MASTER THESIS

ENERGY TRANSITION IN OWNER-OCCUPIED HOUSING:

GOVERNANCE CAPACITY IN TEXEL AND AMERSFOORT

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Words cannot express my gratitude towards my family and friends who supported me with their love, joy and devotion.

Abstract

This thesis focusses on local energy transition, for which the governance capacity to realize energy-efficient retrofits in owner-occupied housing is studied. To realize retrofits and make use of the existing energy saving, potential barriers must be overcome. Retrofits also benefit owner-occupiers. (Local) governments have designed policies to bring together the interests of owner-occupiers and the goal of reducing $C0_2$ emissions. In the research conducted for this thesis, an assessment of the local government capacity was carried out. This was done by means of a cross-regional comparative case study between Texel and Amersfoort. Results show the importance of the owner-occupier's resource capacity, of the abilities of building companies and of the reliance of local governments on the policies of higher levels. The owner-occupier is the most important actor in creating circumstances that lead to a window of opportunity for the energy transition in owner-occupied housing.

Keywords: local government, energy, retrofit, owner-occupied, housing

Summary

Although a significant part of the global $C0_2$ emission is the product of buildings, there is a large energy saving potential in owner-occupied housing with the use of energy-efficient retrofits. Nevertheless, there are certain barriers that limit the potential of such energy saving. This has led governments to make efforts to unite the interests of owner-occupiers with the political goal of reducing $C0_2$. In the Netherlands a local approach was chosen, resulting in new tasks for local governments, so this thesis studies the local policy that addresses the implementation of energy-efficient retrofits in owner-occupied housing.

This thesis conceptualizes energy-efficiency in housing in two ways. The first concept is energy transition, which refers to the social and technical changes that are needed in the shift from a fossil- to a renewable-energy-based society. In this thesis the focus lies on the policy components of the transition. To give an assessment on the abilities to realize energy efficient retrofits governance capacity is used. It assesses policies based on juridical, economic and political capacities. Geographical and resource capacity are added to the theory for a physical component and the ability to study owner-occupiers and building companies.

The results on governance capacity are based on data gathered by means of semi-structured interviews with experts in two frontrunner municipalities; Texel and Amersfoort. This is complemented with data from interviews with owner-occupiers in Texel, unstructured interviews and a questionnaire. Triangulation was used to validate the results on governance capacity.

The results show the importance of owner-occupier's resource capacity, the abilities of building companies and the efforts that local governments carry out to realize energy-efficient retrofits. It is the most important actor that can generate change, leading to a window of opportunity, in the energy transitions of owner-occupied housing.

Table of Contents

List of Figures

1 Introduction

80% of the global CO_2 emissions are produced in cities. Buildings account for one-third of the total global CO_2 emissions (UNEP, 2009). This means cities are the single largest contributor to climate change. Climate change can be considered a complicated collective action problem. Therefore, it is of societal relevance that local governments formulate policies to mitigate climate change (Lee and Painter, 2015). Considering the long lifespan of buildings, there is a risk for lock-in situations (Lucon et al., 2014). Situations in which the options for change have reduced drastically (Driscoll, 2014). This creates an urgent need for policy. Effective policy consists of regulatory, financial and communication measures (de Bruin et al., 2009; Williams, 2013).

Several cost-effective ways exist to reduce $C0_2$ emissions by means of *energy-efficient retrofits* (EERs) of existing housing (Verbeeck and Hens, 2005). A retrofit is the addition of a new component to a house. Energy efficient is a criterion of reduced energy use and increased renewable energy generation. If all cost-effective EERs are realized, total global energy consumption can stay constant or decline by 2050 (Nauclér and Enkvist, 2009). Therefore, making existing buildings more energy efficient is important to reduce greenhouse gas emissions (Baek and Park, 2012). Next to cost saving and environmental benefits, EERs provide co-benefits such as energy security, lower need for energy subsidies, healthier indoor climate, employment gains, increased value for buildings and improved comfort (Lucon et al., 2014). However, barriers hinder the cost-effective retrofits of being realized. These barriers are lack of information, awareness, and access to capital, regulatory systems, transactions costs and industry fragmentation (Baek and Park, 2012; Friege and Chappin, 2014; Lucon et al., 2014).

In the Netherlands, 21% of the CO_2 emissions are produced in the built environment. The housing sector accounts for 14% and the service sector for 7% (Schoots et al., 2017). The built environment can be divided into five segments: new built housing, social housing, private rental housing, utility buildings (service sector) and owner-occupied housing. Each segment has its own dynamic and faces different policy challenges regarding energy efficiency (Vringer et al., 2014).

