They have a strong local focus and produce, supply and/or save energy in a geographically demarcated area (Blokhuis et al., 2012). Furthermore, LECs are often a partnership of local actors and citizens, together with local government or housing associations (Manfren, Caputo & Costa, 2011). By offering citizens the opportunity to participate in energy projects and therefore to economic gain from it, acceptance might be further secured. Various studies have demonstrated that ownership by local community is a vital element fostering acceptance (Boon & Dieperink, 2014; Devine-Wright, 2005; Hargreaves et al., 2013; Mendonca, Lacey & Hvelplund, 2009; Mussall & Kuik, 2011; Saintier, 2017; Warren & McFayden, 2010).

Regional renewable energy plans

As the transition to renewable energy affects a wide range of actors in various sectors, the challenge is to ensure coordination and policy alignment between all the different actors and sectors (Burch et al., 2014; Lipp, 2007; Lutz et al., 2017; Smith, 2007). Various scholars have therefore emphasised the importance of **designing regional renewable energy plans**, as they help to integrate and coordinate the decentral needs with (inter-)national goals (Coutard and Rutherford, 2010; Lutz et al., 2017; Musall and Kuik, 2011). An advantage of regional plans or strategies is that at this level knowledge about local needs and contact with 'people on the ground' can be combined with strategic oversight (Smith 2007). Regional actors can collect and share experiences of pioneering local councils and they are in the position to both feedback these insights to the central level, as well as provide local council with best-practices from other councils (Beer & Tews, 2017; Dahlmann et al., 2017).

3.2.3 Horizontal factors

The horizontal governance mode refers to a process of knowledge transfer and learning among local authorities themselves and this is particularly common in the field of climate and renewable energy governance. These policy areas are highly complex and associated with a high level of uncertainty, therefore there is a high need among local authorities for knowledge, information and sharing best-practices. Kern argues that knowledge transfer and learning among local authorities happens predominantly through networks. So, networks are central to the horizontal governance mode. Given the fact that the literature on the functions of networks in relation to renewable energy suggests that networks can have many other functions too, these are also discussed in this review. However, it is important to note that networks are central in the horizontal mode, but can also take of form of vertical governance. As has been discussed in section 3.1, the key difference is that in the vertical governance mode EU actors may be closely involved in het networks, whereas in the horizontal governance mode they are more at distance and merely adhere to a facilitating role.

Networks

In the third mode of governance, renewable energy policies are formulated and implemented at the local level with the help of networks. Networks within and across municipalities have become commonplace in relation to all sorts of climate change policies, amongst which renewable energy policies (Bulkeley & Betsill, 2004; Fünfgeld, 2015; Granberg, 2006; Newell, Sandström & Söderholm, 2017). Many scholars argue that **participation in networks** can play an important facilitating factor (Gustavsson et al., 2009; Hechter et al., 2016; Lee & Van der Meene, 2012; Newell et al., 2017). Networks function as a web of co-operation and coordination, serving as access points and rallying platform for the local governments by overriding territorial borders, bridging between different levels and scales of operation. In certain cases, these networks provide for joint control over policy outcomes, but they also facilitate 'soft' outcomes like shaping debate and influence the political agenda (Schultze, 2003). Networks offer many other benefits. They allow for the development of common regional visions, specifically adopted to regional needs and characteristics, thereby being easier to implement than distant national guidelines (Essletzbichler, 2012). What's more, networks hold the potential of functioning as vital channels for the dissemination of information, best practice, and knowledge. Through this functioning they can speed up the process of capacity building, especially at the local level (Granberg & Elander, 2007; Gustavsson, Elander & Lundmark, 2009; Hecher et al., 2016; Kern et al., 2004). In this regard, results from a study of Lee and Van der Meene (2012) suggest that the formation of an advisory committee with multiple stakeholders is likely to facilitate learning, engagement and decision-making in climate change networks. This was explained by the fact that such a governing body could ensure participatory representativeness from citizens and stakeholders. Finally, it is generally assumed that access to financial and political resources through networks are also important benefits to municipalities (Betsill & Bulkeley, 2004; Emilianoff; 2014).

3.2.4 Overview factors

The above discussed facilitating factors for local authorities in the transition to renewable energy are summarised in Table 1.

Table 1. *Overview of facilitating factors for local authorities in the transition to renewable energy.*

Cluster	Factor	References
Hierarchical factors	**1. Supportive legislation:** The response of local governments depends on the extent to which their initiatives are supported by national programmes, legislation, and policies. When municipalities are not empowered to implement critical renewable energy policies, they have to wat for key pieces of legislation to pass at higher levels of government before they can undertake action. Also, supportive legislation can serve as a guiding instrument. Higher tiers of government can decrease uncertainties as regards political and regulatory risks by formulating long-term renewable energy goals and fostering legal and policy consistency, thereby promoting investment in RET	Biesbroek et al. (2011), Burch (2010), Corfee-Morlot et al. (2009), Eleftheriadis & Anagnostopoulou (2015), Emilianoff (2014), Kern et al. (2004), Lipp (2007), Lutz et al. (2017), Negro et al. (2012), Steinbach (2013), White et al. (2013)
	2. Policy stability higher government levels: Higher tiers of government can also decrease uncertainties as regards political and regulatory risks by showing commitment to renewable energy goals and policy, thereby promoting investment in RET.	Barradale (2010); Biesbroek et al. (2011), Burch (2009), Hoppe et al. (2014), Lutz et al. (2017), Negro et al. (2012), Steinbach (2013), White et al., (2013)
Vertical factors	**3. Capacity and autonomy:** The combination of sufficient municipal capacity and autonomy in policy-making enables local authorities to bring about a local energy transition.	Bulkeley (2010), Pierre (2014)
	4. Size: Larger municipalities are more likely to enjoy a higher capacity, both in terms of their ability to change their own power-generating operations and to allocate staff and financial resources to follow through on renewable energy commitments.	Amundsen et al. (2010), Dannevig et al. (2012), Scharp et al. (2011), Schultze (2003)
	5. Financial resources: Sufficient financial resources are crucial for the actual development and implementation of renewable energy policy.	Bulkely & Kern (2006), Del Río (2018), Hecher et al. (2016), Jacobsson & Jacobsson (2012), Scharp et al. (2011)
	6. Expertise: The presence of municipal administrators with expertise of renewable energy is likely to facilitate to the deployment of RET. Hence, the presence of specialized departments in the municipality, allowing for the development of knowledge and expertise, is also considered a facilitating factor.	Boon & Dieperink (2014), Bulkeley & Kern (2006), Eleftheriadis & Anagnostopoulou (2015), Hecher et al. (2016), Negro et al. (2012), Lutz et al. (2017)
	7. Acceptance: Socio-political acceptance, meaning recognition on the importance of RET and the acceptance of renewable energy policies by the public, key stakeholders and policymakers is considered a facilitating factor as it equips local policymakers with legitimacy for their renewable energy policies. In addition, community acceptance is of vital	Blanchet (2015), Bulkeley & Kern (2006), Eleftheriadis & Anagnostopoulou (2015), Firestone et al. (2015), Hecher et al. (2016), Lange et al. (2018),

	importance, meaning that local stakeholders, particularly residents and local authorities accept renewable energy projects and policies in the municipality itself.	Steinbach, (2013), Wüstenhager et al. (2007)
	8. Community energy projects: Community energy projects are important to mobilize capacity and political support in a municipality and thereby has the potential to influence the local policy agenda and foster continuity in the governance of local energy systems.	Anguelovksi & Carmin (2011), Blanchet (2015), Blokhuis (2012), Hoppe et al. (2014), Poize & Rüdinger (2014), Saintier (2017), Zahran et al. (2008)
	9. Regional renewable energy plans: Regional renewable energy plans have a high potential of facilitating the transition, as they help to integrate and coordinate the decentral needs with (inter-)national goals.	Beer & Tews (2017), Coutard & Rutherford (2010), Dahlmann et al. (2017), Lutz et al. (2017), Musall and Kuik (2011)
Horizontal factors	**10. Participation in networks:** Participation in networks can be a facilitating factor when it enables the exchange of knowledge and informative, the development of regional visions, and/or access to financial and political resources.	Betsill & Bulkeley (2004), Gustavsson et al. (2009), Hecher et al. (2016), Lee & Van der Meene (2012), Lutz et al. (2017), Newel et al. (2017)

4. Methodology

The purpose of this chapter is to explain the research design that was chosen in order to answer the sub-questions and central research question of this thesis. Section 4.1 will explain the approach that was chosen for answering the research question and the two sub-questions and a justification for selecting this approach. As the approach to sub-question 1 involved an empirical study, the research design of this study is discussed in section 4.2.

4.1 Approach to answering the research question

The central question of this thesis is: *In what way can the European Commission facilitate energy transitions at the local level in order to stimulate Europe's transition to renewable energy?* Kern's modes of governance form the conceptual lens through which this question will be answered. In each mode, the relation between the EU and the local level is different and therefore associated with different roles and actions for EU institutions in relation to the local level. This means that when it is understood which mode of governance is useful for facilitating energy transitions at the local level, inferences can be drawn about the way in which the EC can facilitate energy transitions at the local level.

Various factors that facilitate local transitions to renewable energy have been discussed in relation to the modes of governance in section 3.2. Analysing to what extent these factors play a stimulating role for local authorities in the transition to renewable energy, allows for a better understanding of the way in which the three modes do or do not contribute to the facilitation

of local energy transitions. Therefore, the factors that were identified from the literature will be empirically tested in the context of the Dutch local level (the way in which the factors will be tested and the rationale for choosing Dutch municipalities is further explained in section 4.2). The empirical study will result in data about the roles which the factors play for the Dutch local level in bringing about the energy transition. This contributes to answering the first sub question, i.e. *What factors facilitate energy transitions at the local level?*

The answer to the first sub-question serves as a basis for answering the second sub-question, i.e. *Given the facilitating factors that have been identified, what modes of governance are suited for facilitating energy transitions at the local level?* From the factors that were confirmed to be playing a facilitating role in local transition to renewable energy, inferences will be drawn as to what mode of governance is most suited for facilitating local energy transitions. Note that this means that different modes of governance could be found to be appropriate for facilitating the local level in the transition to renewable energy. This is not an issue, as it is in line with arguments made by Hooghe & Marks (2003) and Kern (2014) about the fact that various types of governance might co-exist and even complement each other. What matters, is the *rationale* behind choosing for the specific mode of governance. Hence the aim of this analysis is to contribute to a better understanding of the value of the different modes of governance for the EC when formulating policy aimed at facilitating the transition to renewable energy at the local level. Once this is understood, the focus of this thesis can turn to discussing what relations between the EU and local level, as well as roles for EU institutions, are associated with the modes of governance. This leads to conclusions about ways in which the EC can facilitate energy transitions at the local level, thereby answering the central research question of this thesis.

4.1.1 Justification of the approach

It is important to emphasize that this thesis does not aim for finding or testing an objective truth, but rather to come to a better understanding of the relation between facilitating factors at the local level and their meaning for EU – local level relations in the context of the renewable energy transition. It is an explorative research, in which the aim is to argue on the basis of both empirical findings and existing theory about the modes of governance, which mode or modes of governance could be of value for the EC in facilitating energy transitions at the local level. Hence, as has just been explained, the approach of this thesis is twofold: an empirical research is conducted on facilitating factors and based on the results of this research it will be explored which mode of governance is appropriate for facilitating energy transitions at the local level. This approach was chosen because it goes beyond a merely theoretical discussion of facilitating factors or modes of governance: testing the facilitating factors allows for empirical data, thereby backing up the discussion with empirical findings. Furthermore, given the fact that energy transitions are the result of a complex interplay of various factors, the added value of this approach can also be found in the link that will be made between the factors and the modes of governance. This brings the various factors together and allows for a structured, coherent

and in-depth discussion of their meaning for the ways in which the EC could stimulate local energy transitions in Europe.

4.2 Research design empirical study

4.2.1 Research design

The first sub-question of this thesis is: *What factors facilitate local authorities in the transition to renewable energy?* For the purpose of answering this question, the facilitating factors as identified in section 3 were measured in an empirical setting. A cross-sectional research design was selected, in which the share of renewable energy per inhabitant in a municipality was the dependent variable and the identified facilitating factors were independent variables. A questionnaire and secondary data were used to measure the extent to which various identified factors are present in Dutch municipalities and to measure the importance that municipalities attach to various factors. Rationale behind this choice is that if the factors are indeed facilitating, one would expect them to be more strongly present in municipalities with a high share of renewable energy as opposed to municipalities with a low share of renewable energy. Furthermore, this research design was selected as the four main criteria for cross-sectional designs applied to the current study:

1. More than one case: 380 municipalities were invited to participate in this study;
2. Measurements are carried out at a single point in time: the factors were measured at one moment by means of a questionnaire or a document study in which data of one specific moment were selected;
3. With quantitative or quantifiable data: data were either quantitative or quantitative indicators were used;
4. Patterns of association are studied: this study looked at patterns of association, meaning that nothing can be said about any causal relationships between the dependent and independent variables (Bryman, 2012).

Another reason for selecting this approach, is that it allowed for both testing the association between factors and the share of renewable energy in a municipality, but also the opinion that respondents attached to various factors. This dual approach is important, as there is a gap between policy input, i.e. the presence of factors, and policy output, i.e. the share of renewable energy per inhabitant. For example, a province might recently have formulated renewable energy targets or a municipality might have just joined a renewable energy network, but these actions are not likely to immediately affect a municipality's share of renewable energy.

In total, 121 municipalities participated in this study ($N_{< 50.000 \text{ inhabitants}} = 89$, $N_{50.000\text{-}100.000 \text{ inhabitants}} = 18$, $N_{>100.000 \text{ inhabitants}} = 14$), with all 12 provinces of the Netherlands being represented by 2 or more municipalities (see Appendix I). The majority of the participating municipalities scored low on the index for share of renewable energy per inhabitant ($M = 2.73$, $Mdn = 1.70$; see Appendix II). As respondents participated under the promise that their identity as well as that

of their municipality would remain anonymous, a list of the participating municipalities is not included.

4.2.2 Rationale sample selection

Dutch municipalities were selected as sample for this study. Municipalities in the Netherlands form a particularly interesting sample for two reasons. First, the Netherlands is performing poorly on renewable energy in comparison to other EU Member States, with one of the lowest proportions of renewable energy in its total energy use (see Figure 1). The share of renewable energy is only 6% of gross final energy consumption and it is hardly increasing (Blokhuis, 2012; CBS, 2017). The low share of renewable energy makes the Netherlands a Member State where the EC could potentially obtain substantial benefits from engagement with the local level.

In the Netherlands, municipalities are the lowest level of subnational government. They are statutorily based on the *Gemeentewet* (translated: Act of Municipalities) of 1851. This Act sets out their organisation and their relationship with the two other levels of government, the national and the provincial. Although many municipal tasks are fulfilled in co-operation with the other two governmental levels, municipalities enjoy a relatively large degree of autonomy. What's more, this autonomy is to be enlarged in the near future with the *Omgevingswet* (translated: environmental code). This code aims at simplifying Dutch environmental legislation and this will have consequences for local energy transitions:

- Energy will become an integral part of environmental policy;
- Municipalities will have more competences;
- Inhabitants and other stakeholders will be involved in energy policy-making;
- Municipalities will have new instruments at their disposal to facilitate the energy transition (Stroomversnelling, 2017).

The autonomy in relation to energy policy-making is an interesting observation, as several Dutch municipalities have in recent years set their own ambitious goals regarding renewable energy. In the Netherlands, municipalities are expected to reach a 14% share of renewable energy in their final energy consumption, which should grow to 16% in 2023, and in 2050 the GHG emissions should be less than 80-95% as compared to GMG emissions in 1990. In a recent study of a Dutch advisory bureau, it was suggested that of the 197 municipalities that were included in the study, 159 had formulated their own long-term ambition in relation to energy neutrality or climate neutrality, and about half of these municipalities had long-term targets that were more ambitious than the national targets (Popma & Kuipéri, 2018). These ambitions in combination with the autonomy Dutch municipalities enjoy, provide for a second reasons as to why Dutch municipalities are a relevant sample to focus on.

4.2.3 Dependent variable

The dependent variable in this research design is the share of renewable energy per inhabitant in Dutch municipalities. For the purpose of measuring this, data of the *Gemeentelijke Duurzaamheidsindex* (translated: Municipal sustainability index*)* were used (GDIndex, n.d.).

This website uses data of the *Klimaatmonitor* (translated: climate monitor), an online database of the Dutch Ministry for Infrastructure and Water Management which inter alia provides data on the production of renewable energy per municipality in Kilowatt hour (kWh) per inhabitant. The *Gemeentelijke Duurzaamheidsindex* calculates an index number for each municipality on a scale from 0 to 10, where 0 indicates the amount of kWh per inhabitant and 10 the highest amount of kWh per inhabitant. The following formula is used for calculating the index numbers: F(X) = 0,0025*X, whereby F(X>400) = 10. In this formula, F stands for the index number and X stands for the amount of renewable energy in kWh per inhabitant.

One of the purposes of the analysis is to test for differences between municipalities with a large and a low share of renewable energy. To this end, various statistical tests will be computed comparing two categories called Group Low and Group High. Group Low refers to municipalities that have a very low share of renewable energy per inhabitant and consists out of municipalities with *F*(index) = 3.0 and *F*(index) < 3.0 (*N* = 86). Group High refers to municipalities that have a large share of renewable energy per inhabitant and consists out of municipalities with *F*(index) >7.0 (*N* = 10).

4.2.4 Independent variables

The facilitating factors as identified in the literature review formed the independent variables that were included in the research design. Many of the facilitating factors are concepts for which there is no direct quantitative measure and for those factors appropriate indicators were selected. An indicator is "something that is devised or already exists and that is employed as though it were a measure of a concept" (Bryman, 2012, p. 164). Indicators can be devised in various ways, usually based on either qualitative evidence relating to the concept or the use of common-sense understanding (Bryman, 2012). In this study, appropriate indicators were selected on the basis of common-sense (see Table 2).

Table 2. *Overview of selected indicators and associated sources for the independent variables.*

Factors	Indicators	Source*
1. Supportive legislation	1. European strategy for renewable energy	Questions 6.1 & 10.1
	2. National strategy for renewable energy	Questions 6.2 & 10.2
2. Policy stability higher government levels	1. Stability national renewable energy policy	Questions 7.1 &11.1
3. Autonomy	1. Policy autonomy for the municipality	Questions 7.3 & 11.3
	2. Local renewable energy targets	Question 5
	3. Municipal strategy for renewable energy	Questions 6.4 & 10.4
4. Size	1. Number of inhabitants	StatLine**
5. Financial resources	1. Financial resources for municipal renewable energy policy	Question 7.4 & 11.4
	2. Subsidies for municipal renewable energy policy	Question 7.2 & 11.2

6. Expertise	1. Department for sustainability policies	Question 7.5 & 11.5
	2. Employees with expertise of renewable energy	Question 7.6 & 11.6
7. Acceptance	1. Acceptance inhabitants of renewable energy generation within the municipality by means of wind turbines and/or solar farms	Question 7.7 & 11.7
	2. Feeling inhabitants about renewable energy generation in general	Questions 9.1 & 13.1
	3. Feeling inhabitants about renewable energy generation within the municipality	Questions 9.2- 9.4 & 13.2 – 13.4
8. Community energy projects	1. Participation of municipal inhabitants in LECs	Question 7.8 & 11.8
	2. Presence LECs	HIER opgewekt***
9. Regional renewable energy plans	1. Provincial strategy for renewable energy	Questions 6.3 & 20.3
10. Participation in networks	1. Participation of the municipality in a European network to promote energy transitions	Question 3
	2. Participation of the municipality in a regional network to promote energy transitions or a regional energy agreement	Question 4
	3. Functions of networks	Questions 8.1 – 8.6 & 12.1 – 12.6

Note. * For those indicators where questions of the questionnaire are the source of information, reference is made to the associated question number. For the entire questionnaire, see Appendix III (original version) and Appendix IV (translated version).
** StatLine is the electronic databank of Statistics Netherlands.
*** HIER opgewekt is an online platform providing data on local energy co-operations in the Netherlands.

All data that could be gathered through secondary sources were collected that way and all other data were gathered through a questionnaire (see Table 2). The choice of limiting the length of the questionnaire as much as possible, was made for the purpose of increasing the response rate (Bryman, 2012; Deutskens, De Ruyter, Wetzels & Oosterveld, 2004). Furthermore, the choice for using an online questionnaire as opposed to semi-structured interviews was made for various analytical reasons. First, given the large sample size, a questionnaire was considered the most cost- and time-effective method. Online questionnaires, as compared to interviews, are much cheaper and require less administrative time for the researcher as they can be send out in large batches at once (Bryman, 2012; Creswell, 2013; Mason, 2002). Secondly, it was aimed to gather quantitative data and questionnaires lend themselves better for this purpose, as they allow for standardised answers. Furthermore, as an online questionnaire can force respondents to give an answer to each question, generally fewer questions are left unanswered, which contributes to the reliability of the data (Bryman, 2012). There are also drawbacks associated to the use of a questionnaire. The format made it at certain points hard to formulate questions in an optimal way: they had to be accurate, but simultaneously remain clear to the respondent. Therefore, certain definitions had to be avoided and simpler synonyms were chosen, with the risk of slightly deviating from the actual meaning of the question. The most important example of this is that the world *factors* might not be very clear to respondents and hence it was asked whether factors were *stimulating*. However, given the similarity of these concepts, this is not hampering

the results of this study. Furthermore, in some cases definitions required additional explanation. At some points, this resulted in a lot of information before the respondent could actually answer the question, risking that the respondent lost track of what was actually asked. To overcome this risk, the questions were partly repeated in the Likert-scale, e.g.: 1 = strongly disagree, 5 = strongly agree.

In order to reach a high sample size, which contributes to the representativeness of the results, and to ensure randomness of the sample, all Dutch municipalities (*N* = 380) were invited to participate in this study. Alderman with 'sustainability policy' or 'environmental policy' as their responsibility were approached by mail on the 24th of May 2018. They were invited to participate in the study, or to forward the invitation to a colleague. The questionnaire was accessible online for two weeks, between the 24th of May and the 7th of June 2018. Of the 121 participating municipalities, the distribution of alderman and policy officers participating in this study was as follows: 56,2% alderman, 37,2% policy officers, 6,6% other (one member of a local council; one advisor; seven programme managers for the municipal sustainability programme; one director of the energy transition).

4.2.5 Questionnaire design

The online questionnaire was created at the website www.surveymonkey.nl. This is a user-friendly platform, which offers the user a wide variety of design formats and questioning styles. Data can be downloaded in SPSS, a statistical software programme in which statistical analyses can be performed. The purpose of the questionnaire was to measure the opinion of participants about and presence of the identified factors. In the remainder of this section, the set-up of the questionnaire is explained question by question. A complete version of the original survey in Dutch is included in Appendix III and a translated version in Appendix IV.

1. *On behalf of which municipality are you participating in this study?*

This question was important for analytical purposes. In the analyses, answers needed to be categorised according to different municipal characteristics (e.g. share of renewable energy or number of inhabitants). Hence it was imperative to know which municipality corresponded to which data.