Owner-occupiers are more committed to invest in the quality of their houses (Hoppe and Lulofs, 2008). However, owner-occupiers neglect energy efficiency in favor of features such as location, the presence of a garden and size when buying a house. In addition, owner-occupiers are barely organized through intermediate organizations. This makes them a difficult target group for policies. Furthermore, owner-occupied housing is

diversified and fragmented. This creates problems of economies-of-scale (Hoppe and Lulofs, 2008).

There are 4,3 million owner-occupied houses in the Netherlands (CBS, 2017a). Energy labels specify energy efficiency ranging from A (most efficient) to G (least efficient). 75% of the labelled houses have been labeled C or worse (CBS, 2016). This adds up to roughly 3,2 million owner-occupied houses that can be retrofitted to be energy efficient. Around one in four owner-occupiers are interested in EERs (Uyterlinde, 2015).

The local government is the contact point for citizens, which makes the local level the most appropriate for policy. However, local governments lack financial means to realize EERs. Therefore, partnerships and agreements with other public and private parties are needed (Hoppe and Lulofs, 2008). A brief outline of policy agreements is described in the next section.

1.1 Policy Agreements

In 2015, 195 countries, including the Netherlands, signed the Paris Climate Agreement. They agreed that the global temperature rise may not exceed 2ºC. The follow-up summit of Bonn in 2017 called on all governments to create concrete action plans (UN, 2017).

In 2010, leaders of the European Union's (EU) member states set the EU 2020-strategy. This involves a reduction of 20% in CO_2 emissions, 20% increased energy efficiency compared to 1990 and 20% renewable energy share by 2020 (EC, 2010). The strategy resulted in two EU directives on energy efficiency in buildings. Under the Energy performance of Buildings Directive, energy performance labels are required when selling or renting a building. Furthermore, EU member states have to report on financial policies measures that improve energy efficiency of buildings (EU, 2010). Under the Energy Efficiency Directive, EU member states have to create long term national building retrofit strategies (EU, 2012). These directives were amended in May 2018 (EU, 2018). Beunen et al. (2009) found that local implementation of EU Directives depends on local circumstances and the interpretation and negotiation processes by local parties.

The EU directives on buildings were implemented in the national Action Plan Energy Saving in the Built Environment (BZK, 2011). This action plan includes three parts: 1) financial tools like subsidies, loans and tax benefits, 2) regulatory tools like mandatory energy labels and energy requirements on new housing laid down in development regulations (Bouwbesluit) and 3) communication tools to improve collaboration in the private sector and awareness among the public.

The approach was based on public-private partnership (BZK, 2011). The public-private partnerships were set out in the covenants. In the Umbrella Covenant

(Koepelconvenant), both private and public parties agreed on a maximum of 507 PJ consumption in the built environment by 2020 (Koepelconvenant, 2012). The More with Less Covenant (Meer met Minder convenant) is aimed at energy label upgrades of two steps (from A to G): 300.0000 houses per year until 2020 (Convenant MmM, 2012).

In the program block by block (blok voor blok), thirteen local pilot projects were carried out from 2012 to 2014. They consisted of consortia of building companies that developed and marketed retrofit products. The pilot projects were funded by the national government and completed in 2014 (RVO, 2014). In September 2013, the Energy Agreement (Energieakkoord) was signed between forty parties, requiring a reduction of 100 PJ. For the owner-occupied housing, this can be achieved by increasing awareness, convenience and financial feasibility of EERs (SER, 2013).

The national coalition agreement from the government forms the basis for the next term (VVD et al., 2017). The emission reduction goals is set at 49% relative to 1990 by 2030. This implies additional reduction of 56 Mtons (megatons) of CO_2. Insulation of houses, heat networks and heat pumps account for 2 Mtons of CO_2. The government chose a local approach in which it partners with local governments, provinces, housing corporations, water boards and electricity network operators to draft region-specific CO_2 reduction plans. The national government made funds available for insulation and renewable energy-based heating. Innovation programs, such as the Priority Sector Energy and the Building Program (Topsector Energie en de Bouwagenda), are focused on creating new retrofit products. A plan for building-based financing is now being developed, including long-term loans with a lower risk for owner-occupiers and financiers. Eventually, 200.000 houses per year have to be retrofitted to achieve 6 million energy efficient houses in 2050 (VVD et al., 2017).

1.2 Policy Efforts

Since the Brundtland report in 1987 and intensifying after Kyoto in 1997, the national government has facilitated local governments in CO_2 emissions reduction policies. The Netherlands was considered frontrunner in energy policies (Hoppe et al., 2016b). The Netherland is no longer a frontrunner, in 2015 the government was ordered in a court ruling to put more effort in CO_2 emissions reduction (Rechtbank Den Haag, 2015). Policies on energy efficiency focuses on stimulating investment in EERs to unite the owner-occupier's interests of reduced costs and co-benefits with the public interest of CO_2 reduction and decreased energy dependency (Vringer et al., 2014).

A study on the Action Plan Energy Saving in the Built Environment found that although progress on energy efficiency goals is being made, the goals for 2020 are hard to

achieve. It is expected that between 2008 and 2020, the total energy consumption in the built environment will decrease by 82 PJ (petajoule), to 521 PJ. This is not enough to achieve the goal of a maximum of 507 PJ in 2020 (Hekkenberg and Verdonk, 2014). Moreover, the goal of the energy agreement is an energy neutral built environment by 2050 (SER, 2013). Meanwhile, all the low hanging fruit measures have been achieved. In the built environment, most energy is used (40%) in owner-occupied housing. So far, the policies were unable to make a significant impact (Vringer et al., 2014).

Parallel to national policies, local efforts were undertaken to stimulate owner-occupiers to realize EERs. Participating owner-occupiers take mostly simple and low-cost measures, such as wall and floor insulation. Large energy label upgrades and energy neutral retrofits are rarely realized (Uyterlinde, 2015).

The Block for Block program involved local initiatives. Its results show that owner-occupiers were not much interested in collective retrofit projects on a street level. The program found that owner-occupiers are diverse and individualistic. It also found that marketing EERs was cost-inefficient. Most building companies prefer to wait for orders instead of putting effort in marketing (RVO, 2016). These practical challenges and policy efforts inform the problem of this research.

1.3 Problem Statement

Driven by the need to mitigate climate change, governments have made several agreements to realize EERs in owner-occupied housing. Over the years, the energy reduction ambitions of these agreements have increased. Although owner-occupier's energy use is declining, the agreed-upon goals are difficult to realize. What appears to be a win-win-win situation for local governments, companies and owner-occupiers is in fact a situation full of barriers. These barriers make owner-occupiers hesitant or indifferent regarding EERs.

Local governments have facilitated and initiated energy efficiency projects in existing housing. Local governments are supposed to perform a key task in drafting regional CO_2 reduction plans. Therefore, it is of societal relevance to research local policies on the realization of EERs in owner-occupied housing.

1.4 Scientific Objective

The scientific objective of this research is to apply the concept of governance capacity in local policy on energy efficient retrofit realization in owner-occupied housing (Nelissen, 2002). Further clarification and the scientific relevance of this research are explained in the theory chapter.

1.5 Reading Guide

The thesis contains of the following chapters. Chapter 2 describes the theories that were used to inform the research questions. Chapter 3 presents the research questions that guided this research. Chapter 4 explains the methods that were used to collect, analyze and validate data. In chapter 5 the results are presented. In chapter 6 the results are discussed. Chapter 7 concludes this thesis.

2 Theory

Now that the context and the problem of policies on *energy-efficient retrofits* (EERs) in owner-occupied housing have been outlined, this chapter presents the societal and scientific relevance of this research. This chapter provides a theoretical understanding of policies to realize EERs in owner-occupied housing. This results in theoretical concepts that can inform the research questions.

2.1 Multilevel Perspective

This research is about the shift from a fossil to a renewable energy based society: *the energy transition*. The theories about energy transition contain various perspectives (Næss and Vogel, 2012). The sociotechnical innovation perspective uses historical examples to conceptualize the replacement of one technology by another (Geels and Schot, 2007). The transition management view describes how governments can intentionally steer a transition (Rotmans et al., 2001). The complex system view looks at the interaction and relations of components in a system (Næss and Vogel, 2012).

The *Multilevel perspective* (MLP) uses a sociotechnical view to conceptualize historical transitions in society. The energy transition is a transition that is currently occurring (Geels and Schot, 2007). Transition is defined as broad change over time in the way a sector in society functions. A transition takes technological and social changes (Geels, 2010). The MLP describes the interaction between these two changes (Geels, 2011). Transitions are performed by actors, which refers to individuals and collectives that purposively try to generate or prevent change (Bos et al., 2013).

In the MLP, a transition occurs at the level of *sociotechnical regimes*. These are descriptions of societal sectors in which technology is socially embedded; for example, the energy, transportation or communication sector (Geels and Schot, 2007). A sociotechnical regime involves *"technology, culture, science, policy and markets or user preference"* (Geels and Schot, 2007, p. 401). Sociotechnical regimes are *dynamically stable*; they are constantly subject to incremental change. This entails technological change as well as changes in user practices, regulations, business networks and symbolic meaning (Geels, 2002).