2. *What is your function within this municipality?*

To this question, participants could choose between three response options (*1 = alderman, 2 = policy officer, 3 = other, namely [open answer]*). This question was posed in order provide some background information on those participating in the study and ensure to some extent that the participants were indeed qualified to participate in this study.

3. *Is the municipality participating in a European network to promote energy transitions? N.B. The term 'European network to promote energy transitions' refers to a partnership of local or regional governments of at least two different European countries, aimed at promoting energy transitions. An example of a European network to promote energy transitions is Energy Cities.*

Participants could answer this question affirmative or negative (*1 = yes, 2 = no*). Participants were asked whether their municipality is taking part in a European network to promote energy transitions for the purpose of exploring whether there is an association between participation in a European network to promote energy transitions and a municipality's share of renewable energy per inhabitant.

4. *Is the municipality participating in a regional network to promote energy transitions or a regional energy agreement?*
   N.B. The term 'regional network to promote energy transitions' refers to a partnership of regional or local Dutch governments and/or private actors, aimed at promoting energy transitions.

Participants could answer this question with affirmative or negative (*1 = yes, 2 = no*). Participants were asked whether their municipality is taking part in a regional network to promote energy transitions or a regional energy agreement, for the purpose of exploring whether there is an association between participation in a regional network to promote energy transitions or regional agreement and a municipality's share of renewable energy per inhabitant.

5. *Has the municipality formulated concrete targets with respect to renewable energy? N.B. An example of a concrete target is: In 2020, 20% more renewable energy is generated per inhabitant and 20% less energy is used as compared to 2013.*

Participants could answer this question with affirmative or negative (*1 = yes, 2 = no*). By asking whether the municipality has formulated concrete targets with respect to renewable energy, it is possible to examine whether there is an association between setting renewable energy targets and a municipality's share of renewable energy per inhabitant.

After answering question 5 the participants were split into two groups. Group 1, including participants that answered 'yes' to question 5, proceeded with question 6 to 9. Group 2, including participants that answered 'no' to question 5, proceeded to question 10 to 13. From these points onwards, both groups of were faced with the same questions, with the sole exception that group 1 answered the questions in relation to 'reaching the renewable energy targets of the municipality' and group 2 in relation to 'bringing about the energy transition in the municipality'. The reason for splitting the group in two is that it would be both confusing

and illogical to ask municipalities without concrete energy targets what role factors played in their municipality in relation to reaching the renewable energy targets. However, since the content of the questions and answers was the same, the answers of Group 1 and Group 2 were merged together in the analysis. This enlarged the sample, which contributed to the statistical power.

In order to avoid repetition, the questions of both groups will from now onwards be discussed simultaneously in corresponding pairs.

6. *To what extent do the factors below play a stimulating role in reaching the renewable energy targets of the municipality?*
   1. A European strategy for renewable energy
   2. A national strategy for renewable energy
   3. A regional strategy for renewable energy
   4. A municipal strategy for renewable energy

10. *To what extent do the factors below play a stimulating role in bringing about the energy transition in the municipality?*
    1. A European strategy for renewable energy
    2. A national strategy for renewable energy
    3. A regional strategy for renewable energy
    4. A municipal strategy for renewable energy

Participants could answer to this question on a 5-point Likert scale (*1 = no stimulating role at all, ..., 5 = strongly stimulating role*). A low score indicated that the concerned factor was not considered to play a stimulating role in reaching the renewable energy targets of the municipality, where high scores indicated that the concerned factor did play a stimulating role in this regard. By differentiating between different government levels, the aim of this question was to provide insight into the importance that strategies of different government levels have in relation to local energy transitions as perceived by the participants.

7. *To what extent do the factors below play an impeding or facilitating role for the municipality in reaching the renewable energy targets?*
   1. Stability in national renewable energy policy
   2. Subsidies for municipal renewable energy policy
   3. Policy autonomy for the municipality
   4. Financial resources for implementing the municipal renewable energy policies
   5. A special department within the municipality for sustainability policy
   6. Employees with expertise in relation to renewable energy
   7. Acceptance by inhabitants of renewable energy generation by means of wind turbines and/or solar energy farms

8. Participation of municipal inhabitants in local energy co-operations

11. *To what extent do the factors below play an impeding or facilitating role in bringing about the energy transition in the municipality?*
    1. Stability in national renewable energy policy
    2. Subsidies for municipal renewable energy policy
    3. Policy autonomy for the municipality
    4. Financial resources for implementing the municipal renewable energy policies
    5. A special department within the municipality for sustainability policy
    6. Employees with expertise in relation to renewable energy
    7. Acceptance by inhabitants of renewable energy generation by means of wind turbines and/or solar energy farms
    8. Participation of municipal inhabitants in local energy co-operations

Participants could answer to this question on a 5-point Likert scale (*1 = strongly impeding, ..., 5 = strongly facilitating*). In addition, a 'does not apply' option was available. Low scores indicated that participants considered the concerned factor as an impeding factor for the municipality in reaching its renewable energy targets. A high score indicated that participants considered the concerned factor as a facilitating factor for the municipality in reaching its renewable energy targets. The purpose of this question was to measure to what extent the presented factors were considered as facilitating factors by the participants.

8. *In order to reach the renewable energy targets, participation in a network is stimulating the municipality when it offers the opportunity to:*
    1. share information, knowledge and experiences
    2. co-operate with other municipalities
    3. co-operate with businesses
    4. create a regional energy strategy
    5. obtain subsidies for renewable energy projects
    6. obtain access to important European actors

12. *In order to bring about the energy transition, participation in a network is stimulating the municipality when it offers the opportunity to:*
    1. share information, knowledge and experiences
    2. co-operate with other municipalities
    3. co-operate with businesses
    4. create a regional energy strategy
    5. obtain subsidies for renewable energy projects
    6. obtain access to important European actors

Participants could express their opinion on the importance of each item on a 5-point Likert scale (*1 = strongly disagree, ..., 5 = strongly agree*). This question measured which opportunities offered by participation in a network are perceived as stimulating a municipality in reaching its renewable energy targets/bringing about the energy transition. Low scores indicated participants disagreed with the statement that the opportunity plays a stimulating role, whereas high scores indicated that the participants agreed with this statement. The purpose of this question was to provide insight which opportunities offered by networks are considered important by the participants.

9. *How do municipal inhabitants feel about the following subject matters?*
   N.B. This concerns a general estimation.
   1. Renewable energy generation in general
   2. Renewable energy generation within the municipality
   3. Placing wind turbines within the municipality
   4. Placing solar energy farms within the municipality

13. *How do municipal inhabitants feel about the following subject matters?*
    N.B. This concerns a general estimation.
    1. Renewable energy generation in general
    2. Renewable energy generation within the municipality
    3. Placing wind turbines within the municipality
    4. Placing solar energy farms within the municipality

Participants could answer on a 5-point Likert scale (*1 = very negative, ..., 5 = very positive*). Low scores indicated that participants estimated that the inhabitants of their municipality felt very negative about the concerned item, whereas high scores indicated that participants estimated inhabitant's opinion on the factor positively. The purpose of this question was to gain insight into the socio-political and community acceptance within the municipality in relation to renewable energy. The first item measured socio-political acceptance, whereas items 2 to 4 measured community acceptance.

4.2.6 Secondary data

This study relied on secondary data for two factors. First, in order to analyse the factor size, data on the number of inhabitants of participating municipalities was retrieved from StatLine, which is the electronic databank of Centraal Bureau voor de Statistiek (CBS; translated: *Statistics Netherlands*; CBS, n.d.). The CBS is an autonomous administrative body, meaning that it is an official public body financed from state budget, but it operates independently from any ministry. Secondly, for the purpose of analysing the factor community energy projects, data on the presence LECs were retrieved from HIER opgewekt (Hier opgewekt, n.d.). This is an online knowledge platform providing data on the presence of local energy-co-operations in the Netherlands. Data for the platform is gathered by HIER klimaatbureau, which is an independent

non-profit foundation. At their website, Hier opgewekt provides for an overview of all LECs in the Netherlands and the municipality in which they are active. As respondents participated under the promise that their identity as well as that of their municipality would remain anonymous, a list of municipalities and the presence or absence of LECs could not be included.

4.2.7 Validity and reliability

Three important criteria that are used for evaluating social research are validity, reliability and replication (Bryman, 2012). The meaning of the latter criterion is quite straightforward: it must be possible for other researchers to replicate the study. In order to ensure replicability, the steps taken in this study are discussed in detail and is indicated where the secondary data that were used can be accessed online. In addition, the original and translated version of the questionnaire are included in the appendices of this thesis.

Closely related to the concept of replicability is the criterion of reliability, which refers to the consistency of measures. The reliability of a study is determined by the extent to which it is possible to repeat the steps that were taken in the study and obtain the same results (Bryman, 2012). This study's relatively large sample size (N = 380, which is 31.84% of the total population), which has a positive impact on the reliability of the data. Larger sample sizes contribute to the reliability of the results as they allow for greater precision and power of the results. However, for the results to be reliable, it is also important that measures are stable of time. It is estimated that the measures of this study are relatively stable, though some are susceptible to variation. It could be the case that municipalities consider different factors stimulating depending on their advances in the transition. However, this variation is controlled for in this study, as differences between municipalities with a high and low share of renewable energy were analysed. Other situations in which municipalities change their opinion on the importance of certain factors are thinkable. However, this is only expected to be the case institutional changes arrive. In most other scenario's, it is unlikely that a municipality's opinion on a factor will significantly change. Furthermore, inter-observer consistency contributes to the reliability of results. Inter-observer consistency is concerned with the question whether or not another researcher would make the same decisions in analysing the data. For example, when decisions need to be taken in relation to the categorization of outcomes or open questions, there is a risk of inconsistency. The decision of categorising municipalities as belonging to Group Low, Group High, or no group is an example of such a categorisation. Other researchers might have taken a different decision. However, the criteria for categorisation were clearly explained and therefore this should not be an issue in relation to reliability.

The criterion which is in many ways considered the most important criterion of research, is validity. Validity is about the integrity of the conclusions that are drawn from the results of a study. There are various types of validity. Measurement or construct validity considers whether a measure really reflects the concept that it is supposed to denote (Bryman, 2012). For some measures in this study, the construct validity was relatively straightforward, e.g. the share of

renewable energy per inhabitant or the number of inhabitants. For some measures it was less straightforward, e.g. socio-political acceptance. There are no standardised tests for assessing construct validity, although there might be tests of which it has already been demonstrated that they measure a specific construct. For the measures in this study, there were no such standardised tests available and all indicators were selected on the basis of common sense. This means that the construct validity cannot be known precisely (Bryman, 2012). However, this was partly compensated for by clearly demonstrating what indicators have been selected and how they have been measured. This enables outsiders to critically assess the construct validity by using his or her common sense and logical reasoning. Another important type of validity is external validity, which refers to the extent to which the results of a study can be generalised beyond the specific research context. In this study, the external validity can be considered on two levels. On the Member State level, the high response rate contributed to the representativeness of the findings (Bryman, 2012). This is not to say that the results can be generalised without any reservations, but it does mean that the results are a fare estimate for the entire population. However, on European level the external validity is relatively low. The sample is only a small fraction all European municipalities. In addition, more substantially, there are significant institutional or contextual differences between the municipalities of European Member States which are likely to affect both the role of some facilitating factors and therefore functioning of the modes of governance. This makes it problematic to generalise the results on a European scale. At most, the results could yield valuable insights in relation to Member States with an institutional organisation similar to that of the Netherlands.

5. Results

In this section, the results of the empirical study on facilitating factors are presented. results are structured along the nine factors that were analysed. An overview of the findings per factor is presented in Table 16 in section 5.5.

For the purpose of analysing whether the means of Group Low and Group High differ significantly, Mann-Whitney tests will be computed at various moments throughout this section. The Mann-Whitney test is a non-parametric test for comparing two independent conditions. A non-parametric test was selected, as there were no reasons for assuming the answers of the respondents are normally distributed, which was also visible in the distribution of most answers (see Appendix VII). An overview of relevant statistical output is included in Appendix VII.

5.1 Cluster 1: Hierarchical factors

5.1.1 Factor 1: Supportive legislation

In order to analyse the role of supportive legislation of higher government levels, participants were asked in question 6 and question 10 what role strategies for renewable energy of higher

government levels play for the municipality in reaching the renewable energy targets/bringing about the renewable energy transition. With regard to a European strategy, on average participants indicated that it plays no role for them (see Table 3). However, note that the response to this question varied quite a lot: many participants indicated that a European strategy does play a stimulating role and many other participants indicated that it currently plays an impeding role (see Appendix V.IV). With regard to a national strategy for renewable energy, participants were less divided and indicated that it plays a stimulating role (see Table 3). As with regard to the differences between Group High and Group Low, no significant differences were found. Both Group Low and Group High indicated that a European strategy plays no role and a national strategy plays a stimulating role (see Tables 4-6).

5.1.2 Factor 2: Policy stability higher government levels

In order to analyse the role of policy stability, participants were asked in question 7.1 and question 11.1 whether stability in national renewable energy policy plays an impeding or facilitating role for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that a national renewable energy policy plays a facilitating role (see Table 3) and no differences were found between Group Low and Group High (Tables 4-6).

Table 3. Mean and median to the hierarchical factors.

	Mean	Median
European strategy for renewable energy	3.26	3.00
National strategy for renewable energy	4.37	4.00
Policy stability national renewable energy policy	4.05	4.00

Note. N = 121.

Table 4. Mean and median of Group Low to the hierarchical factors.

	Mean	Median
European strategy for renewable energy	3.24	3.00
National strategy for renewable energy	4.37	4.00
Policy stability national renewable energy policy	4.01	4.00

Note. N = 86.

Table 5. Mean and median of Group High to the hierarchical factors.

	Mean	Median
European strategy for renewable energy	3.20	3.50
National strategy for renewable energy	4.44	5.00
Policy stability national renewable energy policy	4.00	4.00

Note. N = 10.

Table 6. Mann-Whitney test for the response to the hierarchical factors by Group High and Group Low.

	Mann-Whitney U	*Z*	*p*
European strategy for renewable energy	417.00	-.16	.87
National strategy for renewable energy	429.00	-.02	.99
Policy stability national renewable energy policy	350.00	-1.04	.30

Note. Group Low (*N* = 86) and Group High (*N* = 10).

5.2 Cluster 2: Vertical factors

5.2.1 Factor 3: Autonomy

Policy autonomy

In order to analyse the role of policy autonomy, participants were asked what role policy autonomy for the municipality plays in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that it plays a stimulating role (see Table 8). When looking at the responses of Group Low and Group High, pictures emerged (see Tables 9-11).

Targets

In total, 86,8% (*N* = 105) of the participating municipalities had formulated concrete targets with respect to renewable energy and 13,2% (*N* = 16) did not have concrete targets. The municipalities with concrete targets had a mean renewable energy index score of 2.79 (*Mdn* = 1.7) and municipalities without concrete targets had a mean renewable energy index score of 2.31 (*Mdn* = 1.65). These means did not differ significantly, which means that municipalities with concrete renewable energy targets were not more likely to have a high share of renewable energy per inhabitant than municipalities without concrete targets (U = 831,500, z = -.067, p = .95).

In addition, it was analysed whether there was a difference between Group Low and Group High in the number of municipalities with targets. A Chi-Square test was computed in order to test whether municipalities with targets were more likely to belong to group High (see Appendix V.III). The results indicated that this was not the case, X^2 (1) = .27, p = .61. However, the output of this test showed that one of the assumptions for this test was violated, as one cell had an expected count of less than five (see Appendix V.III). With expected frequencies smaller than 5, it is highly probable that the sampling distribution of the test statistic is deviating too much from a Chi-Square distribution to be of any use (Fields, 2009). Fisher's exact tests is generally used for computing the exact probability of the Chi-Square statistic that is accurate when sample sizes are small. This test was run and confirmed the initial finding that the differences were not significant, p = 5.13. This means that municipalities in Group High were not more likely to have a high share of renewable energy than municipalities in Group Low.

Municipal strategy

In order to analyse the role of autonomy, participants were asked about the importance of a municipal strategy. Participants indicated that a municipal strategy plays a highly stimulating role (see Table 8). Similar answers were given by Group Low and Group High (see Tables 9-11).

5.2.2 Factor 4: Size

In both Group Low and Group High most municipalities were relatively small, with less than 50.000 inhabitants (see Table 7). In order to analyse the extent to which the size of municipality was related to its share of renewable energy per inhabitant, the correlation between the number of inhabitants in a municipality was analysed in relation to its renewable energy index. Two non-parametric tests for bivariate correlations were conducted, Spearman's correlation coefficient and Kendall's tau. Non-parametric tests were selected, as it cannot be assumed that the data on renewable energy is distributed normally. Both test indicated that there was no significant correlation between the size of municipality and its share of renewable energy per inhabitant (r_s = -.01, p = .95; τ = -.01, p = .95). This was also clearly visible in a scatter plot (see Figure 5). In other words, larger municipalities were not more likely to have a high share of renewable energy than smaller municipalities.

Table 7. Distribution of the size of participating municipalities.

	<50.000	50.000-100.000	>100.000
All municipalities	89	18	14
Group Low	18	3	3
Group High	7	1	0

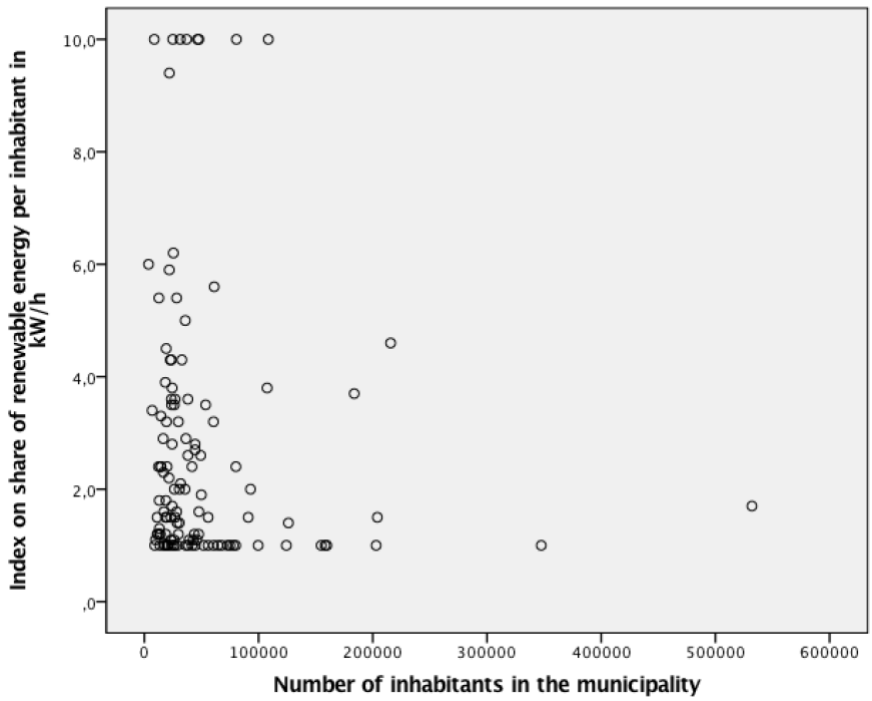


Figure 5. Scatter plot of index on share of renewable energy and number of inhabitants in the municipalities.

5.2.3 Factor 5: Financial resources

In order to analyse the role of financial resources, participants were asked in question 7.4 and question 11.4 what role financial resources for implementing the municipal renewable energy policies play for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that financial resources for implementing the municipal renewable energy policy play a strongly stimulating role (see Table 8). Group Low and Group High also indicated that financial resources for implementing municipal renewable energy play a strongly stimulating role (see Tables 9-11).

In addition to financial resources, participants were asked in question 7.2 and question 11.2 what role subsidies for municipal renewable energy policy play for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that subsidies for municipal renewable energy policy play a stimulating role (see Table 8). Group Low and Group High also indicated that subsidies for municipal renewable energy play a stimulating role (see Tables 9-11).

5.2.4 Factor 6: Expertise

In order to analyse the role of expertise, participants were asked in question 7.6 and question 11.6 what role a special department within the municipality for sustainability policy plays for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that such a department plays a stimulating role (see Table 8). Group Low and Group High both indicated that a department plays a stimulating role (see Tables 9-11).

In addition, participants were asked in question 7.5 and question 11.5 what role the presence of employees with expertise in relation to renewable energy plays for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that the presence of employees with expertise in relation to renewable energy plays a strongly stimulating role (see Table 8). Both Group High and Group Low indicated that employees play a strongly stimulating role (see Tables 9-11).

5.2.5 Factor 7: Acceptance

Participants were asked what role acceptance of inhabitants of renewable energy generation by means of wind turbines and/or solar energy farms play for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that it plays a stimulating role (see Table 8). When looking at Group Low and Group High differences were visible in the means and distribution of answers. Group Low indicated that acceptance plays a stimulating role, whereas Group High indicated it plays no role. Although their responses did not differ significantly (see Tables 9-11), the distribution of their answers was quite different. Whereas the responses of Group Low skewed towards the right (stimulating/strongly

stimulating), the responses of Group High were more evenly distributed over the entire 5-point scale (see Appendix V.XI).

For the purpose of differentiating between socio-political and community acceptance, municipalities were asked in question 9 and question 13 how municipal inhabitants feel about four matters. Question 9.1 related to socio-political acceptance, by asking how inhabitants feel about renewable energy generation in general. Respondents indicated that inhabitants feel positive about renewable energy generation in general (see Table 8). Similar responses were given by Group Low and Group High (see Tables 9-11). Questions 9.2-.4 and questions 13.3-4 related to community acceptance. Participants indicated that inhabitants feel neutral about renewable energy generation in the municipality (see Table 8). More specifically, inhabitants feel negative about placing wind turbines in the municipality, but neutral about placing solar energy farms in the municipality. The same picture emerged for both Group Low and Group High (see Tables 9-11). In conclusion, this means that participants indicated that they estimated there is generally socio-political acceptance, meaning inhabitants are positive about renewable energy generation in general. However, when it comes to community acceptance, it was estimated that inhabitants are neither positive nor negative about renewable energy generation in the municipality (with an exception for renewable energy generation by means of wind turbines, about which inhabitants feel negative).

5.2.6 Factor 8: Community energy projects

Among the participating municipalities, 50 (41.3%) municipalities had a LEC and 71 (58.7%) did not. A Mann-Whitney test was computed in order to analyse whether municipalities with a LEC were more likely to have a higher share of renewable energy per inhabitant, but no significant differences were found between municipalities with and without a LEC ($M_{\text{With LEC}} = 2.63$, $Mdn_{\text{Wth LEC}} = 1.50$; $M_{\text{Without LEC}} = 2.80$, $Mdn_{\text{Without LEC}} = 2.20$; $U = 1533.00$, $z = -1.28$, $p = .20$). This means that municipalities with a LEC were not more likely to have a higher share of renewable energy per inhabitant than municipalities without a LEC.

However, the role of LECs was also measured in the questionnaire. Participants were asked in question 7.8 and question 11.8 what role participation of municipal inhabitants in LECs plays for the municipality in reaching the renewable energy targets/bringing about the energy transition. Participants indicated that it plays a stimulating role (see Table 8). In fact, the answers were highly skewed towards the right side (stimulating/strongly stimulating) (see Appendix V.XII). No significant differences were found between Group Low and Group High (see Tables 9-11).

5.2.7 Factor 9: Regional renewable energy plans

In order to analyse the role of regional renewable energy plans, participants were asked in question 6.3 and question 10.3 what role a provincial strategy for renewable energy plays in

reaching the renewable energy targets/bringing about the renewable energy transition. On average participants indicated that it plays a stimulating role, with the distribution of answers begin highly skewed towards stimulating/strongly stimulating (see Table 8 and Appendix X.IV). Comparable answers were given by Group Low and Group High (see Tables 9-11).

Table 8. Mean and median of the vertical factors.

Factor	Indicator	Mean	Median
3	Policy autonomy	4.01	4.00
3	Municipal strategy for renewable energy	4.62	5.00
5	Subsidies for municipal renewable energy policy	4.31	5.00
5	Financial resources for implementing the municipal renewable energy policies	4.54	5.00
6	Special department for sustainability policy	4.01	4.00
6	Employees with expertise in relation to renewable energy	4.60	5.00
7	Acceptance inhabitants of renewable energy generation by means of wind turbine and/or solar energy farms	4.21	5.00
7	Renewable energy generation in general	4.08	4.00
7	Renewable energy generation in the municipality	3.71	4.00
7	Placing wind turbines in the municipality	2.35	2.00
7	Placing solar energy farms in the municipality	3.15	3.00
8	Participation of municipal inhabitants in local energy co-operations	4.36	5.00
9	Regional strategy for renewable energy	4.26	4.00

Note. N = 121.

Table 9. Mean and median of Group Low of the vertical factors.

Factor	Indicator	Mean	Median
3	Policy autonomy	3.91	4.00
3	Municipal strategy for renewable energy	4.58	5.00
5	Subsidies for municipal renewable energy policy	4.34	5.00
5	Financial resources for implementing the municipal renewable energy policies	4.47	5.00
6	Special department for sustainability policy	4.05	4.00
6	Employees with expertise in relation to renewable energy	4.57	5.00
7	Acceptance inhabitants of renewable energy generation by means of wind turbine and/or solar energy farms	4.30	5.00
7	Renewable energy generation in general	4.10	4.00
7	Renewable energy generation in the municipality	3.69	4.00
7	Placing wind turbines in the municipality	2.37	2.00
7	Placing solar energy farms in the municipality	3.17	3.00
8	Participation of municipal inhabitants in local energy co-operations	4.33	4.00
9	Regional strategy for renewable energy	4.24	4.00

Note. N = 86.

Table 10. Mean and median of Group High of the vertical factors.

Factor	Indicator	Mean	Median
3	Policy autonomy	3.70	4.00
3	Municipal strategy for renewable energy	4.80	5.00
5	Subsidies for municipal renewable energy policy	4.10	4.00
5	Financial resources for implementing the municipal renewable energy policies	4.60	5.00
6	Special department for sustainability policy	4.00	4.00
6	Employees with expertise in relation to renewable energy	4.60	5.00
7	Acceptance inhabitants of renewable energy generation by means of wind turbine and/or solar energy farms	3.60	4.00
7	Renewable energy generation in general	4.30	4.00
7	Renewable energy generation in the municipality	3,80	4.00
7	Placing wind turbines in the municipality	2.30	2.00
7	Placing solar energy farms in the municipality	3.10	3.00
8	Participation of municipal inhabitants in local energy co-operations	4.70	5.00
9	Regional strategy for renewable energy	4.20	4.50

Note. N = 10.

Table 11. Mann-Whitney test for the response to the vertical factors by Group High and Group Low.

Factor	Indicator	Mann-Whitney U	*Z*	*p*
3	Policy autonomy	383.00	-.60	.55
3	Municipal strategy for renewable energy	429.00	-.02	.99
5	Subsidies for municipal renewable energy policy	344.50	-1.14	.26
5	Financial resources for implementing the municipal renewable energy policies	386.00	.68	.50
6	Special department for sustainability policy	331.00	-1.29	.20
6	Employees with expertise in relation to renewable energy	414.00	-.23	.82
7	Acceptance inhabitants of renewable energy generation by means of wind turbine and/or solar energy farms	316.50	-1.51	.13
7	Renewable energy generation in general	358.00	-1.08	.28
7	Renewable energy generation in the municipality	405.50	-.35	.73
7	Placing wind turbines in the municipality	402.00	-.36	.72
7	Placing solar energy farms in the municipality	404.50	-.33	.74
8	Participation of municipal inhabitants in local energy co-operations	323.50	-1.43	.15
9	Regional strategy for renewable energy	366.00	-.58	.56

Note. Group Low (*N* = 86) and Group High (*N* = 10).

5.3 Cluster 3: Horizontal factors

5.3.1 Factor 10: Participation in networks

European network

Among the participating municipalities, 20 (16,5%) participated in a European network to promote energy transitions. In order to analyse whether municipalities that participated in a European network were more likely to fall in Group High, a chi-square test was computed, which indicated that this was not the case, X^2 = .36, *p* = .55 (see Appendix V.I). Again, one cell

had an expected count of less than 5, but Fisher's Exact Test confirmed the earlier finding that municipalities participating a European network were not more likely to fall in Group High (p = .48).

Regional network

Among the participating municipalities, 116 (95.9%) participated in a regional network to promote energy transitions or a regional energy agreement. In order to measure whether municipalities that participated in a regional network or a regional energy agreement were more likely to fall in Group High, a chi-square test was computed, which indicated that this was not the case, X^2 = .36, p = .55 (see Appendix V.II). Once more, one of the cells had an expected count of less than 5, but Fisher's exact test confirmed the finding municipalities participating in a regional network were not more likely to fall into Group High (p = .71).

Stimulating factors participation in network

In order to examine stimulating functions of networks, participants were asked in question 8 and question 12 when participation in a network has a stimulating effect in relation to reaching the renewable energy targets/bringing about the energy transition. Participants indicated that they agreed to the statement that participation in a network is stimulating the municipality when networks offer the opportunity to obtain access to:

- Share information, knowledge and experience;
- Co-operate with other municipalities;
- Co-operate with businesses;
- Crate a regional energy strategy;
- Obtain subsidies for renewable energy projects (see Table 12).

Furthermore, something which stands out is the distribution of responses to the items above. To all of them, most respondents indicated they agreed to the stimulating role of this function, many indicated they strongly agreed, and only a couple indicated it plays no role or an impeding role (see Appendix V.XIII). In other words, none of the items seems to play a more stimulating role for municipalities in comparison to the others.

Participant were on average neutral regarding the role of networks that offered the opportunity to obtain access to important European actors (see Table 12), but looking at the distribution of answers this outcome seems somewhat misleading (see Appendix V.XIII). Although most municipalities indeed they were neutral about whether or not this played a stimulating role for the municipalities in the transition to renewable energy, the distribution of answers shows that there were also many municipalities that indicated they agreed or even strongly agreed to this. In order to test whether the different opinions could be explained by the participation in a European network, it was analysed whether municipalities that participate in a European network for renewable energy agreed more to the statement than municipalities that did not participate in a European network. Although the average of municipalities participating in a European network was indeed a little higher (M = 3.8, Mdn = 4) than those

that did not (*M* = 3.44, *Mdn* = 3), this difference was not significant (*U* = 754.00, *z* = -1.92, *p* = .06).

In order to test for differences between Group High and Group Low, the mean scores of these groups on question 8 and question 12 were compared in a Mann-Whitney test (see Tables 13-15). This test indicated that Group High and Group Low differed on one item, which was the role obtaining access to important European actors. Group Low indicated that they agreed to the statement that networks that offer the opportunity to access important European actors plays a stimulating role, but Group High indicated that they were neutral about this statement. In other words, municipalities with a high share of renewable energy shared their opinion on the simulating role of various opportunities offered by participation in networks with municipalities with a low share of renewable energy.

Table 12. Mean and median of the answers to question 8 and question 12.

	Mean	Median
Share information, knowledge and experiences	4.26	4.00
Co-operate with other municipalities	4.23	4.00
Co-operate with business	4.18	4.00
Create a regional energy strategy	4.20	4.00
Obtain subsidies for renewable energy projects	4.26	4.00
Obtain access to important European actors	3.50	3.00

Note. *N* = 121.

Table 13. Mean and median of Group Low to question 8 and question 12.

	Mean	Median
Share information, knowledge and experiences	4.27	4.00
Co-operate with other municipalities	4.26	4.00
Co-operate with business	4.20	4.00
Create a regional energy strategy	4.4	4.00
Obtain subsidies for renewable energy projects	4.29	4.00
Obtain access to important European actors	3.53	3.00

Note. Group Low (*N* = 86).

Table 14. Mean and median of Group High to question 8 and question 12.

	Mean	Median
Share information, knowledge and experiences	4.20	4.00
Co-operate with other municipalities	4.10	4.00
Co-operate with business	4.20	4.00
Create a regional energy strategy	4.00	4.00
Obtain subsidies for renewable energy projects	4.30	4.00
Obtain access to important European actors	2.90	3.00

Note. Group High (*N* = 10).

Table 15. Mann-Whitney test for the responses to question 8 and question 12 by Group High and Group Low.

	Mann-Whitney U	*Z*	*p*
Share information, knowledge and experiences	405.00	-.35	.73
Co-operate with other municipalities	367.00	-.88	.38
Co-operate with business	412.00	-.25	.80
Create a regional energy strategy	346.00	-1.13	.26
Obtain subsidies for renewable energy projects	417.00	-.18	.86
Obtain access to important European actors	234.50	-2.54	.01

Note. Group Low (*N* = 86) and Group High (*N* = 10).

5.4 Final remarks

In the previous parts of this section, a broad variety of results have been presented. Before discussing the meaning of these results in relation to the modes of governance is discussed in in section 6, this section will point out three points of interest that have emerged from the presented results.

It is remarkable that no correlation was found for any the factors that were tested in relation to the share of renewable energy in a municipality (i.e.: size, participation in a European or regional network, concrete renewable energy targets, presence of a LEC). In other words, these factors were identified in the literature as (potentially) playing a facilitating or stimulating role in local energy transitions, but none of the factors was in this study more likely to apply to or be present in municipalities with a higher share of renewable energy. This is remarkable, as at first sight this suggests that the factors do not play a facilitating role. However, this conclusion cannot be drawn for two reasons. First, the sample of this study included many municipalities with a very low share of renewable energy and only a few municipalities with a very high share of renewable energy. This makes it hard to find significant correlations (Fields, 2009). Furthermore, renewable energy transitions are highly complex phenomena, brought about by many different and interrelated factors (Loorbach, 2010; Mattes, Huber & Koehrsen, 2015; Sippel & Jenssen, 2009). The fact that none of the analysed factors were correlated with a high share of renewable energy at most indicates that these factors are not powerful enough by themselves to explain any differences in the share of renewable energy. However, it could well be the case that these factors are facilitating in the presence of one or more other factors. For example, size was not found to be correlated to the share of renewable energy, but it might be correlated to it if combined with the factor financial resources. Put slightly different: although larger municipalities are not more likely to bring about the energy transitions, larger municipalities with sufficient financial resources might well be more likely to. Unfortunately, it was beyond the scope of this thesis to carry out regression analyses that could identify such relations.

When turning to the results of the questionnaire, it is striking that practically all factors were considered to play a stimulating or strongly stimulating role in the transition to renewable energy. This strengthens the arguments just made about the fact that many factors probably

play a role in the transition and that the absence of any correlation in this study should not be interpreted as indicating that there is no relation at all. However, it must be kept in mind that the opinion of respondents must also not be given too much importance. Most municipalities had a very low share of renewable energy, and therefore one could say that the respondents have no actual experience as to what factors play a role in the transition to renewable energy. When being in the middle or even past a transition, opinions on the importance of factors might change. However, the fact that municipalities with a high share of renewable energy generally gave similar responses to the questions, suggests that opinions do not radically differ after a successful transition to renewable energy.

Finally, the responses to the importance of renewable energy strategies of higher government levels yielded an interesting insight. When comparing the responses to roles played by a European, national, provincial and municipal strategy respectively, the results suggest that the importance increased with each level being closer to the local level. Put slightly different: a European strategy was not considered to play a particular role, a national and regional strategy were considered to play a stimulating role, and a municipal strategy a strongly stimulating role. This indicates that local authorities consider local energy policies to be a very important factor in the transition to renewable energy. It suggests that European and national strategies are not sufficient, at least not in Member States where local authorities enjoy autonomy with regard to energy policies.

5.5 Overview of the findings

Table 16. Overview of the analysed factors and associated findings.

Factors	Indicators	Findings
1. Supportive legislation	1. European strategy for renewable energy	Mixed picture, but on average it plays **no particular role** for municipalities in the transition to renewable energy.
	2. National strategy for renewable energy	Plays a **stimulating role** for municipalities in the transition to renewable energy.
2. Policy stability higher government levels	1. Stability national renewable energy policy	Plays a **stimulating role** for municipalities in the transition to renewable energy.
3. Autonomy	1. Policy autonomy for the municipality	Plays a **stimulating role** for municipalities in the transition to renewable energy.
	2. Local renewable energy targets	**No relation** was found between municipalities with and without renewable energy targets in relation to their share of renewable energy per inhabitant.
	3. Municipal strategy for renewable energy	Plays a **strongly stimulating role** for municipalities in the transition to renewable energy.
4. Size	1. Number of inhabitants	**No relation** was found between the number of inhabitants in a municipality and its share of renewable energy.
5. Financial resources	1.Financial resources for municipal renewable energy policy	Financial resources for implementing the municipal renewable energy policies play a **strongly stimulating role** for municipalities in the transition to renewable energy.
	2. Subsidies for municipal renewable energy policy	Subsidies for municipal renewable energy policy play a **stimulating role** for municipalities in the transition to renewable energy.
6. Expertise	1. Department for sustainability policy	The presence of a specialised department for municipal renewable energy policy plays a **stimulating role** for municipalities in the transition to renewable energy.
	2. Employees with expertise of renewable energy	The presence of employees with expertise in relation to renewable energy plays a **strongly stimulating role** for municipalities in the transition to renewable energy.
7. Acceptance	1. Acceptance inhabitants of renewable energy generation within the municipality by means of wind turbines and/or solar farms	Plays a **stimulating role** for municipalities in the transition to renewable energy

	2. Renewable energy generation in general	Participants estimated inhabitants feel **positive** about this.
	3. Renewable energy generation in the municipality	Participants estimated inhabitants feel **neutral** about this.
	4. Placing wind turbines in the municipality	Participants estimated inhabitants feel **negative** about this.
	5. Placing solar energy farms in the municipality	Participants estimated inhabitants feel **neutral** about this.
8. Community energy projects	1. Participation of municipal inhabitants in LECs	Participants indicated that this plays a **stimulating** role.
	2. Presence LECs	**No differences** in the share of renewable energy were found between municipalities with or without one or more LECs.
9. Regional renewable energy plans	1. Provincial strategy for renewable energy	Plays a **stimulating role** for municipalities in the transition to renewable energy.
10. Participation in networks	1. Participation in a European network	**No relation** was found between the participation of a municipality in a European network and its share of renewable energy.
	2. Participation in a regional network or regional energy agreement	**No relation** was found between the participation of a municipality in a regional network or regional energy agreement its share of renewable energy.
	3. Networks that offer the opportunity to share information, knowledge and experiences are stimulating the municipality.	Participants **agreed** to this statement.
	4. Networks that offer the opportunity to co-operate with other municipalities are stimulating the municipality.	Participants **agreed** to this statement.
	5. Networks that offer the opportunity to co-operate with business	Participants **agreed** to this statement.
	6. Stimulating role of networks that offer the opportunity to create a regional energy strategy are stimulating the municipality.	Participants **agreed** to this statement.
	7. Networks that offer the opportunity to obtain subsidies for renewable energy projects are stimulating the municipality.	Participants **agreed** to this statement.
	8. Networks that offer the opportunity to obtain access to important European actors are stimulating the municipality.	Participants were **neutral** regarding statement.

6. Discussion

In section 5, the empirical results have been presented. The purpose of this section is to discuss these results in relation to Kern's modes of governance. For each cluster, the results are discussed and interpreted. Furthermore, the implications of the results in relation to the modes of governance are discussed.

6.1 Cluster 1: Hierarchical factors

European strategy: mixed picture

The hierarchical governance mode is characterised by top-down relations between the different government levels. In this mode of governance local authorities implement European and national legislation, but play no role in decision-making procedures. The local and EU level have no direct links; they are indirectly linked via the national government of the Member State. Hence, in this mode of governance national governments function as gatekeepers. For this reason, it has been argued by Kern (2014) that the hierarchical mode currently plays a limited role for the local level in climate change policy. This claim appears to hold true in relation to renewable energy policy specifically, as in this study participants indicated that a European strategy for renewable energy plays no particular role for their municipality in reaching its renewable energy targets or bringing about the energy transition. It should be noted, however, that this was no clear-cut picture. On average participants indicated that a European strategy plays no particular role in reaching the renewable energy targets/bringing about the energy transition. However, the opinions on the role of a European strategy differed considerably: many municipalities considered it to play a stimulating role, many indicated it played no role, and some indicated it played an impeding role. Thus, the picture on the role of a European strategy was rather mixed. This might suggest that some municipalities are more aware of the multi-level context of renewable energy policies or that they are to a larger extent affected by the EU policies than other municipalities. However, no differences were found between municipalities with a high or low share of renewable energy. Therefore, it cannot be argued that municipalities with a high share of renewable energy were more likely to regard an EU strategy as stimulating the municipality in the transition to renewable energy.

Stable national policy and strategy: stimulating role

With regard to a national strategy for renewable energy, participants were less divided and indicated that it plays a stimulating role. The findings suggest that a national strategy plays a stronger role for municipalities in reaching their renewable energy targets than a European strategy. This could be explained by the fact that the Energy Union's strategy is mainly directed to nation governments, whereas national policy is directed at the local level. Furthermore, the results of this study indicate that for a national strategy to be stimulating, it is important that it is stable over time. This is in line with a recent document from the *Interprovinciaal Overleg* (IPO, translated: Interprovincial Consultation), *Vereniging van Nederlandse Gemeenten* (VNG,

translated: Association of Dutch municipalities) and the *Unie van Waterschappen* (UvW, translated: Union of Water Boards). In this document, the importance of policy stability and the commitment of national government to the renewable energy targets in order to foster investments in RET is emphasized (IPO, VNG & UvW, 2017). In this regard, it is important to note that policy stability entails more than formulating long-term targets and a strategy: it requires that policies related to the strategy, such as subsidies and tax benefits, remain stable for a longer period (Barradale, 2010).

Implications for the hierarchical mode

In conclusion, the results of this study seem to confirm Kern's argument that the hierarchical governance mode plays a limited role. However, it should be strongly emphasized that a limited role does not equate no role. Despite the responses of participants on the importance of a European strategy, the results of this study indirectly suggest that a European strategy plays a stimulating role. A stable, national strategy was considered a stimulating factor and in many ways, this is impacted by the European strategy. Put slightly different, the local level is indirectly impacted by European legislation given that the Renewable Energy Directive sets targets for Member States. It requires Member States to adopt national renewable energy action plans, in which they show the actions and policies they formulated in order to meet their renewable energy targets. These plans will at some point involve the local level. Would the Renewable Energy Directive be unstable, this could have consequences of the stability of national policy, especially in those Member States that lack an internal motivation for bringing about the energy transition (Klessmann et al., 2011; Maltby, 2013). Moreover, the EU and a national strategy are important, because they signal to local authorities, investors and other actors that the EU and its Member State will go down the road of renewable energy with the end objective of ending the use of energy from fossil fuels. This reduces uncertainties associated with the energy transition, which fosters investment in RET (Biesbroek et al, 2011). Hence, although hierarchical governance by the EC is only indirectly affecting the local level, this could still have a profound effect on local authorities and the outcomes of their renewable energy policies. Reasoning in line of the above metioned, the EC could (indirectly) facilitate local energy transitions in two ways. First, by committing itself to its energy policy and renewable energy targets, it fosters stability of energy policy and strategy. Would this not lead to more stability of national policies, it would at least show a strong signal to private actors (Barradale, 2010; Corfee-Morlot et al., 2009; Eleftheriadis & Anagnostopoulou, 2015). Secondly, the EC could aim for reaching more (ambitious) agreements to strengthen its energy policy and raise the commitments of Member States to the EU renewable energy targets.

6.2 Cluster 2: Vertical factors

In the vertical governance mode, direct ties can be established between local authorities and EU institutions. The governance mode thereby allows for both top-down as well as bottom-up processes. However, the extent to which the local level is initiating bottom-up processes depends heavily on both their will and capacity to do so. Various factors contribute to the

capacity of a municipality to act. This study specifically looked at the role of autonomy, size, financial resources, expertise, acceptance and a provincial strategy.

Autonomy is not enough

When municipalities are not empowered to implement critical renewable energy policies, they have to wait for key pieces of legislation to pass at higher levels of government before they can undertake action. Therefore, some level of policy autonomy is required for municipalities However, autonomy alone is not sufficient. A municipality should also have the capacity to act. It was therefore argued that a combination of sufficient municipal capacity and autonomy in policy-making enables local authorities to bring about local energy transitions. Dutch municipalities enjoy a large degree of autonomy and therefore it was interesting to analyse whether they regarded this as an impeding or stimulating factor. Most respondents indicated that policy autonomy played a stimulating or strongly stimulating role in bringing about the energy transition in the municipality. This might be explained by the fact that national government has been slow to act on renewable energy policy and therefore municipalities taking this issue seriously needed to formulate more ambitious renewable energy policies (Committee of the Regions, 2017). However, autonomy has not been a facilitating factor by itself, as most municipalities in the Netherlands have so far not been able to reach a high share of renewable energy. This is also confirmed by the results of this study, as municipalities which formulated concrete renewable energy targets were not more likely to have a higher share of renewable energy than those who had not. However, it should be kept in mind that there is a considerable gap between the formulation of renewable energy targets, the implementation of policies and the actual outcome of the policies. As participants were not asked how long the renewable energy targets were in place, nothing could be concluded as to whether or not this might explain the absence of a correlation. However, given the high share of municipalities with renewable energy targets and the high share of municipalities participating in a network to stimulate energy transitions, a lack of willingness does not seem to be the problem. This strengthens the argument that has been made in the literature, on the fact that it is the combination of both autonomy *and* capacity that is required to enable a municipality to bring about the transition to renewable energy (Eckersley, 2018; Pierre, 2014).

Strongly stimulating: Municipal strategy, financial resources and expertise

The results of this study further indicate that municipalities consider three factors to be strongly stimulating in the transition to renewable energy: a municipal strategy, financial resources for municipal renewable energy policy and the presence of employees with expertise in relation to renewable energy. How do these factors relate? One way to interpret this is that a municipal strategy plays a critical role in realising renewable energy ambitions, but that knowledge in relation to this complex policy field is very important in designing (and monitoring) such a strategy, and that financial resources and/or expertise for the actual implementation of the policy are very important. The latter is confirmed by various studies, emphasizing the costs that are associated to the transition (Bulkeley & Kern, 2006; Hecher et al., 2016; Musall & Kuik,

2011). Financial resources are an issue in two ways. On the one hand, the implementation of municipal renewable energy policies is costly. This involves inter alia costs for the development of a coherent strategy, subsidies and tax benefits to stimulate investments in RET and renewable energy generation projects, and/or investments in RET and RES generation by the municipality itself (Bulkeley & Kern, 2006; Hecher et al., 2016). On the other hand, a complex issue in the transition to renewable energy relating to finance is the question of ownership. If a municipality wants to raise its share of renewable energy, it can do so by increasing renewable energy generation, but also by reducing energy consumption. Hence, a central element of energy policies involves energy saving (IPO, VNG & UvW, 2017). This means that housing corporations and private house owners need to invest in better insulation. Apart from the question as to whether these parties see the need for doing this (and have the will to do so), many owners simply do not have sufficient financial resources to cover for it. Governments need to offer these households opportunities to do so and regardless of the forms this will take, it will be associated with large sums of money, as the investments need to be paid one way or the other (Huisman, 2018; IPO, VNG & UvW, 2017).