Incremental change can be understood by combining two views: from evolutionary-economics and from social institutional theory (Geels and Schot, 2007). Evolutionary economic processes are driven by *variation*, *selection* and *imitation*. Variation as actors make different choices and local circumstances lead to different products. Products

compete in a selection environment of users, special interest groups and policy agencies. Successful products give firms the potential to grow. Imitation reinforces this process as successful products are imitated by other firms. As long as the selection environment is stable, change remains incremental (Geels and Schot, 2007). Social-institutional dynamics of technological changes are processes of sense making. When a new technology arrives, social groups differ in the way they interpreted the new technology. Eventually a process of *closure* takes place and a dominant interpretation of the new technology is negotiated. This dynamic is associated with power struggles and can take place at conferences, journals and in the competition for research grants (Geels and Schot, 2007).

This describes a sociotechnical regime during normal times. In evolutionary economic terms, the selection environment is stable. In contrast to incremental change, in a transition, a sociotechnical regime is changed into another (Geels and Schot, 2007). A transition is driven by radical innovations from technical *niches* and external pressure from the so-called *socio-technical landscape*. Technical niches are environments in which actors develop innovative technologies that can potentially replace existing ones.

Niches are protected from pressure from the sociotechnical regime and are distinguished by a high amount of instability and uncertainty. Radical niche innovations can succeed in replacing technologies from the regime if a *window of opportunity* is created by means of pressure from the socio-technical landscape. This window of opportunity is a period in which the conditions help the niche innovation. It is a broader conception of window of opportunity than the policy concept that describes the period of time in which public problem recognition, policy formation and the right political climate intersect (Kingdon, 1984).

The sociotechnical landscape consists of external factors as economic growth, environmental problems or dominant ideologies. In the context of this research, climate change would be an external factor in the socio-technical landscape. The landscape is only indirectly influenced by actors from the regime or niches (Geels and Schot, 2007).

This research concerns local policies in energy efficient urban development. This is somewhat problematic within the framework of MLP. MLP mainly focuses on technological replacement; urban development is characterized by an incremental process of change, caused by strong path-dependencies and lock-in situations connected to the lifetime of buildings (Næss and Vogel, 2012). MLP focuses on broad, long term societal changes, thus giving theoretical insights in the energy transition. However, it lacks a policy perspective on transitions. Concepts from policy sciences can contribute to energy research (Hoppe et al., 2016a). Therefore, the theory of multilevel governance is described in the next section.

The link between MLP and multilevel governance is the relation between the structural influences (landscape/regime) and the influence of strategic action from actors (regime/niches) that they both consider. Strategic action is bounded by the structure in which it takes place and simultaneously time changing this structure (Buizer, 2008). Similarly, this *duality* is considered in the following theories described.

2.2 Multilevel Governance

The energy transition is both a normative goal and a collective good (Geels, 2010). It is a normative goal because it involves a debate about values and beliefs and a collective good since private actors lack enough incentives to address sustainability problems (Geels, 2010). Therefore, public authorities, such as local governments, are important actors in the energy transition. *Multilevel governance* (MLG) describes the actions of public authorities and their relations with other actors. Governance is defined as a "*processes through which collective goals are defined and pursued in which the state (or government) is not necessarily the only or most important actor"* (Betsill and Bulkeley, 2006, p. 144). MLG referrers to increasing horizontal and vertical interdependence between public, private and civic actors. It describes efforts of local actors in the energy transition and its dependency on policies of higher levels (Bache and Flinders, 2004). Multilevel climate governance is the interplay and the co-ordination of climate action at and across all levels (Emelianoff, 2014).

Horizontal relations exist between administrative units of governments and supranational organizations. Vertical relations exists between public, private and civic actors (Betsill and Bulkeley, 2006). Gustavsson et al. (2009) explain that a distinct dependency on horizontal or vertical relations in local climate mitigation governance stems from different business structures and local conditions. This influences the level of ambition and leads to different climate-policy strategies (Gustavsson et al., 2009). Emelianoff (2014) stresses the influence of national climate policies on local energy transitions. Due to strong economic lobbies that block ambitious national climate policies, an opportunity for action in cities has occurred. Local governments have been facilitating energy transitions in various ways although lacking resources. They are depended on policies of other levels of government. The process is driven by actors from various levels and societal spheres constructing new steering arrangements (Emelianoff, 2014).

The duality of MLG is that it is both a strategic tool and a structural trend (Arnouts and Arts, 2009). It is a strategic tool since governments try to increase their influence and problem-solving ability by means of new steering arrangements. It is a structural trend since there is societal change in which new relations between state, market and civil

society are formed in local, national, international policy making (Arnouts and Arts, 2009).