Another noteworthy finding is that the presence of employees with expertise was considered strongly stimulating, and that a specialised department was considered stimulating. This indicates that is the presence of people with knowledge in relation to renewable energy are particularly considered important by municipalities, which strengthens the assumption that municipalities are in need of information, knowledge, and examples of best-practices. This is in line with findings from Brouwer et al. (2017), who found in a recent study in the Netherlands that many municipalities have the will to act on ambitious energy and climate goals, but their capacity to realise these goals varies greatly. Smaller municipalities in particular lacked sufficient knowledge (Brouwer et al, 2017). In fact, many studies emphasize the importance of expertise and knowledge exchange in relation to renewable energy transitions, as well as the lack of this at the local level (Boon & Dieperink, 2014; Hecher et al., 2016; Lutz et al., 2017; Negro et al., 2012).

Size: more is needed

Various scholars have argued that larger municipalities are more likely to enjoy a higher capacity, both in terms of their ability to change their own power-generating operations and to allocate staff and financial resources to follow through on renewable energy commitments (Amundsen et al., 2010; Dannevig et al., 2012; Fuhr et al, 2018; Granberg & Elander, 2007; Schultze, 2003). Therefore, this study analysed whether the size of a municipality in terms of inhabitants, was positively related to its share of renewable energy, i.e. higher municipalities were expected to have a higher share of renewable energy per inhabitant. However, this expectation was not confirmed by the results. There no correlation between the size of a municipality and its share of renewable energy could be observed. In fact, most municipalities with a high share of renewable energy were small to medium sized municipalities (<100.000 inhabitants). When looking for an explanation, one possible explanation relates to numerical

logic. Smaller municipalities need to generate less renewable energy in order to gain a higher share per inhabitant as compared to municipalities with many inhabitants. However, this explanation is not satisfactory, as the majority of the small and medium sized municipalities had a very low share of renewable energy as well. A more substantial argument is that the number of inhabitants might be misleading, as small municipalities may have heavy industries at their territory which adds significantly to their energy consumption. For example, Velsen only with 67.810 inhabitants has an energy-intensive steel production plant located nearby. This steel producer, Tata Steel, counts for 95% of the energy consumption of the municipality (Pols, 2018). Finally, and perhaps most importantly, an explanation could be found in the fact that many factors play a role and municipal size is not likely to be a facilitating factor on its own.

Acceptance and community energy projects: stimulating role

Participants indicated that inhabitants accepting renewable energy generation by means of wind turbines and/or solar energy farms plays a stimulating role. Wüstenhagen et al. (2007) argue that two forms of acceptance can be identified, socio-political acceptance and community acceptance. Socio-political acceptance can be understood as a recognition of the importance of renewable energy as well as the acceptance of renewable energy policies by the public, key stakeholders and policymakers. However, acknowledging the importance of renewable energy generation in general, differs from accepting the placement of wind turbines in your neighbourhood. Therefore, community acceptance refers to the acceptance of renewable energy policy and projects in the municipality specifically. The argument made by Wüstenhager et al. (2007) was partly supported by findings from this study, as participants estimated that inhabitants feel positive about renewable energy generation in general, but negative about placing wind turbines in the municipality. However, participants estimated that inhabitants are neutral regarding renewable energy generation in the municipality and neutral about placing solar energy farms in the municipality. This is probably related to the intrusiveness nature of wind turbines in local environments, as was discussed in section 3.2.2, and suggests that community acceptance depends on the RET that is implemented. This would suggest that policymakers need to take into consideration local needs and opportunities when formulating renewable energy strategies.

Community energy projects were expected to play a stimulating role in the transition to renewable energy. Through their involvement, citizens can mobilise capacity and political support in a municipality. Hence, these projects have the potential to influence the local agenda and foster continuity in the governance of local energy systems. A common form of community energy projects in the Netherlands are LECs. In this study, participants indicated that LECs indeed play a stimulating role in the transition to renewable energy. It was analysed whether this role was visible in the performance of municipalities, i.e. whether municipalities with LEC's had a higher renewable energy index. However, no differences between municipalities with a low and high share of renewable energy were found. The fact that no actual differences were found does not imply that LECs indeed play a stimulating role. First and foremost, these co-

operations are not big enough to affect a municipality's index all by itself, which means that other factors should be present too in order for the co-operation to lead to a significant effect. In addition, it takes time before the results of a co-operation become visible (Hecher et al., 2016). Many co-operations have just recently become active and are still growing and developing themselves (Hier Opgewekt, 2017). Also, the way in which co-operations stimulate the energy transition might not only relate to the actual deployment of RET. LECs have a broad reach. During the year, many information events, energy markets, knowledge sessions and the like are organised. Through these events, as well as attention from local newspapers, LEC contribute to raising awareness among the broader population about the utility and need of energy transitions (Blanchet, 2015; Hoppe et al., 2014; Hier Opgewekt, 2015; Hier Opgewekt 2017; Zahran et al., 2008). On the long-term, this might contribute to fostering acceptance of the energy transitions. In relation to acceptance, another observation should be made. The fact that participants in this study convincingly indicated that LECs play a stimulating role indicates that municipalities have no (significant) experiences on LEC's causing significant local opposition to renewable energy.

Regional renewable energy plans: much potential

Participants indicated that a provincial strategy for renewable energy plays a stimulating role. This is in line with findings from Telos (2017), a research centre for sustainability of Tilburg University. In their national monitor of sustainable municipalities in 2017, they found that a broad city-regional approach to sustainability is important for municipalities. In fact, various recent studies emphasize the importance of regional approaches and the importance of the regional level for this (Beerman & Tews, 2017; Dahlmann et al, 2017; Kern & Alber, 2008; Rotmans, 2015; Späth & Rohracher, 2010). A prime example of the importance of the regional level can be found in the province South-Holland. The port of Rotterdam produces more than 200 megawatt residual heat per year, which could serve as a valuable source of renewable energy for nearby municipalities (Rotmans, 2015). The province of South-Holland is currently designing an energy system in which the residual heat can be connected to geothermal heat from greenhouse horticulture in the nearby Westland and supply this to cities in the province with a warmth demand, such as Rotterdam, Delft, The Hague and Leiden. This project could not have been initiated by a single municipality, the province plays a crucial role in enabling it (Rotmans, 2015). In fact, Rotmans (2015) argues that the in the near future different RES will need to be combined and distributed through different levels: from regional, to local, to neighbourhood, to households. This requires a so-called 'smart grid', which is a new and smart energy infrastructure connecting different government levels. Provinces play a crucial role in facilitating this process (Beermann & Tews, 2017; Rotmans, 2015; Späth & Rohracher, 2010). They can steer the process by setting ambitious targets, offer investment opportunities to business actors. Another reason indicating the importance of the regional level, is that in the long run the entire energy system should transform. This means that at one point it not only becomes ineffective to keep focussing on local, decentralised energy transitions, but potentially also hampering if the grid of the entire system cannot support it. This argument is exemplified

by the German energy transition, which has long been based on a decentralised system. Now that the distribution of renewable energy generation is no longer a niche market, the system has entered a new phase. Renewable energy generation has gained systemic relevance for the entire German energy system, which means that the grid infrastructure of the German system starts to adjust (Beermann & Tews, 2017). It has been argued that this requires governance approaches which facilitate the coordination of bottom-up experimentation with the overall governance framework (Ohlhorst, Tews & Schreurs, 2013)

Implications for the vertical governance mode

No single factor was associated with municipalities with a high share of renewable energy and many factors were considered by participants as stimulating or strongly stimulating in the transition to renewable energy. The picture that emerged, is that various factors are important in the transition to renewable energy and that it is indeed the combination of autonomy *and* capacity that facilitates municipalities in the transition to renewable energy. This suggests that if the EC would like to facilitate energy transitions at the local level, they should focus on contributing to the capacity of local authorities to bring about energy transitions. The vertical governance mode is a mode in which co-operation between different government level is central and in which direct ties between the EU and local level can be established. This makes the vertical governance mode a particularly promising mode when it comes to contributing to the capacity of local authorities. Knowledge and financial resources are inter alia in the literature identified as two key issues related to a municipality's capacity to act in the transition to renewable energy. The results of this study are in line with these findings, as participants indicated these factors play a strongly stimulating role. Interestingly, these are two prime examples of issues which can be address through the vertical governance mode.

On financial resources, Kern notes that "vertical governance is directly linked to EU funding" (Kern, 2014, p. 121). The EU offers many funding opportunities for renewable energy projects. The results of this study and the literature on energy transitions suggest that this is an important factor. Through subsidies, the EU can make an important contribution to the energy transition. However, the EU is only able to finance a fraction of the costs. Findings by Lutz et al. (2017) indicate that this is not necessarily problematic as funding structures for RE development are heterogeneous, meaning that projects generally rely various funding sources: European, national and local funding, but also private sector funding sources and charity. On the other hand, it is also very probable that only local authorities with high capacity are able to compete for funding. In this regard, Granberg and Elander, (2007) emphasised the asymmetrical allocation of funds for local climate investment plans in Sweden. Smaller municipalities did not apply or were not able to successfully compete, and hence most funding went to larger municipalities. This is not necessarily an undesirable situation. Given the large proportion of EU citizens living in cities and their close ties to industries and business, cities with high capacity can have a high impact (Betsill & Bulkeley, 2006; Castán Broto, 2017; Rutherford & Coutard, 2014). Also, larger municipalities with high capacity offer the potential

to nearby small municipalities to profit from their developments (Hongtao, Feiock, & Berry, 2017; Telos, 2017). On the other hand, existing differences between pioneers and smaller municipalities might become even more pronounced if the pioneers strengthen their capacity due to national funding whereas the smaller municipalities might not even have the capacity to apply for funding (Grandberg & Elander, 2007). Entire regions with a low population and/or little financial resources could be set aside if there is no large and motivated municipality. Not only is this demotivating, it is also a waste of potential. Sparsely populated regions might have a great potential for renewable energy generation, which could be of use to regions with less potential (Bridge, Bouzarovksi, Bradshaw & Eyre, 2013). Hence, the EC might focus on ways in which funding structures are distributed in a more levelled playing field. Also, Lutz et al. (2017) found that strong engagement in formal networks was beneficial for renewable energy implementation, inter alia because it enabled the exchange of information about funding opportunities. This suggests that the EC could not only support the local level by actually providing funding, but also by informing local authorities about successful funding opportunities. In relation to the just discussed finding that many renewable energy projects are financed by multiple funding sources, this might indeed be helpful to local authorities.

This leads to the second prime example of co-operation in the vertical governance mode: (transnational)networks for sharing knowledge and best-practices. Expertise seems to be a crucial element in the capacity of local authorities to implement renewable energy policies. Municipalities may either attract employees with expertise in relation to renewable energy or join a network in the hope to benefit from knowledge sharing. Indeed, since the 1990's the number of municipalities joining a climate change network has rapidly increased (Hakelberg, 2014; Kern, 2014; Kern & Bulkeley, 2009). However, municipalities may join networks for various other reasons too, which will be further discussed in section 6.3. For the vertical mode, it is mostly interesting what network-like structures the EU could set up in order to help local authorities to access expertise. A promising example has recently been initiated by the EC's Directorate-General for the Environment. TAIEX-EIR P2P supports public administrations in the Member states with the approximation, application and enforcement of EU environmental law and policies (European Commission, 2018). It does so by financing expert exchange on EU environmental policy and law. Expert exchange may take three forms:

1. Expert missions, in which a Member State that requested for peer advice and exchange of experience on a specific topic may receive an expert from another Member State;
2. Study visits, whereby a maximum of three employees from a requesting institution may be sent to another Member State institution for 2-5 days to learn from peers and exchange good practices;
3. Workshops, either single or multi-country for about 2 days.

Various public institutions can apply, such as national, regional and local departments and agencies, but also networks and regional or local environmental implementation businesses entrusted with a public task. Although TAIEX-EIR P2P is specifically focused on environmental legislation, as similar structure could be devised for energy policy.

Another promising structure which is already in place is the Covenant of Mayors. The EC launched the Covenant of Mayors for Climate and Energy initiative in 2008. It is a voluntary agreement and with more than 7.750 signatories it represents over 40% of the EU population (Covenant of Mayors, n.d.). The Covenant commits its signatories to develop a sustainable energy (and climate) action plan within two years after signing and to go beyond the EU 2020 targets. In order to evaluate the progress that cities make towards their objectives, they are also requested to submit a monitoring report every second year after the adoption of their action plan. Furthermore, the Covenant offers local authorities the opportunity to participate in a twinning programme, aimed at increasing the capacity and knowledge of local authorities. What's more, cities that abide by the agreement's rules, become eligible for additional EU funding for their renewable energy projects. This is thus an excellent example of a bottom-up approach to renewable energy policies whereby the EC co-operates with the local level (Hakelberg, 2018; Kern, 2014). Moreover, the two central issues that were identified in this thesis, i.e. expertise and financial resources, are addressed by this Covenant.

Another potential role for the EC within the vertical governance mode is supporting or even initiating regional co-operation. Many local authorities have ambitious plans, but lack the capacity to realise their them. It would be a missed opportunity for the EC to not think of a way to reach these authorities and contribute to their capacity. Especially in a Member State like the Netherlands, where municipalities both have the autonomy for energy policy-making and set ambitious targets in relation to renewable energy. In this regard, the regional level seems to be an ideal connection piece in the puzzle (Dahlmann et al., 2017; Hecher et al., 2016). It is a level which is both closely connected to the national and local level. It is therefore a strategic level for translating European and national policy into policy adjusted to local needs and opportunities, but at the same time able to devise a strategy which is not focused on the needs of a single local authority. It can strategically oversee a larger region, thereby connecting the local needs and opportunities to the bigger, national strategy. When doing this successfully, various studies have suggested or showed that this can have a great impact (Beermann & Tews, 2017; Dahlmann et al., 2017; Rotmans, 2015). Furthermore, the EC is in a good position to foster regional co-operation across borders. In regions with common renewable energy potential, co-operation could help to achieve cost reductions (Dahlmann, 2017; European Commission, 2015b). Regions with common renewable energy potential are not confined to national borders. Therefore, transnational regional co-operation is key in achieving cost reductions. For example, an offshore wind energy system and associated grid systems would be ideal for the Northern and Baltic Seas region.

6.3 Cluster 3: Horizontal factors

Networks: many opportunities to stimulate

In the horizontal governance mode, the process of knowledge transfer and learning among local authorities is central. This process happens predominantly through networks. However,

from the literature on climate change governance, various other functions of networks were identified. This study explored what functions municipalities regard as stimulating in their transition to renewable energy. Participants indicated that for their municipality, participation in a network is stimulating when it offers the opportunity to: share information, knowledge and expertise; co-operate with other municipalities; co-operate with business; create a regional energy strategy; and to obtain subsidies for renewable energy projects. Amongst these different functions, no single function was found particularly stimulating. The only function which was not considered stimulating was access to important European actors, on average participants indicated that they neither agreed nor disagreed to the statement that this played a stimulating role. However, to this it should be noted that although most participants indicated it played no particular role, many indicated it does play a stimulating role. It could in this study not be retrieved what caused the variation in opinions on the role of access to European actors.

Municipalities were asked whether they participated in a European and/or regional network to promote energy transitions. Among the participating municipalities, 17% participated in a European network and 96% participated in a regional network. Municipalities that participated in a network were not more likely to have a high share of renewable energy than municipalities that did not participate in a network. On the one hand this should not be interpreted as a clear indication that networks have no stimulating effect. At most, it indicates that it participation in a network is not by itself able to bring about the energy transition. On the other hand, an important observation made by Hakelberg (2014) is that transnational networks have difficulties in influencing the laggards. Laggards seem to use their network membership as a public signal for climate related activities, but generally fail to live up to their commitments. This is in line with findings by Kern & Bulkeley (2009), who have argued that networks are predominantly useful for climate change pioneers, who have both the will and capacity to act.

Implications for the horizontal governance mode

Although the results of this study do not provide for evidence that participation in networks is actually a facilitating factor in the transition to renewable energy, it does indicate that local authorities see much potential for a stimulating role. Would participation in a network offer the opportunity to share knowledge and expertise, co-operation with both public and private actors, and/or access to funding opportunities, participants indicated that this would play a stimulating for the municipality in the transition to renewable energy. These findings are in line with the findings from the former section, in which it was discussed that municipalities indicated that expertise and financial resources play a strongly stimulating role in the transition to renewable energy. Many scholars have argued that networks can be a good instrument for sharing knowledge and best practices (Gustavsson et al., 2009; Hakelberg, 2014; Kern & Bulkeley, 2009). An example of an important network in the realm of horizontal governance is Energy Cities. This is the European Association of local authorities in energy transitions. It was created in 1990 and currently represents more than 1000 local authorities (towns and cities) in as much as 30 Member States. For local authorities looking for a city partner in a certain project

the network provides an excellent basis and thereby facilitates the implementation of joint projects. Furthermore, it strengthens its members' roles and skills in relation to renewable energy by facilitating the exchange of knowledge and best practices. Also, the network has a vertical governance component, as it represents the interests of its members by EU institutions through lobbying.

Note that even if the EU is not actively involved in the network itself, this mode of governance can still make a meaningful contribution to the facilitating of energy transitions at the local level. Energy Cities has many members and although the impact of participation may differ per municipality, the network makes a contribution to the implementation of renewable energy in the EU (Hakelberg, 2014; Heinelt & Niederhafner, 2008; Kern, 2014). What's more, pioneering cities have also shown leadership vis-à-vis national governments (Schreurs, 2008). Hence, it could be expected that the effects of the networks go beyond the local jurisdictions they represent (Schreurs, 2008).

Although EU institutions may not play a strong role in the horizontal governance mode, there are some ways in which they could facilitate the existence, functioning and impact of networks. Providing funds to assist these networks is the most important facilitating role (Kern & Alber, 2008; Kern & Bulkeley, 2009). However, also the open and transnational nature of the EU forms a facilitating environment for the emergence of transitional networks. Scholars indicated that although transnational networks in the realm of climate change governance were established in various parts of the world, but the institutional density of the networks in the EU is unique (Kern 2014). However, would EU actors become more substantially involved, the role of the EU soon becomes co-operative, leading to a vertical governance mode. This means that the initiative and governance of the networks lies in principle with the local authorities themselves. Therefore, this approach is most likely to involve and impact local authorities with a high capacity to act. It will be the pioneers in the transition to renewable energy that are willing and able to be actively involved in networks (Fuhr et al., 2018; Hakelberg, 2014; Kern & Bulkeley, 2009).

7. Conclusion

7.1 Conclusion

Europe's energy system needs to reform as it is currently unsustainable. Central in the reform of the energy system is a transition to renewable energy. Both European policymakers and academic scholars increasingly emphasize the importance of the local level in realising this transition. However, the way in which the EC could engage with the local level in order to bring the energy transition about has remained understudied. This thesis aimed to shed light on this and posed the following central research question: *In what way can the European Commission facilitate energy transitions at the local level in order to stimulate Europe's transition to*

renewable energy? In order to answer this question, two sub-questions were formulated, which will be answered before turning to the central research question.

The first sub-question of this thesis was: *What factors facilitate energy transition at the local level?* In order to answer this question, various factors were identified from the literature and subsequently tested in an empirical study. Both the opinion of local authorities on the role of various factors, as well as the correlation of some factors in relation to the share of renewable energy per inhabitant in the participating municipalities were analysed. With regard to the opinion of local authorities on the importance of various factors, the following was found. A municipal strategy for renewable energy, financial resources for implementing the municipal renewable energy policies, and employees with expertise in relation to renewable energy were considered strongly stimulating factors. Furthermore, various factors were considered to play a stimulating role: a national strategy for renewable energy, stability in national renewable energy policy, a regional strategy for renewable energy, subsidies for municipal renewable energy policy, policy autonomy for the municipality, a special department within the municipality for sustainability policy, acceptance by inhabitants of renewable energy generation by means of wind turbines and/or solar energy farms, and participation of municipal inhabitants in local energy co-operations. Furthermore, it was indicated that participation in a network is stimulating the municipality in the energy transition, when it offers the opportunity to share information, knowledge and experiences, co-operate with other municipalities, co-operate with businesses, create a regional energy strategy, and to obtain subsidies for renewable energy projects. Obtaining access to important European actors was on average not considered to play a stimulating role, although also many participants did consider it to play a stimulating role.

For the following factors, it was tested whether there was a correlation between the factor and the share of renewable energy per inhabitant in a municipality: participation in a European network, participation in a regional network, the formulation of concrete renewable energy targets, size (in terms of inhabitants), community acceptance, presence of LEC(s). None of these factors were correlated to the share of renewable energy in a municipality. At first sight, this seems to be at odds with the literature and the opinion of local authorities on these factors. However, these findings could very well be explained by the fact that a transition to renewable energy is a very complex process and hence no single factor may be facilitating by itself, but only in interaction with its environment (Loorbach, 2010; Matters et al., 2015; Sippel & Jenssen, 2009). The results of the questionnaire would be in line with this argument, as participants indicated almost all factors measured played a stimulating or strongly stimulating role in the transition to renewable energy. Furthermore, the transition to renewable energy has not really taken off in the Netherlands and most municipalities have a very low share of renewable energy. Hence, few municipalities with a high share of renewable energy could be analysed, which made it harder to find patterns of correlation.

In order to answer the research question, Kern's (2014) modes of climate governance were used. Each mode contributes in a different way to EU climate governance, of which renewable energy policy is a central element, and the specific combination of these three modes determines policy outcomes. Furthermore, each mode is associated with certain roles and activities for EU institutions. Hence, analysing which mode of governance is of value for the EC in facilitating energy transitions at the local level, contributes to answering the central research question. For the purpose of arguing which modes are of value in this regard, the relations of the above-mentioned factors to the three modes were discussed. Hence, the second sub-question of this thesis was: *Given the facilitating factors that have been identified, what modes of governance are suited for facilitating energy transitions at the local level?* The picture that emerged from the discussion in section 7, is that each mode of governance can contribute in a meaningful way to the facilitation of energy transitions at the local level. This had various implications for the way in which the EC can facilitate local energy transitions, which means this thesis can turn to the central research question: *In what way can the European Commission facilitate energy transitions at the local level in order to stimulate Europe's transition to renewable energy?* The results of this thesis suggest that there are various opportunities for the EC to engage with local authorities in order to facilitate their transition to renewable energy. From a hierarchical governance perspective, it seems crucial that the EC shows strong commitment to its energy policy, thereby creating a stable policy environment. This is a precondition for the stability of national energy policies, which in turn is important for local authorities. In addition, a stable European strategy for renewable energy decreases uncertainties about the future of Europe's energy system, thereby decreasing the perceived risks associated to investments in RET.

Looking at the question from the perspective of the vertical governance mode, it seems promising that there are multiple ways in which the EC can establish direct and cooperative relations with the local level. Various examples of current or potential relations have been discussed, of which most promising seem the set-up of systems that facilitate sharing knowledge and best-practices amongst local authorities and co-operation with the regional level. The local level not only needs guidance in the transition to renewable energy, but also the capacity to formulate its own strategy and to actually implement it. In this regard, a municipal strategy, sufficient financial resources and expertise seem crucial. The EC could address these issues by establishing systems in which the exchange of expertise and information about funding opportunities is facilitated. A point of attention in the set-up of these systems is the creation of levelled playing field, meaning that these systems should also be assessable for local authorities with low capacities.

The hierarchical governance mode also offers the opportunity to facilitate local energy transitions. On the one hand, it has been argued that this mode is most likely to involve pioneers and front-runners in the field of renewable energy. The mode relies on self-governance by local actors and hence it is highly dependent upon the will and capacity of actors.

This is in line with the argument of Kern (2014) that the Europeanisation of climate change policy will for most cities mainly entail the implementation of national and EU climate policy, but for pioneers the EU offers many options. On the other hand, there are also indications to suggest that the effects of these pioneers go beyond their jurisdictions. They have been able both affect other local authorities, as well as national governments. Hence, the hierarchical governance mode is very likely make meaningful contributions to local energy transitions. The ways in which the EC can facilitate local authorities in their transition to renewable energy through this governance mode are indirect, as they go via the networks. Still the EC could facilitate the emergence, performance and outcome of networks by creating a favourable context for transnational co-operation and by providing funding opportunities for both the networks themselves and promising initiatives and projects that result from these networks.

In conclusion, each mode offers different opportunities for the EC to contribute to the facilitation of local energy transitions. An important benefit of the vertical governance mode over the hierarchical governance mode, is that it doesn't involve lengthy decision-making and legislation procedures and therefore no approval of a qualified majority of the Member States votes. This not only makes it a faster and more flexible approach, but also allows the EC as well as local authorities to bypass Member States that are for whatever reason less willing or capable to bring about the energy transition. However, although the vertical governance mode might offer most direct opportunities, this does by no means make the other modes less important. The hierarchical governance mode is crucial to foster an environment in which the local level is able to formulate renewable energy policies and implement them. Furthermore, the capacity of the EC in maintaining direct relations with local authorities is obviously limited and therefore the vertical governance mode is also crucial, as it helps to reach the EC policy objectives while requiring relatively small efforts from EU institutions and actors.

7.2 Critical appraisal and outlook

This thesis is an exploratory study on the way in which the EC can facilitate local energy transition and it contributes to the academic literature in various ways. Given the complex nature of renewable energy transitions, academics from various disciplines have approached the topic. This thesis brought together articles from a wide variety of those disciplines in relation to facilitating factors and structured them according to the modes of governance as formulated by Kern (2014). Kern originally identified these modes in relation to climate change policy, but given that renewable energy is a central element of climate change governance the modes considered relevant to renewable energy policies as well. Approaching the complex puzzle of local energy transitions and ways in which they can be facilitated by the EC by using the modes of governance in combination with facilitating factors has, to the best of my knowledge, not been attempted before. It turned out to be a useful approach, providing insights about the research puzzle in a structured way. By contributing to a better understanding of the outcomes of governance processes, deliberate and substantiated choices can be made in relation to policies that are aimed at facilitating renewable energy transitions

at the local level. Hence, the approach is promising for future research, not only in relation to renewable energy policy, but also in relation to other policy areas. Moreover, not only are the results promising for theoretical purposes, it also offers relevant insights for EU policymakers. This comprehensive and well-structured approach offers them valuable insights and tools for handling the complex task of transforming Europe's energy system.

Apart from the promising findings of this thesis, the approach taken was also associated with certain limitations. In this light, a limitation encountered during the analysis of the responses to questions 7 and 11. In hindsight, these questions could be interpreted in two ways: the role which the factors *actually* play or the role they could *potentially* play. The distribution of responses suggests that the latter interpretation prevailed: the option 'does not apply' was only rarely selected, whereas this should have been much higher if municipalities were indicating what role the factors actually played. Furthermore, it was argued that it does not really matter how the question was interpreted by participants, as long as the results were not considered in the analysis to reflect the actual situation: considering something to be stimulating can entail both the actual and/or potential role, whereas considering something to actually play a role cannot include a potential role. Fortunately, the purpose of the questions was not to only measure the actual role. Hence, it was decided that the ambiguity did not pose significant problems for the analysis.

Another limitation is related to the modes of governance and the MLG perspective in general. Although the modes of governance allow for a descriptive analysis of patterns in a system that is already in place, they cannot explain the emerge of the patterns nor predict them (Eckersley, 2018; Guderjan & Miles, 2016). Put slightly different, the modes do not contribute to a better understanding of power relations between and within networks, policymakers and other stakeholders. It would be of great added value if future research would be able to combine the modes of governance with approaches that do allow for the identification of power relations (Geels, 2014). A promising approach in this regard is the fusion approach, which links "overall macro-dynamics of European integration to responsive micro-processes within Member States" (Guderjan & Miles, 2016, p. 639). The approach allows for examining the extent to which the local level in the EU has become integrated into the bigger European governance system.

Another limitation of this thesis is its limited generalisability. The results of this thesis mainly provide valuable insights about ways in which the EC can facilitate local energy transitions in Member States with institutional arrangements similar to that of the Netherlands. More specifically, the high degree of autonomy which Dutch local authorities enjoy in relation to energy policy-making is most likely to have an effect on the importance that local authorities assign to certain factors. In countries with highly centralised policy frameworks, local authorities have less policy-making discretion and therefore also policy-decisions to take. Given the complexity and uncertainty of energy transitions, local authorities are faced with highly

complex choises to make in relation to their renewable energy policy. It could well be the case that this applies to a larger extent to local authorities with a high degree of autonomy as compared to those who can (partially) rely on a national strategy or policy framework. However, even in such circumstance the modes of governance can be used to explore ways in which the EC could engage with the local level. It would be an interesting angle for future research, to investigate differentiated approaches for the EC with respect to local authorities with high and low policy-making autonomy in the transition to renewable energy.

Measuring facilitating factors in a quantitative way was shown to be suited approach, as this was an exploratory research and the use of a questionnaire allowed for a high number of participants and factors that could be taken into consideration. On the other hand, this also entailed that the information on the individual facilitating factors was limited. First of all, this made the thesis largely dependent on self-reporting. The opinion of local authorities on the importance of factors is valuable information, but it might not directly mean that factors which are considered stimulating are actually exerting a significant stimulating effect in the transition. Furthermore, the questionnaire did not allow for examining *why* participants considered a factor stimulating or not. This was also a result of measuring many different factors. If less factors were examined, it would have been possible to pose various questions in relation to one factor. This was in the current questionnaire not possible, because it would have led to too many questions. To summarize, the quantitative approach provided a useful starting point for policymakers, but it would be of great value if this was to be supplemented by a quantitate assessment of the factors and their relations. Hence, now that this thesis has made a first attempt at exploring ways in the EC could facilitate the local level by mapping factors that are important for local energy transitions, it would be of great value if further research followed up on the first findings of this thesis.

In addition to qualitative follow-ups, the results of this thesis indicate that quantitative approaches analysing the interaction between various factors could also lead to important insights. This thesis analysed various individual factors, but it was beyond the scope of the thesis to analyse the factors in combination with and in relation to other factors. Although the facilitating nature of various factors might at first sight appear to be obvious, no correlations were found between those that were actually measured and the share of renewable energy in municipalities. Hence, the role of the factors is actually not that straightforward. What's more, not only might the factors interact with each other, but quite possibly also with their environment (Sippel & Jenssen, 2009). This means that the importance of factors is likely to differ not only between local levels of different Member States, but also within. Further insight into what it actually is that makes a factor facilitating, enables policymakers to better understand what factors are important to them and take this into consideration when formulating renewable energy policies.

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9. Appendices

Appendix I: Distribution provinces

Table 17. *Distribution of the participating municipalities over the Dutch provinces.*

Province	Total number of municipalities in the province	Number of municipalities participating in this study	Percentage of municipalities participating in this study per province
Drenthe	12	2	16.7
Flevoland	11	2	18.2
Friesland	19	5	26.3
Gelderland	52	17	32.7
Groningen	21	6	28.5
Limburg	35	6	17.1
Noord-Brabant	63	23	36.5
Noord-Holland	54	14	25.9
Overijssel	25	9	36.0
Utrecht	27	11	40.7
Zeeland	14	4	28.6
Zuid-Holland	49	22	44.9

Appendix II: Distribution index numbers

Table 18. Distribution municipalities index number on the share of renewable energy per inhabitant.

Category	Index score	Frequency	Percent	Cumulative percent
1	1.0	36	29.8	29.8
2	1.1-2.0	34	28.1	57.9
3	2.1-3.0	15	12.4	70.2
4	3.1-4.0	15	12.4	82.6
5	4.1-5.0	7	5.8	88.4
6	5.1-6.0	4	3.3	91.7
7	6.1-7.0	0	-	-
8	7.1-8.0	0	-	-
9	8.1-9.0	0	-	-
10	9.1-10.0	9	7.4	100

Note. M = 2.73, *Mdn* = 1.70.

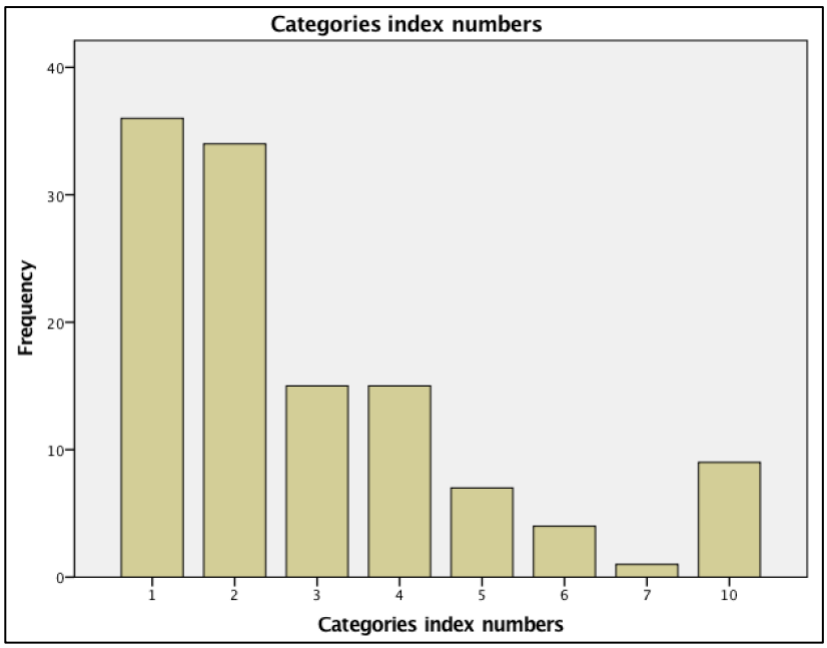


Figure 6. Distribution share of renewable energy per inhabitant in kW/h.

Appendix III: Original survey design

Welkom,

Deze enquête is onderdeel van een onderzoek waarin wordt gekeken naar manieren waarop de Europese Commissie gemeenten zou kunnen ondersteunen in de transitie naar duurzame energie. De resultaten van de enquête worden gebruikt om in kaart te brengen welke factoren voor Nederlandse gemeenten stimulerend werken in het realiseren van hun doelstellingen t.a.v. duurzame energie. Onder andere op basis van deze resultaten zal worden gekeken naar manieren waarop de Europese Commissie gemeenten kan ondersteunen. Het onderzoek wordt uitgevoerd door een masterstudent van Universiteit Utrecht in het kader van een afstudeerstage bij adviesbureau KWINK groep.

De vragenlijst bestaat uit 9 vragen en het invullen kost u circa **4 minuten**. Uw gegevens zullen **anoniem en vertrouwelijk** worden verwerkt en zullen nooit tot individuele personen te herleiden zijn. De gegevens worden uitsluitend voor onderzoeksdoeleinden gebruikt.

Graag ontvang ik uw reactie voor **donderdag 7 juni.**

Alvast hartelijk dank voor uw deelname aan dit onderzoek!

* 1. Namens welke gemeente neemt u deel aan dit onderzoek?

* 2. Wat is uw functie bij deze gemeente?

- [ ] Wethouder
- [ ] Beleidsmedewerker
- [ ] Anders, namelijk

* 3. Neemt de gemeente deel aan een Europees netwerk ter bevordering van energietransities?

N.B. De term 'Europees netwerk ter bevordering van energietransities' verwijst hier naar een samenwerkingsverband van lokale of regionale overheden uit ten minste twee verschillende Europese landen, met als doel de bevordering van energietransities. Een voorbeeld van een Europees netwerk ter bevordering van energietransities is Energy Cities.

- [ ] Ja
- [ ] Nee

* 4. Neemt de gemeente deel aan een regionaal netwerk ter bevordering van energietransities of een regionaal energieakkoord?

N.B. De term 'regionaal netwerk ter bevordering van energietransities' verwijst hier naar een samenwerkingsverband van regionale of lokale Nederlandse overheden en/of private partijen, met als doel de bevordering van energietransities.

- [ ] Ja
- [ ] Nee

* 5. Heeft de gemeente concrete doelstellingen geformuleerd ten aanzien van duurzame energie?

N.B. Een voorbeeld van een concrete doelstelling is:*In 2020 wordt per inwoner 20% meer duurzame energie opgewekt en 20% minder energie verbruikt dan in 2013.*

- [ ] Ja
- [ ] Nee

* 6. In hoeverre spelen onderstaande factoren een stimulerende rol in het realiseren van de duurzame energiedoelstellingen van de gemeente?

	Totaal geen stimulerende rol	Geen stimulerende rol	Neutraal	Stimulerende rol	Sterk stimulerende rol	Niet aanwezig bij/ n.v.t. op de gemeente
Een Europese strategie voor duurzame energie	○	○	○	○	○	○
Een nationale strategie voor duurzame energie	○	○	○	○	○	○
Een provinciale strategie voor duurzame energie	○	○	○	○	○	○
Een gemeentelijke strategie voor duurzame energie	○	○	○	○	○	○

* 7. In hoeverre spelen onderstaande factoren een afremmende of stimulerende rol voor de gemeente in het realiseren van de duurzame energiedoelstellingen?

	Sterk afremmende rol	Afremmende rol	Geen rol	Stimulerende rol	Sterk stimulerende rol	Niet aanwezig bij / n.v.t. op de gemeente
Stabiliteit in het nationale beleid voor duurzame energie	○	○	○	○	○	○
Subsidies voor het duurzame energiebeleid van de gemeente	○	○	○	○	○	○
Beleidsvrijheid voor de gemeente	○	○	○	○	○	○
Financiële middelen voor het uitvoeren van het duurzame energiebeleid	○	○	○	○	○	○
Een speciale afdeling binnen de gemeente voor duurzaamheidsbeleid	○	○	○	○	○	○
Medewerker(s) met expertise op het gebied van duurzame energie	○	○	○	○	○	○
Acceptatie van de inwoners van duurzame energieopwekking d.m.v. windmolens en/of zonneweides in de gemeente	○	○	○	○	○	○
De participatie van gemeentelijke inwoners in lokale energiecoöperaties	○	○	○	○	○	○

* 8. Om de duurzame energiedoelstellingen te realiseren, werkt deelname aan een netwerk stimulerend voor de gemeente als het de mogelijkheid biedt om:

	Sterk mee oneens	Mee oneens	Neutraal	Mee eens	Sterk mee eens
informatie, kennis en ervaringen te delen	○	○	○	○	○
samen te werken met andere gemeenten	○	○	○	○	○
samen te werken met het bedrijfsleven	○	○	○	○	○
tot een regionale strategie te komen	○	○	○	○	○
subsidies te krijgen voor duurzame energieprojecten	○	○	○	○	○
toegang te krijgen tot belangrijke Europese actoren	○	○	○	○	○

* 9. Hoe staan inwoners van de gemeente tegenover de volgende onderwerpen?

N.B. Het gaat hier om een algemene inschatting.

	Zeer negatief	Negatief	Neutraal	Positief	Zeer positief
Duurzame energieopwekking in het algemeen	○	○	○	○	○
Duurzame energieopwekking binnen de gemeente	○	○	○	○	○
Het plaatsen van windmolens binnen de gemeente	○	○	○	○	○
Het plaatsen van zonneweides binnen de gemeente	○	○	○	○	○

* 10. In hoeverre spelen onderstaande factoren een stimulerende rol in het realiseren van de duurzame energietransitie in de gemeente?

	Totaal geen stimulerende rol	Geen stimulerende rol	Neutraal	Stimulerende rol	Sterk stimulerende rol	Niet aanwezig bij / n.v.t. op de gemeente
Een Europese strategie voor duurzame energie	○	○	○	○	○	○
Een nationale strategie voor duurzame energie	○	○	○	○	○	○
Een provinciale strategie voor duurzame energie	○	○	○	○	○	○
Een gemeentelijke strategie voor duurzame energie	○	○	○	○	○	○

* 11. In hoeverre spelen onderstaande factoren een afremmende of stimulerende rol voor de gemeente in het realiseren van de duurzame energietransitie in de gemeente?

	Sterk afremmende rol	Afremmende rol	Geen rol	Stimulerende rol	Sterk stimulerende rol	Niet aanwezig bij / n.v.t. op de gemeente
Stabiliteit in het nationale beleid voor duurzame energie	○	○	○	○	○	○
Subsidies voor het duurzame energiebeleid van de gemeente	○	○	○	○	○	○
Beleidsvrijheid voor de gemeente	○	○	○	○	○	○
Financiële middelen voor het uitvoeren van het duurzame energiebeleid	○	○	○	○	○	○
Een speciale afdeling binnen de gemeente voor duurzaamheidsbeleid	○	○	○	○	○	○
Medewerker(s) met specifieke expertise op het gebied van duurzame energie	○	○	○	○	○	○
Acceptatie van de inwoners van duurzame energieopwekking d.m.v. windmolens en/of zonneweides in de gemeente	○	○	○	○	○	○
De participatie van gemeentelijke inwoners in lokale energiecoöperaties	○	○	○	○	○	○

* 12. Met betrekking tot het realiseren van de transitie naar duurzame energie, werkt deelname aan een netwerk stimulerend voor de gemeente als het de mogelijkheid biedt om:

	Sterk mee oneens	Mee oneens	Neutraal	Mee eens	Sterk mee eens
informatie, kennis en ervaringen te delen	○	○	○	○	○
samen te werken met andere gemeenten	○	○	○	○	○
samen te werken met het bedrijfsleven	○	○	○	○	○
tot een regionale strategie te komen	○	○	○	○	○
subsidies te krijgen voor duurzame energieprojecten	○	○	○	○	○
toegang te krijgen tot belangrijke politieke	○	○	○	○	○
toegang te krijgen tot belangrijke Europese actoren	○	○	○	○	○

* 13. Hoe staan inwoners van de gemeente tegenover de volgende onderwerpen?

N.B. Het gaat hier om een algemene inschatting.

	Zeer negatief	Negatief	Neutraal	Positief	Zeer positief
Duurzame energieopwekking in het algemeen	○	○	○	○	○
Duurzame energieopwekking binnen de gemeente	○	○	○	○	○
Het plaatsen van windmolens binnen de gemeente	○	○	○	○	○
Het plaatsen van zonneweides binnen de gemeente	○	○	○	○	○

Dit is het einde van de vragenlijst. Nogmaals hartelijk dank voor uw deelname aan deze vragenlijst! Bij vragen over dit onderzoek kunt mailen naar het volgende mailadres: fuyterlinde@kwinkgroep.nl.

LET OP: Om uw antwoorden op te slaan is het belangrijk dat u op de knop ' **Gereed**' klikt.

Appendix IV: Translated survey design

Welcome,

This questionnaire is part of a study in which it is explored in what ways the European Commission could support municipalities in the transition to renewable energy. Amongst other things, the results of this questionnaire will be used to outline what factors stimulate Dutch municipalities in reaching their renewable energy goals. This study is carried out by a master student of Utrecht University in the context of a graduate internship at advisory bureau KWINK groep.

The questionnaire involves 9 questions and participation will take about 4 minutes. Your data will be handled confidential and anonymously, and will never be traced back to individual persons. The data will used exclusively for research purposes.

Please send me your response before Thursday June 7.

I would like to thank you in advance for your participation!

1. On behalf of which municipality do you participate in this study?

2. What is your function within this municipality?

- [ ] Alderman
- [ ] Policy officer
- [ ] Other, namely

3. Is the municipality participating in a European network to promote energy transitions?

N.B. The term 'European network to promote energy transitions' refers to a partnership of local or regional governments of at least two different European countries, aimed at promoting energy transitions. An example of a European network to promote energy transitions is Energy Cities.

- [ ] Yes
- [ ] No

4. Is the municipality participating in a regional network to promote energy transitions or a regional energy agreement?

N.B. The term 'regional network to promote energy transitions' refers to a partnership of regional or local Dutch governments and/or private actors, aimed at promoting energy transitions.

- [ ] Yes
- [ ] No

5. Has the municipality formulated concrete targets with respect to renewable energy?

N.B. An example of a concrete target is: In 2020, 20% more renewable energy is generated per inhabitant and 20% less energy is used as compared to 2013.

- [ ] Yes
- [ ] No

6. To what extent do the factors below play a stimulating role in reaching the renewable energy targets of the municipality?

	No stimulating role at all	No stimulating role	Neutral	A stimulating role	A strongly stimulating role	Not present at the municipality/ does not apply
A European strategy for renewable energy	○	○	○	○	○	○
A national strategy for renewable energy	○	○	○	○	○	○
A regional strategy for renewable energy	○	○	○	○	○	○
A municipal strategy for renewable energy	○	○	○	○	○	○

7. To what extent do the factors below play an impeding or facilitating role for the municipality in reaching the renewable energy targets?

	Strongly impeding role	Impeding role	No role	Stimulating role	Strongly stimulating role	Not present at the municipality/ does not apply
Stability in national renewable energy policy	○	○	○	○	○	○
Subsidies for municipal renewable energy policy	○	○	○	○	○	○
Policy autonomy for the municipality	○	○	○	○	○	○
Financial resources for implementing the municipal renewable energy policies	○	○	○	○	○	○
A special department in the municipality for sustainability policy	○	○	○	○	○	○
Employees with expertise in relation to renewable energy	○	○	○	○	○	○
Acceptance by inhabitants of renewable energy generation by means of wind turbines and/or solar energy farms	○	○	○	○	○	○
Participation of municipal inhabitants in local energy co-operations	○	○	○	○	○	○

8. In order to reach the renewable energy targets, participation in a network is stimulating the municipality when it offers the opportunity to:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
share information, knowledge and experiences	○	○	○	○	○
cooperate with other municipalities	○	○	○	○	○
cooperate with businesses	○	○	○	○	○
create a regional energy strategy	○	○	○	○	○
obtain subsidies for renewable energy projects	○	○	○	○	○
obtain access to important European actors	○	○	○	○	○

9. How do municipal inhabitants feel about the following subject matters?
N.B. This concerns a general estimation.

	Very negative	Negative	Neutral	Positive	Very positive
Renewable energy generation in general	○	○	○	○	○
Renewable energy generation in the municipality	○	○	○	○	○
Placing wind turbines in the municipality	○	○	○	○	○
Placing solar energy farms in the municipality	○	○	○	○	○

10. To what extent do the factors below play a stimulating role in bringing about the energy transition in the municipality?