2.3 Policy Arrangement Approach

The *policy arrangement approach* (PAA) is useful when conceptualizing policy. The PAA conceptualizes policy through four interdependent dimensions: *actors, resources, rules* and *discourses* (Liefferink, 2006). The understandings from MLG are incorporated based on Arts and Tatenhoven (2006) and identified as the structural component of MLG. In line with Arnouts and Arts (2009), the strategic component of MLG is added to the PAA (Arnouts and Arts, 2009).

A policy arrangement is defined as: *"the temporary stabilization of the organization and substance of a policy domain at a specific level of policy making"* (van Tatenhove et al., 2000, p. 54). Policy arrangements are formed, preserved and changed constantly based on interactions between actors and coalition of actors. Actors act strategically in a policy arrangement and are both free to change the policy arrangement and are controlled by it. Policy arrangements can be understood through structural changes in society as well; the structural component of MLG. These are slow changing ideas and practices of governance and a changing relationship between state, market and civil society (van Tatenhove et al., 2000).

The first dimension of the policy arrangement is *actors* and their coalitions (Liefferink, 2006). It is believed that the interaction between actors results in patterns and hereby shapes policy. Actors form coalitions based on shared *rules,* exchanging of *resources* and shared *discourses.*

The second dimension of the policy arrangement is *resources*. The distribution and availability of resources shapes the power structures of a policy arrangement (Arnouts and Arts, 2009). Power can be understood in two ways: as the allocation of resources to influence the social and physical environment and achieve certain policy outcomes. Power can also exist in a hidden form, which is revealed by looking at the relative autonomy and dependency of actors in a policy arrangement (van Tatenhove et al., 2000). Here power is seen from the resources perspective.

The third dimension is *rules,* consisting of formal and informal rules. Formal rules are set out in texts. Informal rules are based in political culture. The rules describe the boundaries of a policy coalitions, they are about who is in and who is out (Liefferink, 2006).

The fourth dimension is *discourses*, which is defined as collection of ideas, expressed in language, through which meaning is given to reality. Applied in the context of policy

arrangements, policy discourses are defined as *"a dominant interpretative schemes, ranging from formal policy concepts to popular story lines, by which meaning is given to a policy domain"* (van Tatenhove et al., 2000, 63).

The implication of the policy arrangement approach is that if one dimension of the policy arrangement changes, this influences all three other dimensions.

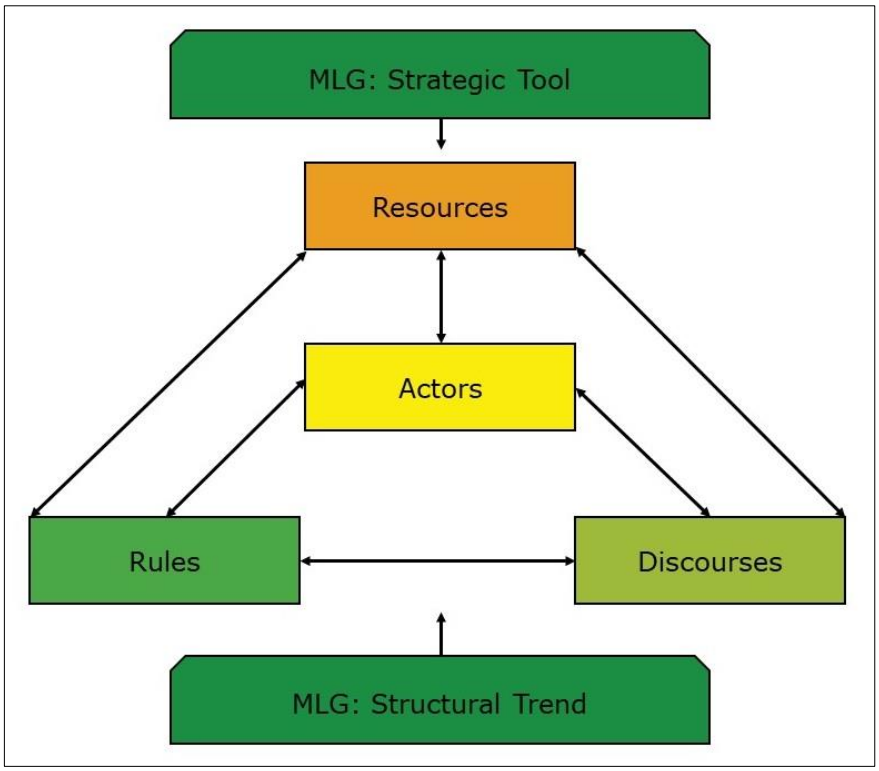

Figure 2.1 Policy Arrangement Approach and Multi Level Governance, based on (Arnouts and Arts, 2009)

2.4 Governance Capacity

The policy arrangement approach is a descriptive theory (a theory that describes and explains policy). To evaluate policies and give a qualitative assessment, a prescriptive theory is needed. Therefore, in line with Arts and Goverde (2006), *governance capacity* is used as a concept in this research. Governance capacity is defined as the ability of a policy arrangement to (partly) achieve collective goals (Arts and Goverde, 2006). In this context, this is the ability to realize EERs in owner-occupied housing.