	No stimulating role at all	No stimulating role	Neutral	A stimulating role	A strongly stimulating role	Not present at the municipality/ does not apply
A European strategy for renewable energy	○	○	○	○	○	○
A national strategy for renewable energy	○	○	○	○	○	○
A regional strategy for renewable energy	○	○	○	○	○	○
A municipal strategy for renewable energy	○	○	○	○	○	○

11. To what extent do the factors below play an impeding or facilitating role in bringing about the energy transition in the municipality?

	Strongly impeding role	Impeding role	No role	Stimulating role	Strongly stimulating role	Not present at the municipality/ does not apply
Stability in national renewable energy policy	○	○	○	○	○	○
Subsidies for municipal renewable energy policy	○	○	○	○	○	○
Policy autonomy for the municipality	○	○	○	○	○	○
Financial resources for implementing the municipal renewable energy policies	○	○	○	○	○	○
A special department in the municipality for sustainability policy	○	○	○	○	○	○
Employees with expertise in relation to renewable energy	○	○	○	○	○	○
Acceptance by inhabitants of renewable energy generation by means of wind turbines and/or solar energy farms	○	○	○	○	○	○
Participation of municipal inhabitants in local energy co-operations	○	○	○	○	○	○

12. In order to bring about the energy transition in the municipality, participation in a network is stimulating the municipality when it offers the opportunity to:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
share information, knowledge and experiences	○	○	○	○	○
cooperate with other municipalities	○	○	○	○	○
cooperate with businesses	○	○	○	○	○
create a regional energy strategy	○	○	○	○	○
obtain subsidies for renewable energy projects	○	○	○	○	○
obtain access to important European actors	○	○	○	○	○

13. How do municipal inhabitants feel about the following subject matters?
N.B. This concerns a general estimation.

	Very negative	Negative	Neutral	Positive	Very positive
Renewable energy generation in general	○	○	○	○	○
Renewable energy generation in the municipality	○	○	○	○	○
Placing wind turbines in the municipality	○	○	○	○	○
Placing solar energy farms in the municipality	○	○	○	○	○

This is the end of the questionnaire. I would like to thank you again for participating in this questionnaire! Would you have any queries in relation to this study, please mail to the following mailaddress: fuyterlinde@kwinkgroep.nl.

NOTE: In order to save your answers it is important to push the bottom 'ready'.

Appendix V: Output

V.I Output question 3

Table 19. Cross-tabulation of the Chi-Square test on question 3 in relation to Group Low and Group High.

		Participation in a European network		
		Yes	No	Total
Group Low	Count	15	71	86
	Expected count	14,3	71,7	86
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	17.4%	82.6%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	93.8%	88.8%	89.6%
	% Of Total	15.6%	74.05	89.6%
Group High	Count	1	9	10
	Expected count	1.7	8.3	10
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	10.0%	90.0%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	6.3%	11.3%	10.4%
	% Of Total	1.0%	9.4%	10.4%
Total	Count	81	15	96
	Expected count	81.0	15.0	96.0
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	100.0%	100.0%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	84.4%	15.6%	100.0%
	% of Total	16.7%	83.3%	00.0%

Table 20. Chi-square tests on question 3 in relation to Group Low and Group High.

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.357	1	.550		
Continuity Correction	.022	1	.881		
Likelihood Ratio	.400	1	.527		
Fisher's Exact Test				1.000	.475
Linear-by-linear association	.353	1	.552		
N of Valid Cases	96				

V.II Output question 4

Table 21. Cross-tabulation of the Chi-Square tests on question 4 in relation to Group Low and Group High.

		Participation in a regional network		
		Yes	No	Total
Group Low	Count	83	3	86
	Expected count	83.3	2.7	86
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	96.5%	3.5%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	89.2%	100.0%	89.6%
	% Of Total	86.5%	3.1%	89.6%
Group High	Count	10	0	10
	Expected count	9.7	0.3	10
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	100.0%	0.0%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	10.8%	0.0%	10.4%
	% Of Total	10.4%	0.0%	10.4%
Total	Count	93	3	96
	Expected count	93.0	3.0	96.0
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	96.6%	3.1%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	100.0%	100.0%	100.0%
	% of Total	96.6%	3.1%	100.0%

Table 22. Chi-Square tests on question 4 in relation to Group Low and Group High.

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.360	1	.548		
Continuity Correction	.000	1	1.000		
Likelihood Ratio	.671	1	.413		
Fisher's Exact Test				1.000	.716
Linear-by-linear association	.356	1	.551		
N of Valid Cases	96				

V.III Output question 5

Table 23. Cross-tabulation of the Chi-Square test on question 5 in relation to Group Low and Group High.

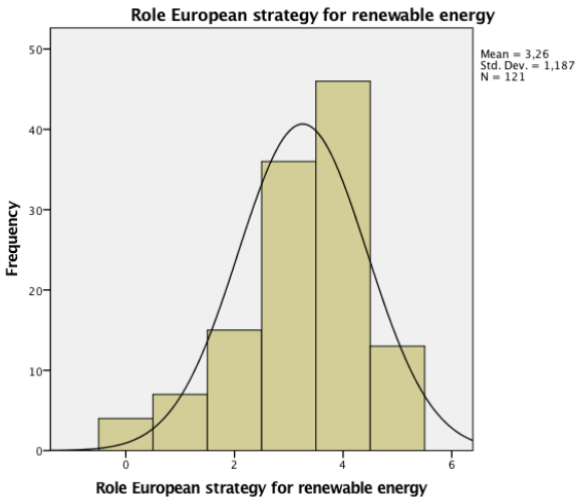
		Targets		
		Yes	No	Total
Group Low	Count	72	14	86
	Expected count	72.6	13.4	86.0
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	83.7%	16.3%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	88.9%	93.3%	89.6%
	% Of Total	75.0%	14.6%	89.6%
Group High	Count	9	1	10
	Expected count	8.4	1.6	10.0
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	90.0%	10.0&	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	11.1%	6.7%	10.4%
	% of Total	9.4%	1.0%	10.0%
Total	Count	81	15	96
	Expected count	81.0	15.0	96.0
	% Within 'Categories of high and low scoring municipalities on renewable energy index'	100.0%	100.0%	100.0%
	% Within 'Has the municipality formulated concrete targets with respect to renewable energy?	84.4%	15.6%	100.0%

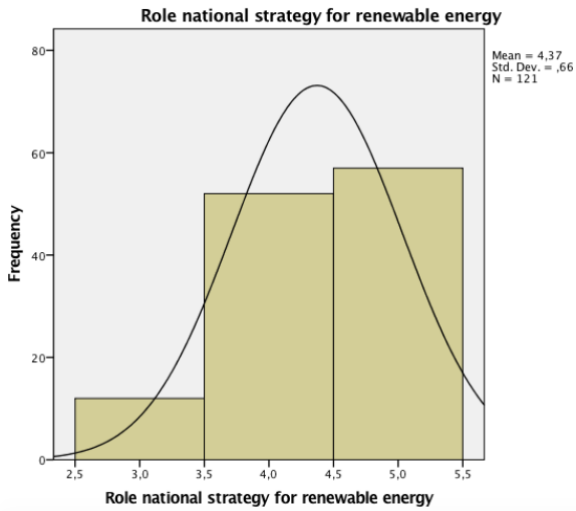
Table 24. Chi-square tests on question 5 in relation to Group Low and Group High.

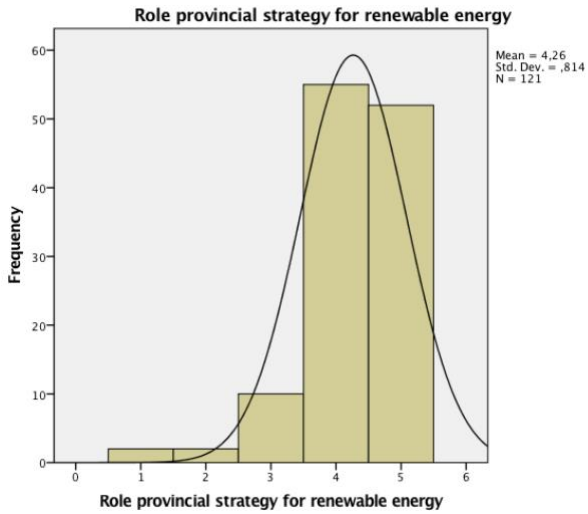
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.268	1	.605		
Continuity Correction	.003	1	.954		
Likelihood Ratio	.297	1	.586		
Fisher's Exact Test				1.000	.513
Linear-by-linear association	.265	1	.607		
N of Valid Cases	96				

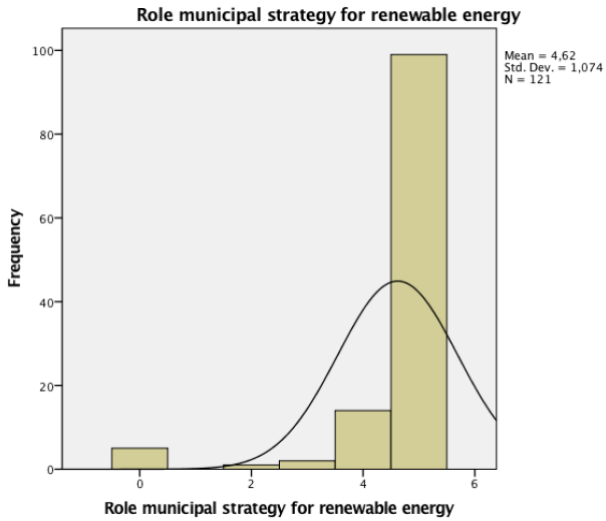
V.IV Output question 6 and question 10

Distribution of answers to question 6 and question 10 by all participants.

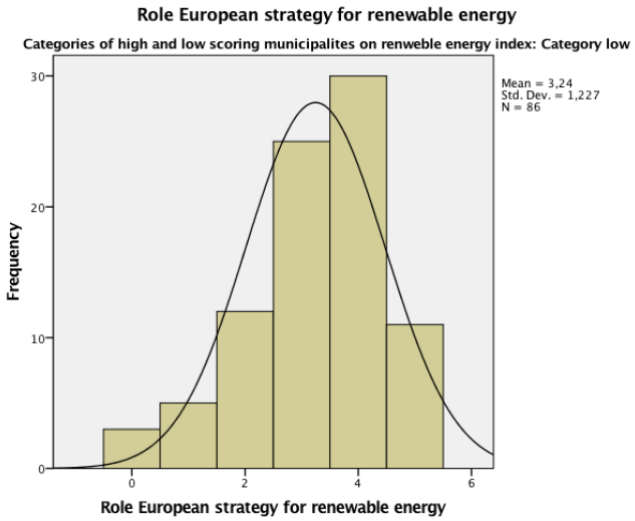


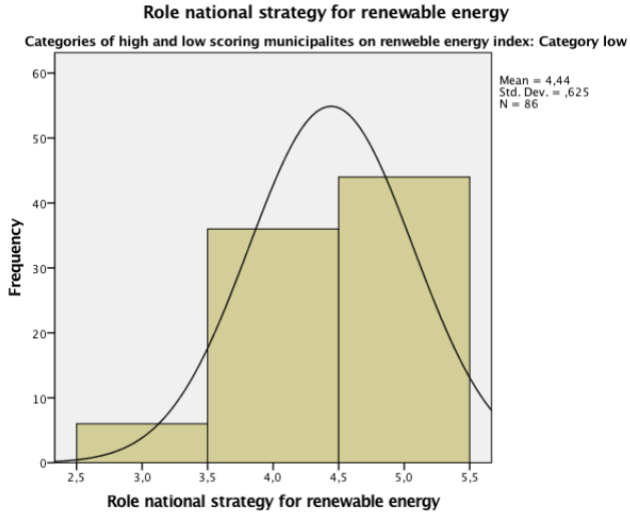


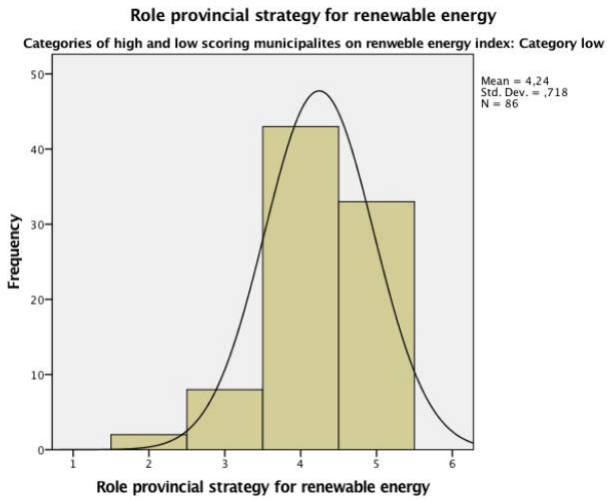


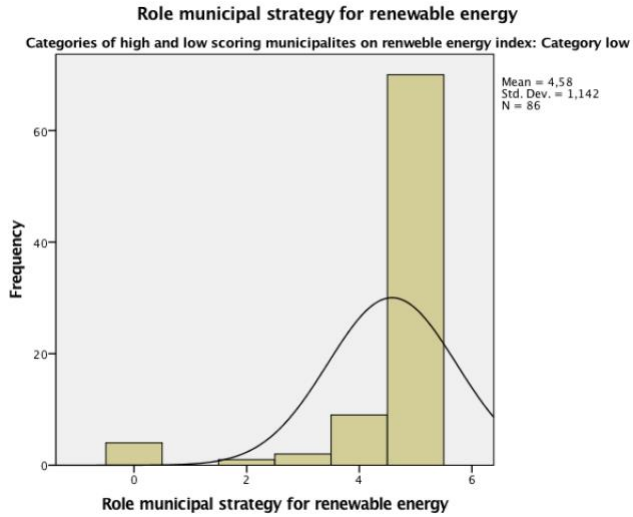


Distribution of answers to question 6 and question 10 by Group Low

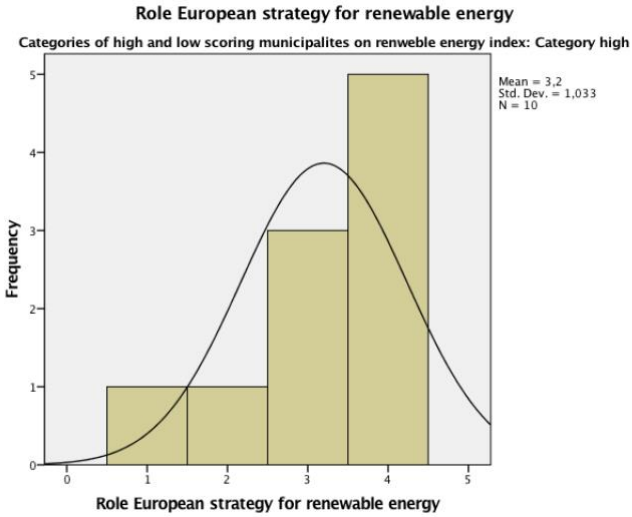


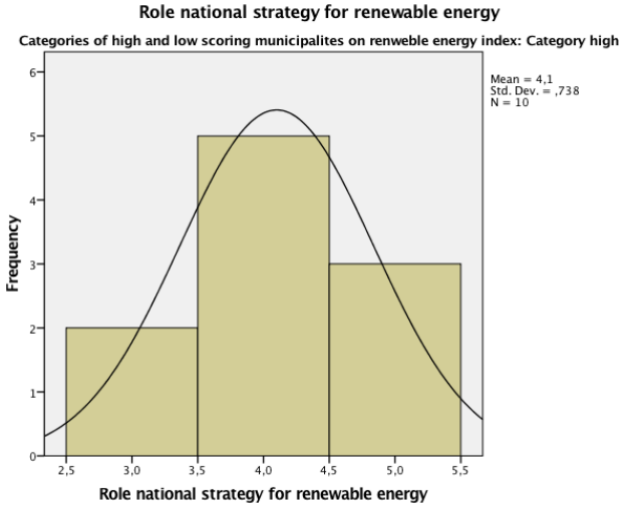


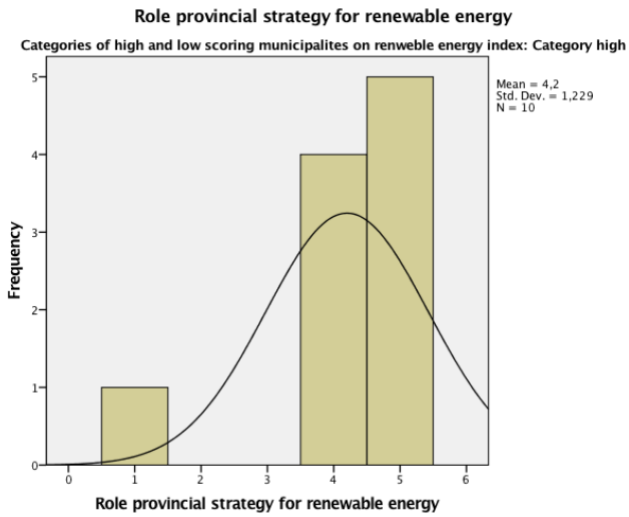


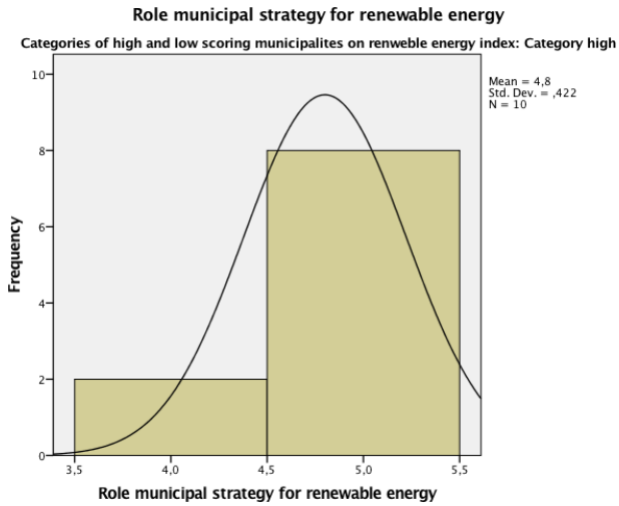


Distribution of answers to question 6 and question 10 by Group High



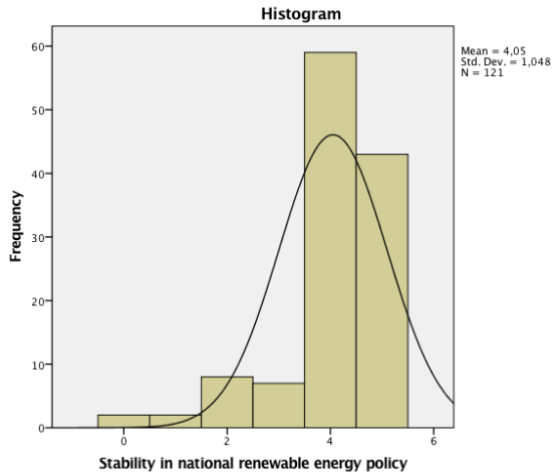




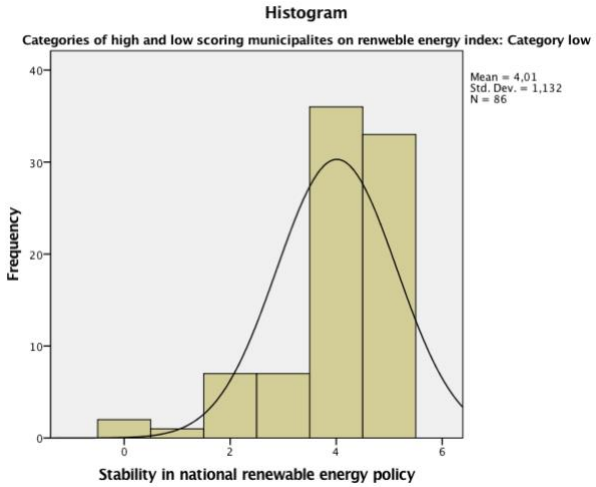


V.V Output question 7.1 and question 11.1

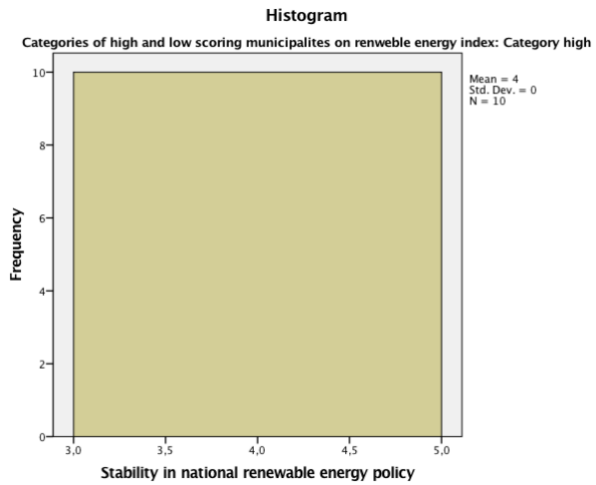
Distribution of answers to question 7.1 and question 11.1 by all participants



Distribution of answers to question 7.1 and question 11.1 by Group Low

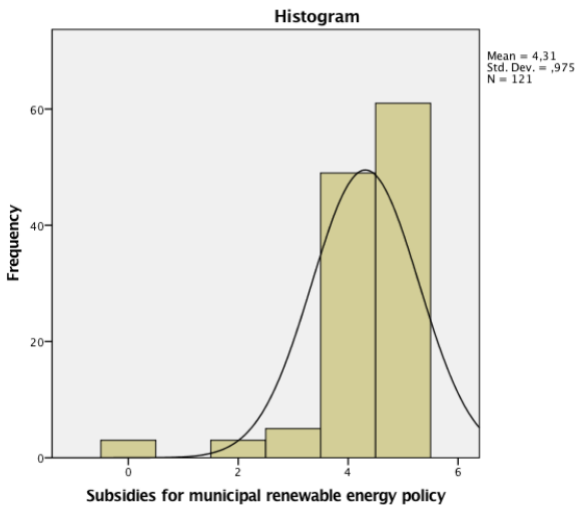


Distribution of answers to question 7.1 and question 11.1 by Group High

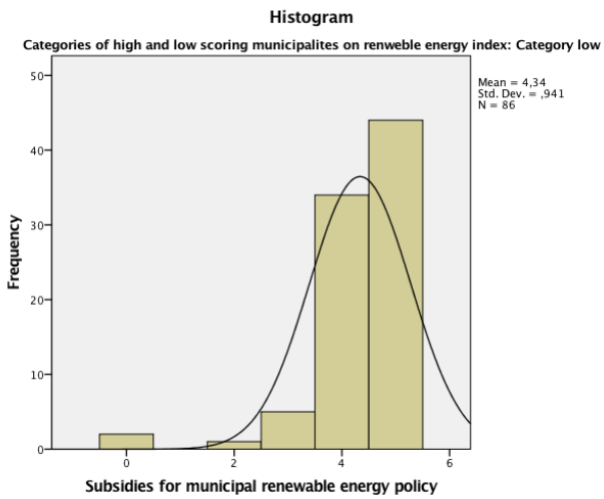


V.VI Output question 7.2 and question 11.2

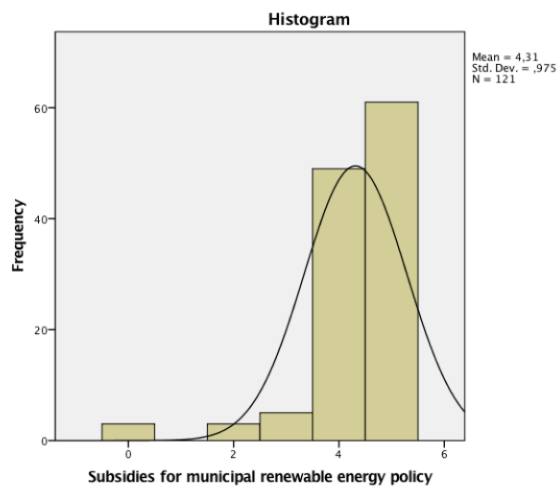
Distribution of answers to question 7.2 and question 11.2 by all participants



Distribution of answers to question 7.2 and question 11.2 by Group Low

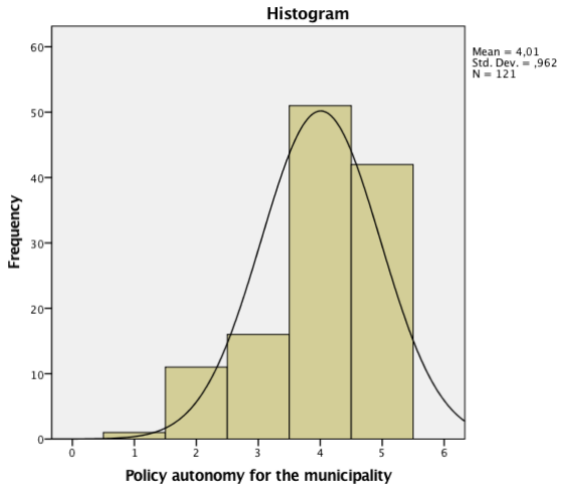


Distribution of answers to question 7.2 and question 11.2 by Group High

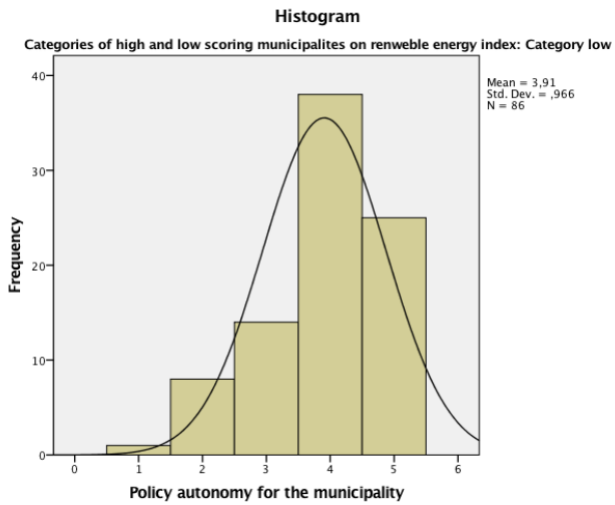


V.VII Output question 7.3 and question 11.3

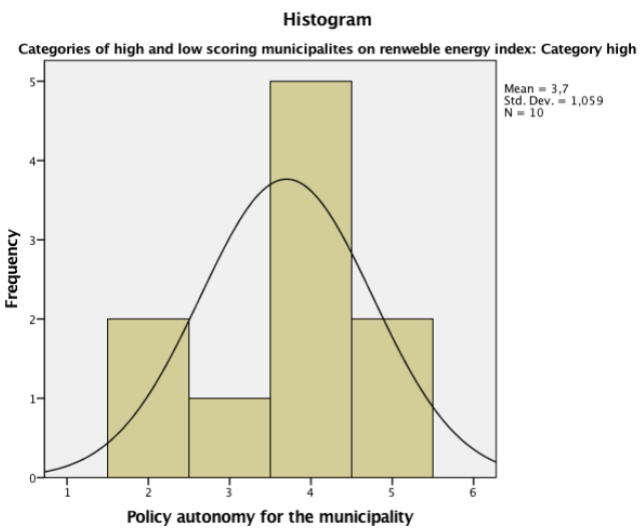
Distribution of answers to question 7.3 and question 11.3 by all participants



Distribution of answers to question 7.3 and question 11.3 by Group Low

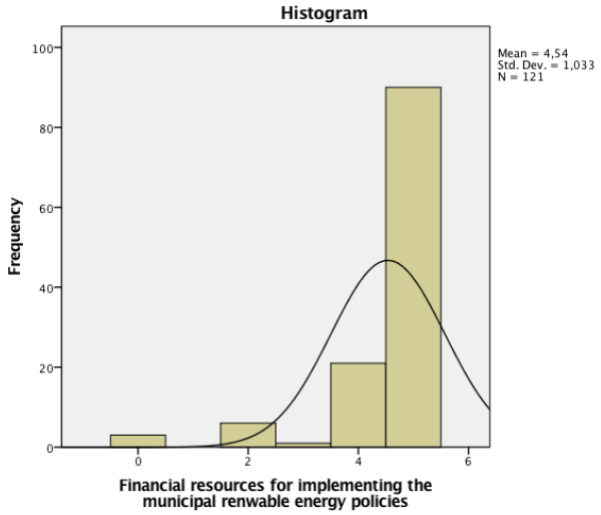


Distribution of answers to question 7.3 and question 11.3 by Group High

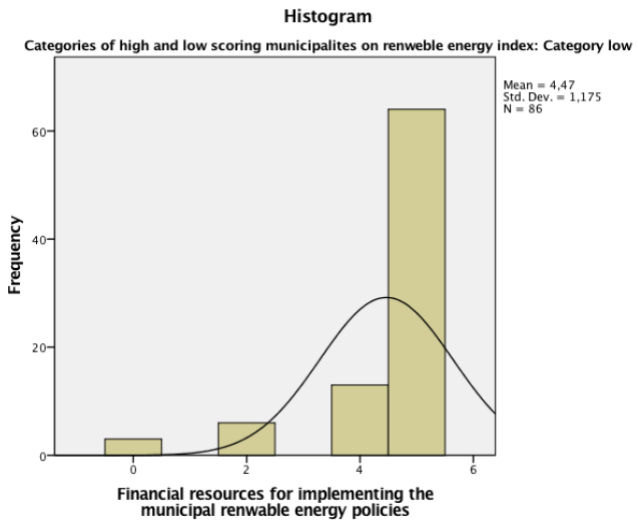


V.VIII Output question 7.4 and question 11.4

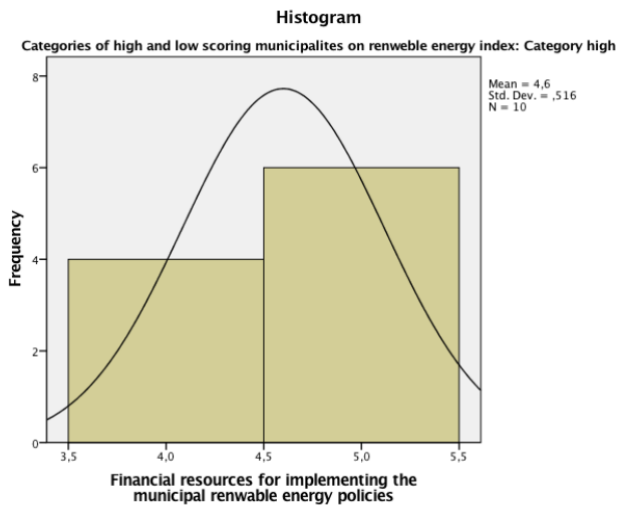
Distribution of answers to question 7.4 and question 11.4 by all participants



Distribution of answers to question 7.4 and question 11.4 by Group Low

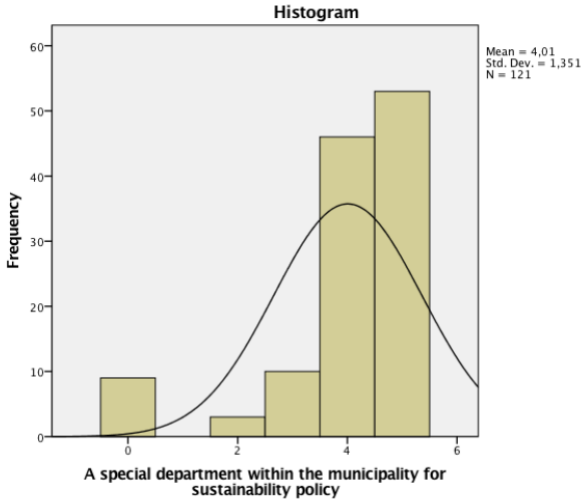


Distribution of answers to question 7.4 and question 11.4 by Group High

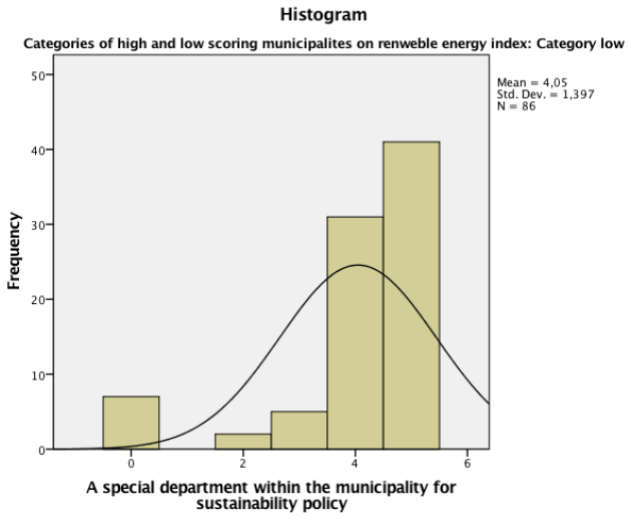


V.IX Output question 7.5 and 11.5

Distribution of answers to question 7.5 and question 11.5 by all participants



Distribution of answers to question 7.5 and question 11.5 by Group Low



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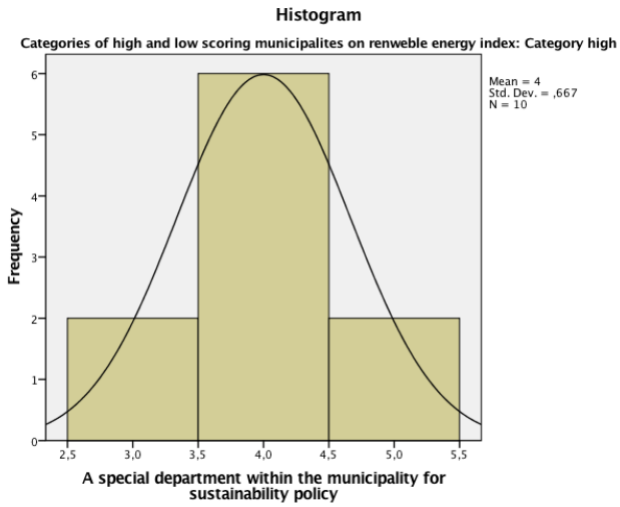
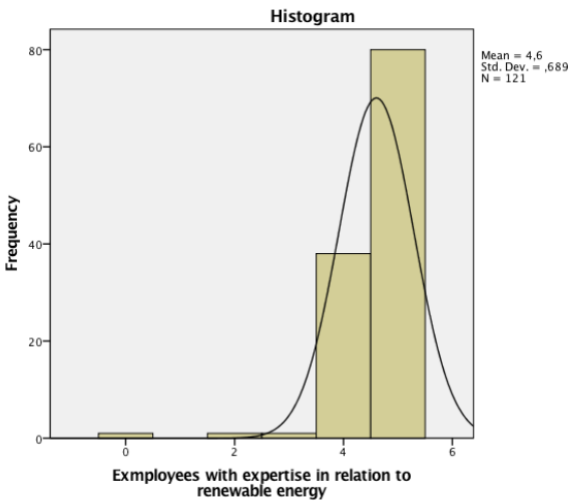
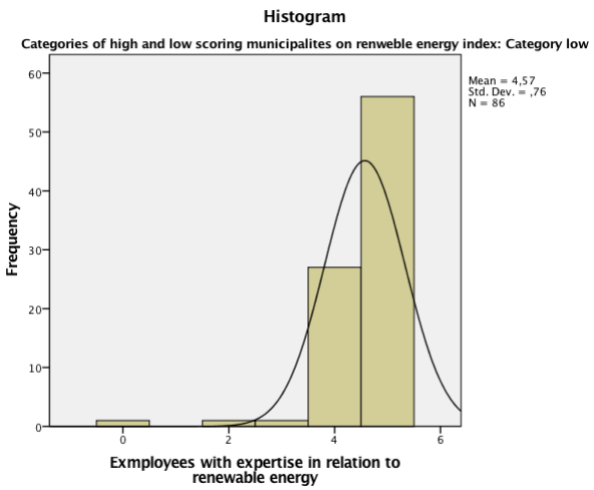


V.X Output question 7.6 and 11.6

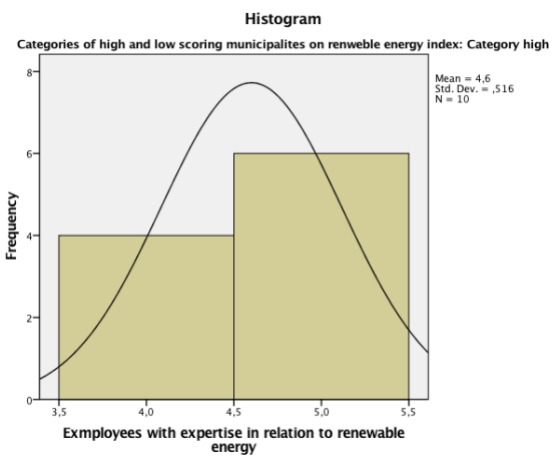
Distribution of answers to question 7.6 and question 11.6 by all participants



Distribution of answers to question 7.6 and question 11.6 by Group Low

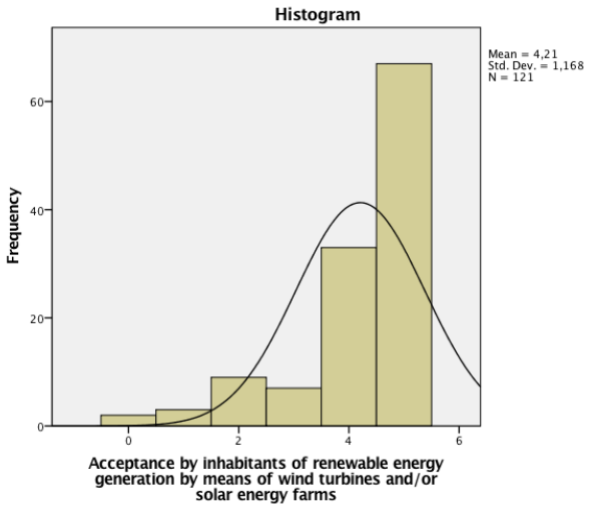


Distribution of answers to question 7.6 and question 11.6 by Group High

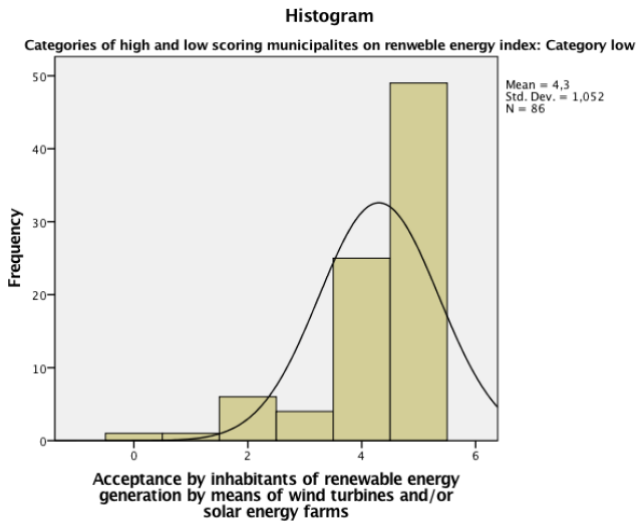


V.XI Output question 7.7 and 11.7

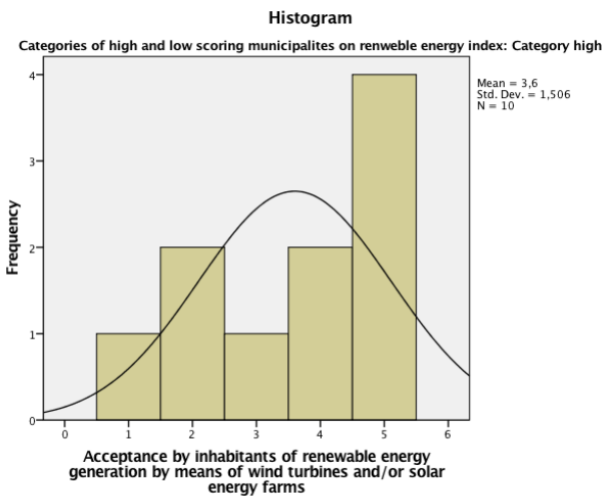
Distribution of answers to question 7.7 and question 11.7 by all participants



Distribution of answers to question 7.7 and question 11.7 by Group Low

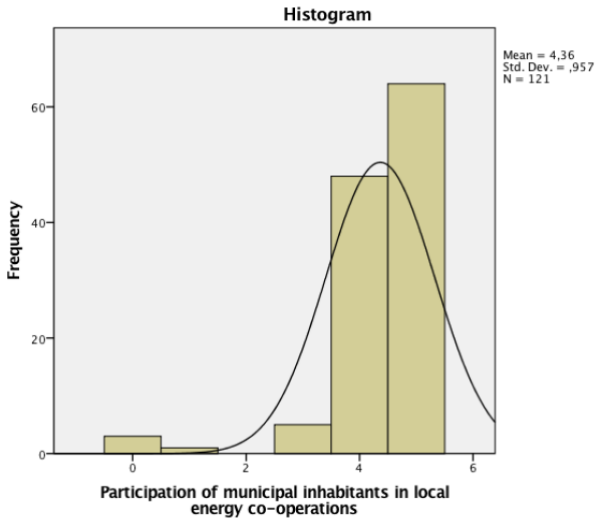


Distribution of answers to question 7.7 and question 11.7 by Group High

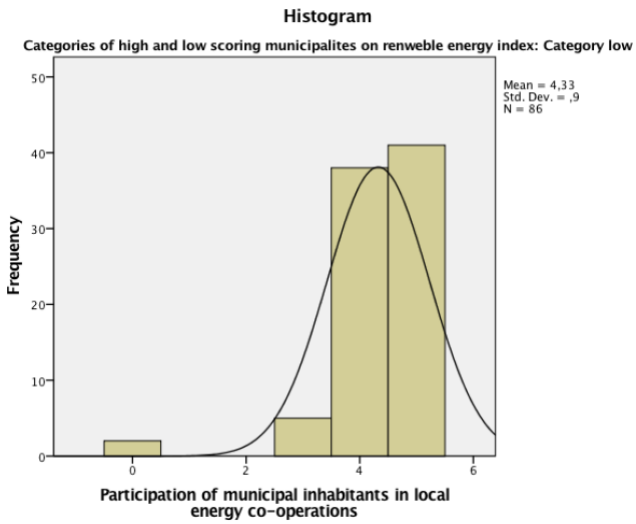


V.XII Output question 7.8 and 11.8

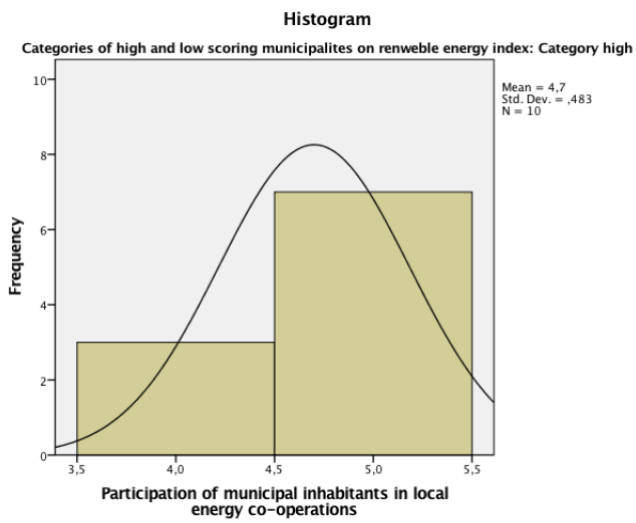
Distribution of answers to question 7.8 and question 11.8 by all participants



Distribution of answers to question 7.8 and question 11. by Group Low

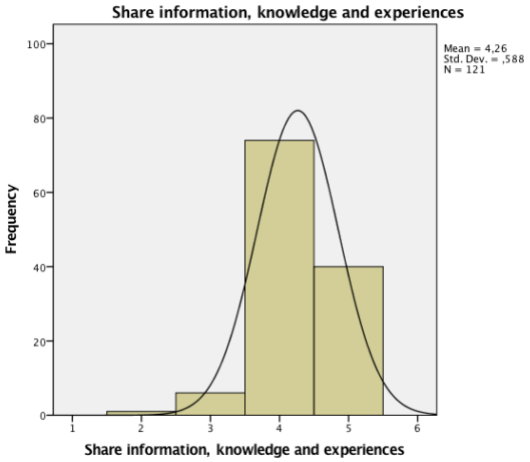


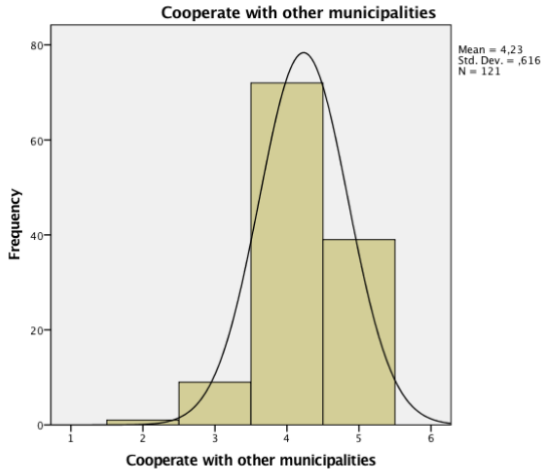
V.XII.III Distribution of answers to question 7.8 and question 11.8 by Group High