There is an indicative and a performative component in governance capacity. The indicative component describes the potential governance capacity and depends on the coherence between the four dimensions of the policy arrangement (Arts and Goverde, 2006). The performative component conceptualizes the performance of a policy arrangement. The performance is assessed by means of Nelissen's (2002) JEP-triangle.

Nelissen describes three aspects of new types of governance based on the criteria of good governance. Nelissen reasons that governments act in a tension between different expectations. Policy should be *democratic*, *effective* and *just*. These aspects are contradictory. Nelissen links the three contradicting aspects to assess governance capacity.

The *juridical, the economic-business* and the *political-societa*l aspects are combined in the JEP-triangle. Here referred to as *juridical-*, *economic-* and *political capacity*. The juridical capacity is related to the fact that governments in a constitutional democracy act based on a division of tasks between governmental bodies. Citizens are protected from their own governments by means of fundamental human rights. Central concepts in the juridical capacity are *rule of law* and *equality*. The aspect of economic capacity comes from the desire that governments should act *effectively* and *efficiently*. The political capacity involves values that are important for a functioning democracy. Although it is debatable what constitutes a functioning democracy, it is agreed that values as *participation, transparency, accountability* and *political representation* are important (Nelissen, 2002).

There is a tension between the three aspects. Markets demand flexibility and the juridical aspect demands certainty. Similarly, markets demand autonomous decision-making, but the political aspect insists on collective decision-making. Furthermore, the political aspect requires responsiveness to all societal needs, while the juridical aspect is based on legal responsibility (Arts and Goverde, 2006). The assessment of a policy arrangement is "*based in attention for the degree to which they do justice to the demands"* of the three aspects: the juridical, the economic and the political capacity (Nelissen, 2002, p. 15).

2.4.1 Geographical Capacity

MLP is not explicit about what spatial context a transition takes place in (Hodson and Marvin, 2010). Therefore, a fourth aspect is added to the JEP-triangle: geographical capacity. Neas and Vogel (2012) build on the work of Geels and Schot (2007) in the context of cities. Unlike technological change described by Geels and Schot, change in urban context depends on the *social*, *cultural*, *economic*, *political* and *natural* characteristics (Næss and Vogel, 2012). These components are described earlier in this chapter using the theories of MLG and PAA, except for the *natural* characteristic, defined here as characteristics that are not directly influenced by humans. Kranzl et al. (2014) compared nine EU member states and found that natural characteristics, such as climate and geological characteristics, could enable opportunities for EERs. This also applies to *building* stock characteristics, like ownership structure (Kranzl et al., 2014).

Existing houses are associated with *"vested interests, cultural norms, lifestyles"* and is thus part of the regime in MLP terms (Næss and Vogel, 2012, 48). Existing houses in the Netherlands are an inheritance of the past. They depend on *infrastructure*, defined as "*the physical components of interrelated systems providing commodities and services essential to"* existing houses (Fulmer, 2009, 32). This infrastructure provides individual and collective technologies existing alongside each other (Næss and Vogel, 2012). Here the *supporting natural, building and infrastructural characteristics* for EERs are taken as indicators of geographical capacity.

2.4.2 Resource Capacity

Mees and Driessen (2011) operationalized the JEP-triangle in researching local climate adaption policies. Their example is followed by adding a fifth aspect: *resource capacity.* Likewise, Dang et al. (2016) used the concept of *facilitating resources* to indicate the governance capacity in forest and nature policy. Here a distinction is made between the resource capacity of three groups of actors: owner-occupiers, building companies and local governments (van Doren et al., 2016b).

Owner-Occupiers

Resources in the form of *capital* are necessary to deal with any problem. In line with van Doren et al. (2016b) and Wilson et al. (2015), capital is taken as the first indicator of the owner-occupier's resource capacity. Capital is defined as money that enables owner-occupiers to realize EERs. Capital can compensate for an insufficiency in the second indicator of the owner occupier's resource capacity: *information* (van Doren et al., 2016b; Wilson et al., 2015). Information is defined as knowledge that enables owner-occupiers to realize EERs.

Wilson et al. found that energy research in existing housing is biased towards capital and informational properties. These properties influence decisions on EERs and assume motivated owner-occupiers, as environmental awareness or values shape a decision (van Doren et al., 2016a; Wilson et al., 2015). The origin of a decision on EERs lies in properties like stage of life, the meaning of the idea home or social dynamics within a household of an owner-occupier (Wilson et al., 2015). In this research, these properties of the owner occupier's resource capacity are noticed. Therefore, *supporting non-capital and non-informational properties* also indicate the owner-occupier's resource capacity. It is assumed that if owner-occupiers give precedence to EERs in relation to other housing features, they do so based on *supporting non-capital and non-informational properties.*

Building Companies

In the Netherlands, most retrofit work is realized by small and medium sized building enterprises. These are building companies with less than 250 employed staff (EC, 2018). Their *skills and expertise* indicate their resource capacity (Wilson et al., 2015), which is defined as technical and business development abilities that enable the realization of EERs (van Doren et al., 2016b).

In addition, EERs require efficient cooperation between building companies with different specializations (van Doren et al., 2016a). Therefore, *cooperation* between building companies indicates resource capacity. Here cooperation is defined as the collaborative abilities that enable the realization of EERs.

Local Governments

The resource capacity of the local governments consists in this research of two indicators: *budget* and *human resources* allocated to EERs in owner-occupied housing (Mees and Driessen, 2011). The former is defined as financial means of the local government allocated to polices that enable the realization of EERs and the latter as the number of fulltime-equivalent (FTE) allocated to polices that enable the realization of EERs in owner-occupied housing.

2.4.3 Juridical Capacity

Since governments act in an MLG environment, a clear division of responsibilities can become ambiguous. The aspect of juridical capacity is based on an unambiguous roles (Nelissen, 2002). Sullivan et al. (2013) stresses in this respect the importance of local government leadership. Therefore, in this research, a *clear local government's role* indicates juridical capacity and is defined as well-defined local government's tasks on the realization of EERs.

In line with Mees and Driessen (2011), juridical capacity is interpreted in this research as formal rules. Indicated by all the *regulations* local governments have at their disposal to realize EERs in owner-occupied housing. Regulations are defined as official rules that enable the realization of EERs in owner-occupied housing.

2.4.4 Economic Capacity

The aspect of economic capacity is based in the need for policies to be effective, efficient and implementable (Nelissen, 2002). Effectiveness is defined as the ability to achieve policy goals. Efficiency is defined as a valuation of the ratio between the used means and the (partly) achieved policy goals. It is problematic to perform an efficiency assessment of energy policies in existing housing (Hoppe et al., 2016a). Therefore, the existence of

policy evaluations indicates economic capacity and is defined as actions taken to give a structured overview on the impacts of policies that enable the realization of EERs.

2.4.5 Political Capacity

Values of democracy are expressed in political capacity (Nelissen, 2002). Here the aspect of political capacity includes two components: informal rules and discourses. First, Mees and Driessen (2011) interpreted informal rules as the political will that enables political capacity in local climate adaption. *Political priority* is taken as an indicator of political capacity. It is defined local government's acceptance of polices that enable the realization of EERs in owner-occupied housing.

The second indicator of political capacity in this research is *actor involvement* in policies that increase the realization of EERs. It is inspired by Dang et al. (2016), who studied the performative component of governance capacity in nature conservation by taking *social learning* as an indicator of *converging discourses.* Van Gossum et al. (2011) took *similarity in perspectives* as an indicator of discourse in the governance capacity of a land use planning project. What both approaches have in common is the following notion. If actors interact trough involvement in policies common ground can be achieved. This advances political capacity. Actor involvement is defined as owner-occupiers and building companies engagement in policies that enable the realization of EERs in owner-occupied housing.

2.5 Theoretical Outcome

The aspects and indicators of governance capacity are the outcome of this theory chapter. Governance capacity is the ability of a policy arrangement to (partly) achieve a collective goal. The collective goal here is the realization of EERs. The theoretical implication is that the indicators enable their aspects and thus governance capacity. Governance capacity is displayed in Figure 2.2.