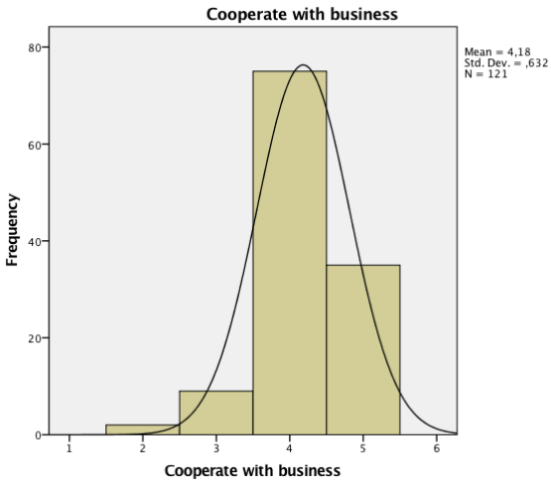


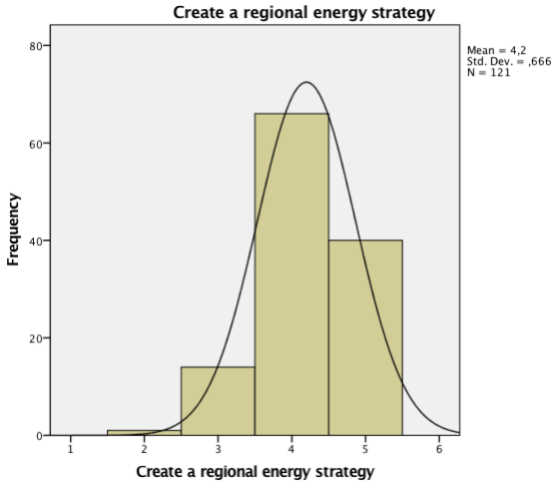
V.XIII Output question 8 and question 12

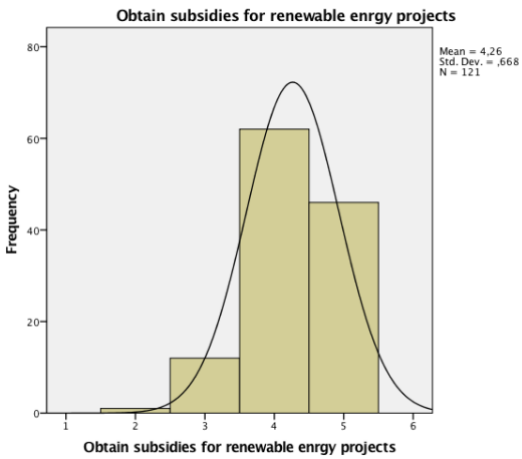
Distribution of answers to question 8.1-.4 and question 12.1-.4 by all participants

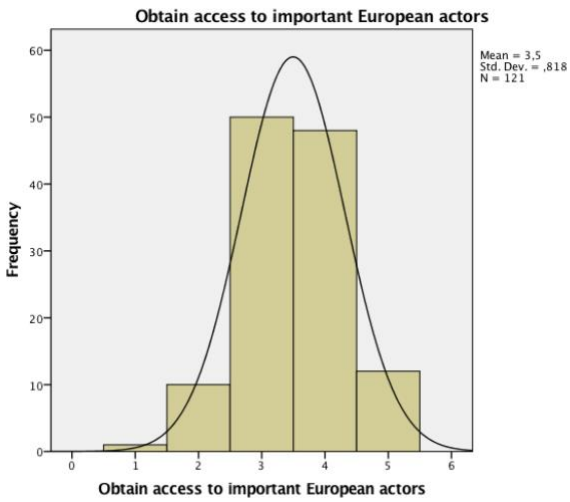




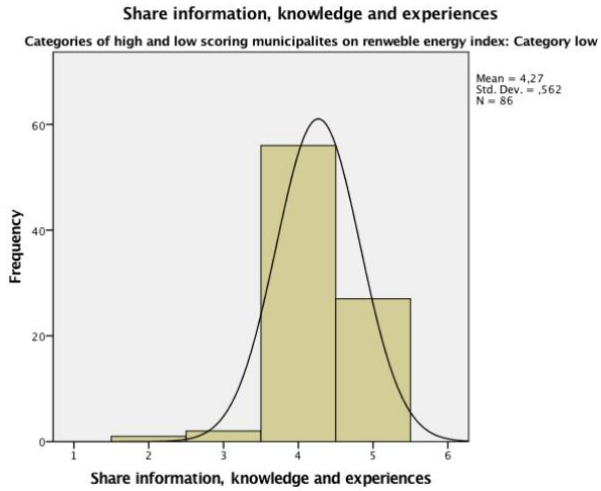


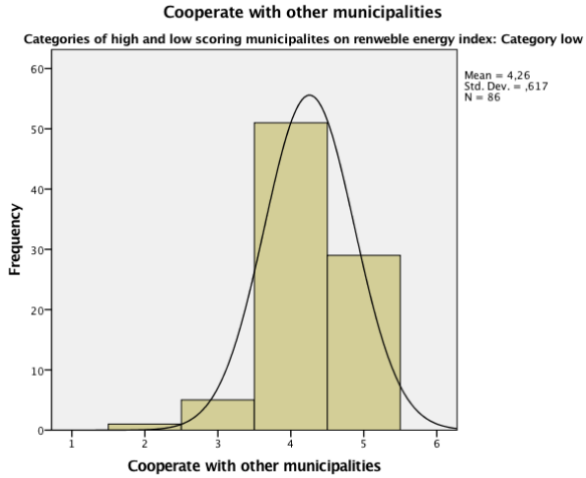


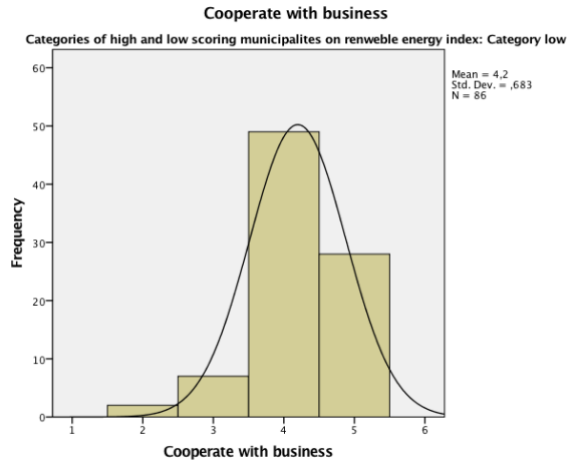


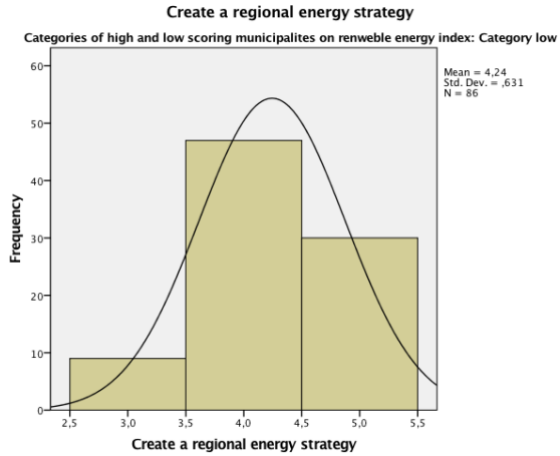


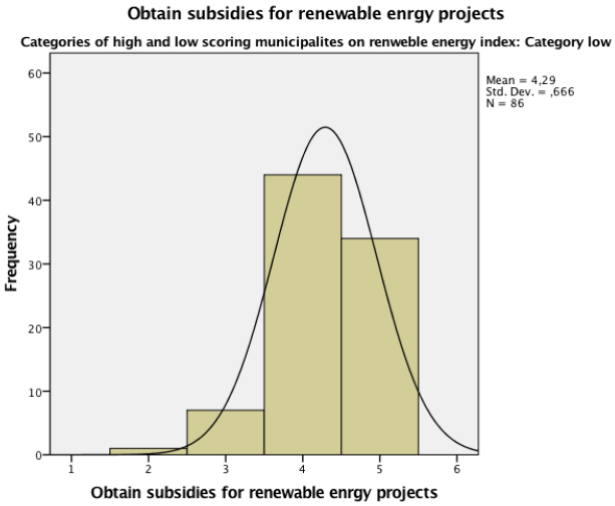
Distribution of answers to question 8.1-.4 and question 12.1-.4 by Group Low

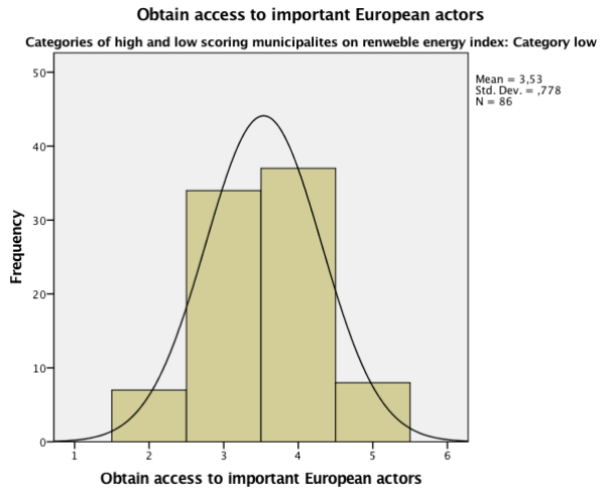




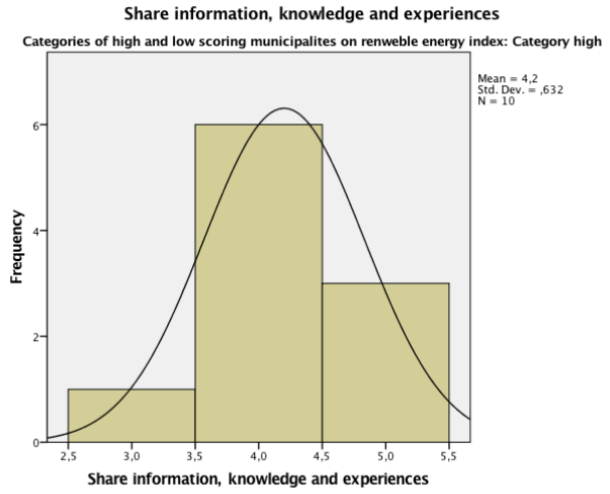


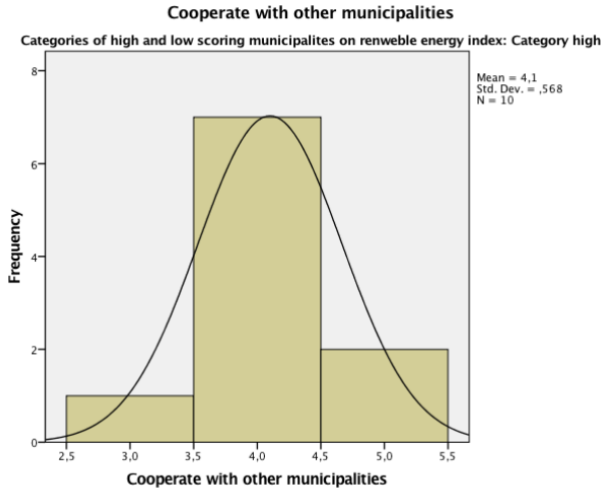


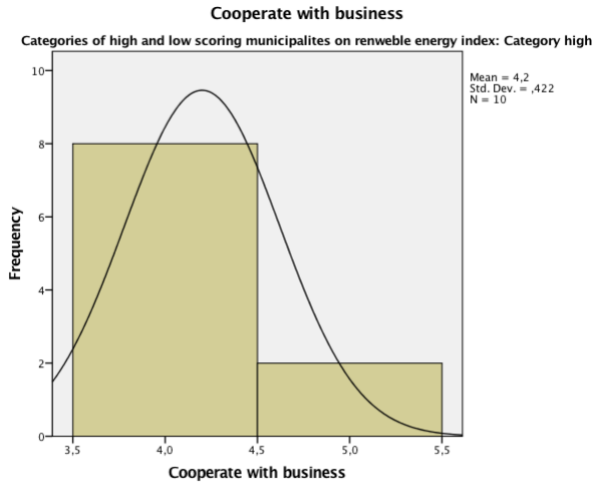


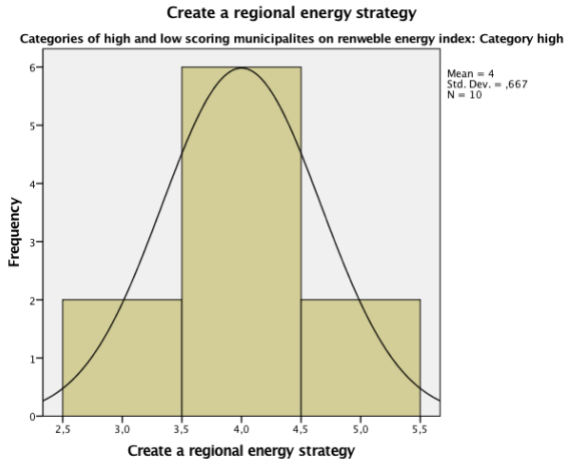


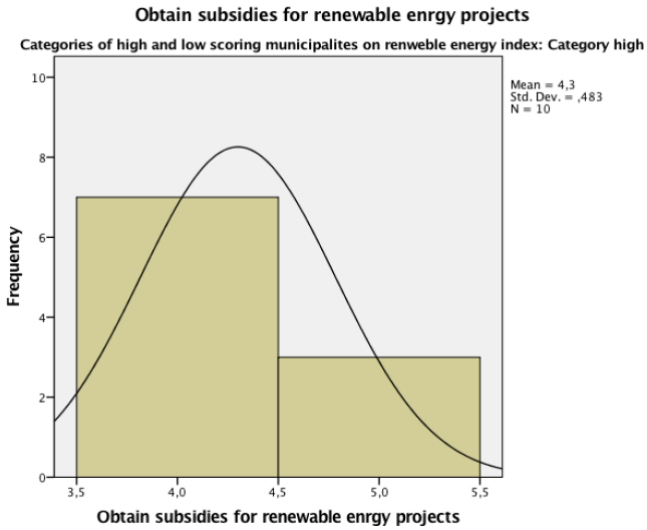
Distribution of answers to question 8.1-.4 and question 12.1-.4 by Group High

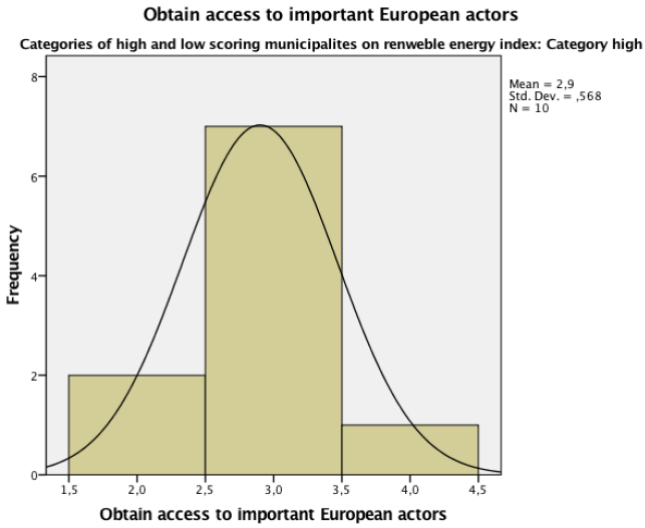






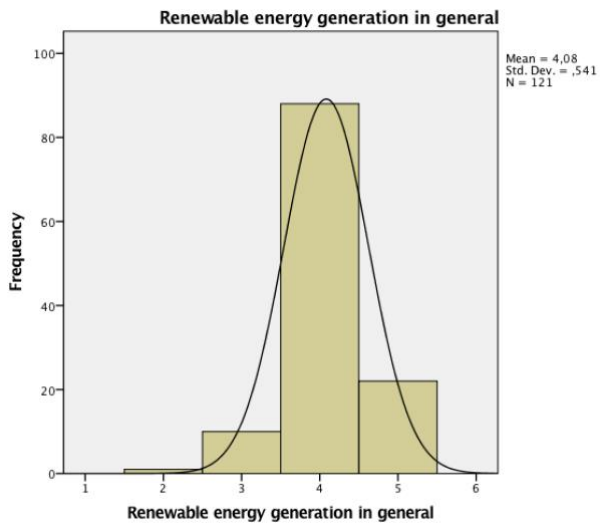


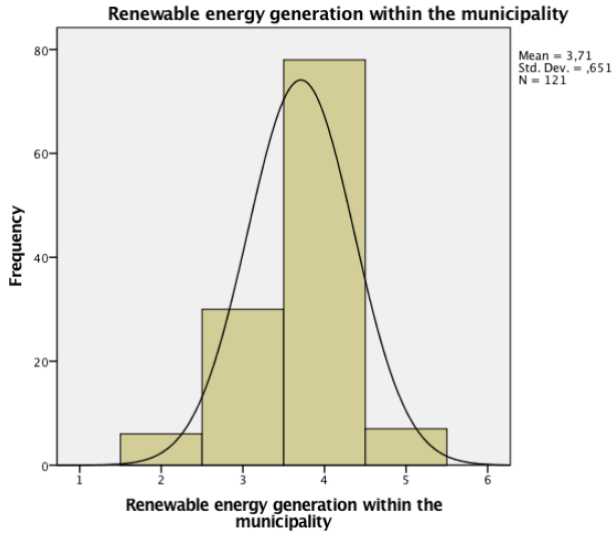


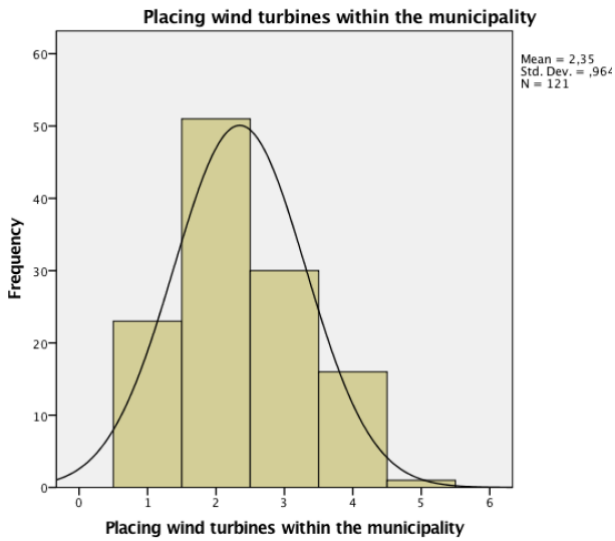


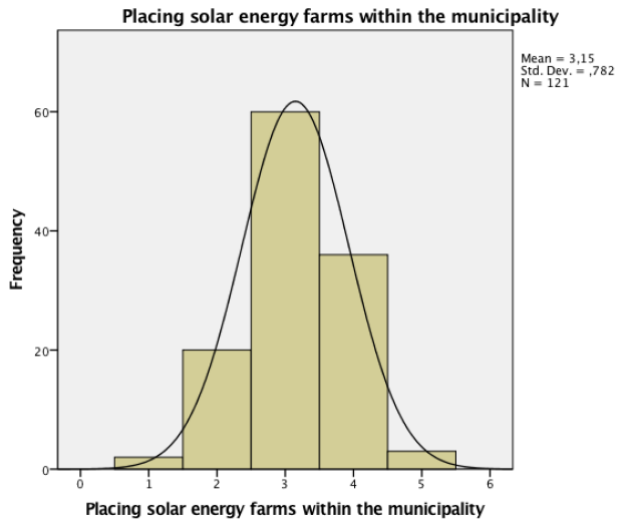
V.XIV Output question 9 and question 13

Distribution of answers to question 9.1-.4 and question 13.1-.4 by all participants

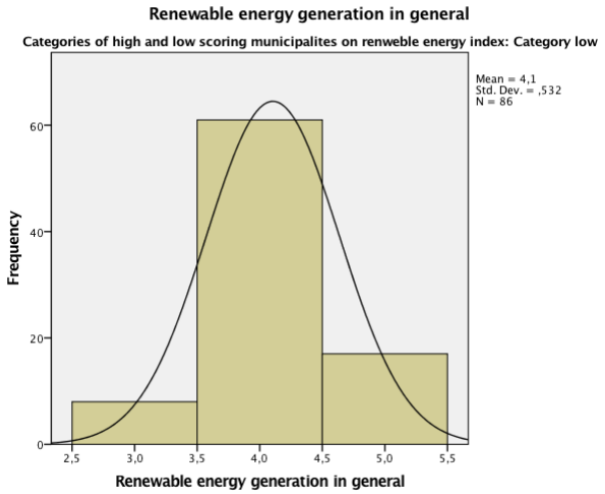


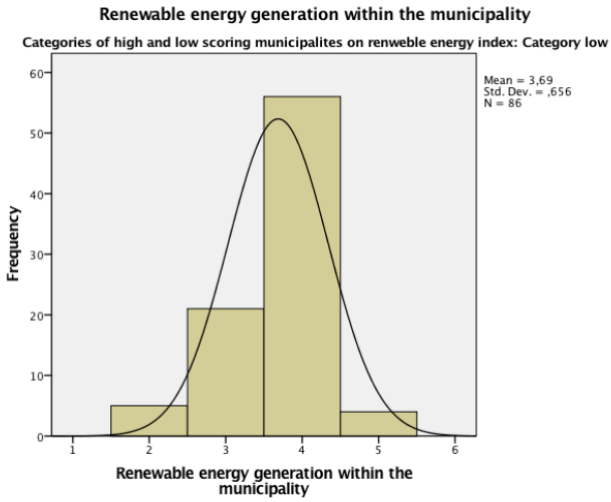


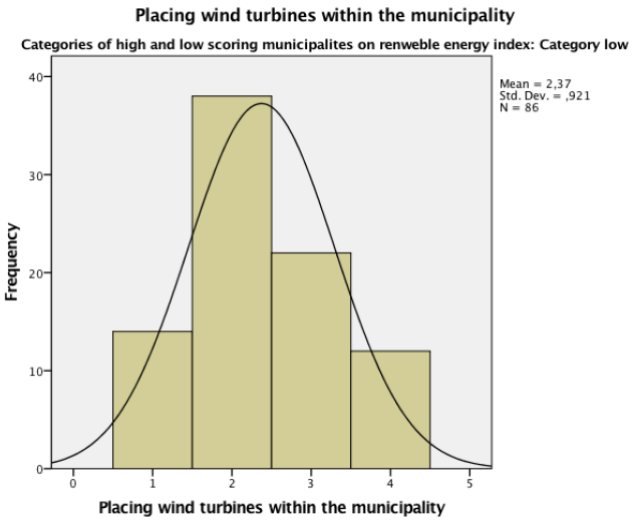


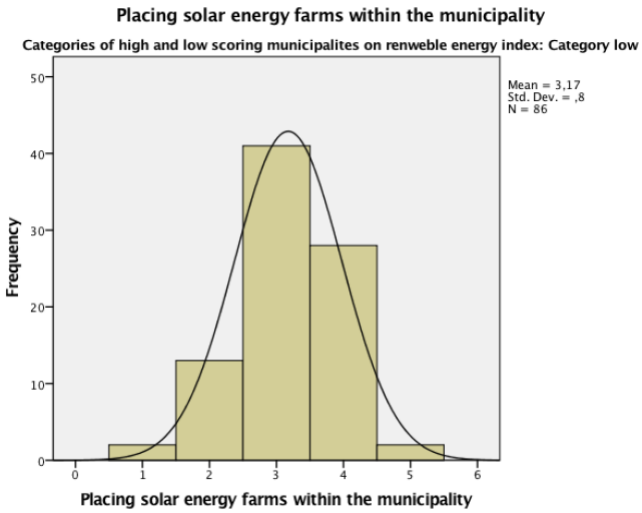


Distribution of answers to question 9.1-.4 and question 13.1-.4 by Group Low









Distribution of answers to question 9.1-.4 and question 13.1-.4 by Group Low