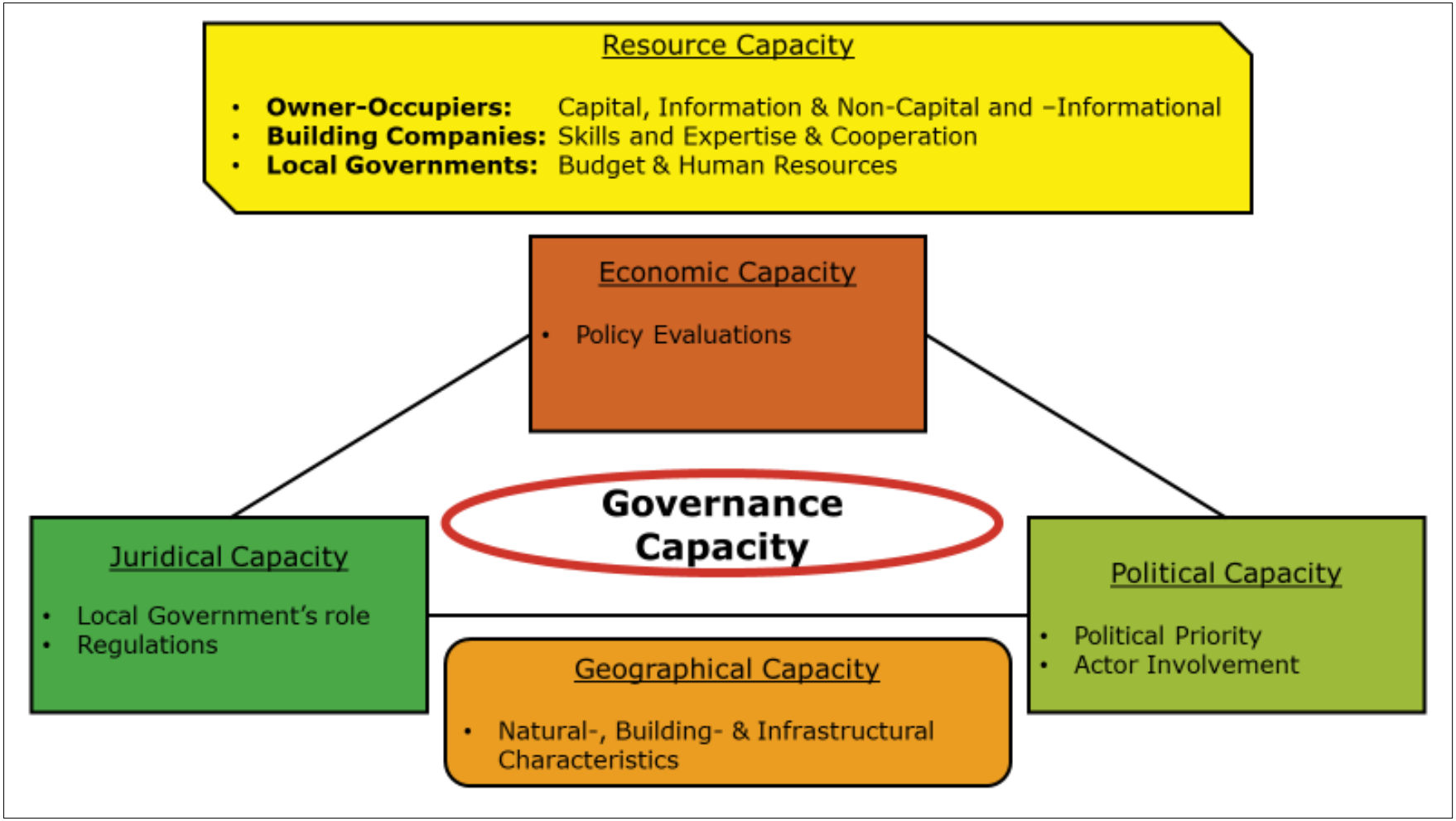

Figure 2.2 Aspects and Indicators enabling Governance Capacity, including JEP-triangle, based on (Nelissen, 2002)

3 Research Questions

The previous chapters introduced *energy-efficient retrofits* (EERs) in owner-occupied housing, discussed their societal relevance and stated the problem. Using the theories of *multilevel perspective* (MLP), *multilevel governance* (MLG), *policy arrangement approach* (PAA) and *governance capacity*, the scientific relevance of the topic was explained. This brings us to the research questions.

3.1 Main Research Question:

What aspects of governance capacity enable the local energy transition in owner-occupied housing?

3.2 Research Questions:

1. What characteristics of geographical capacity enable governance capacity?

2. What elements of resource capacity enable governance capacity?

3. What elements of juridical, economic and political capacity enable governance capacity?

4. Which actors are involved in the local energy transition in owner-occupied housing?

To answer the main research question, only research question one, two and three seem needed, which is why the fourth research sub-question needs explanation. One of the outcomes of the chapter devoted to the theory is the supposition that actors are an important aspect of governance capacity. In the theoretical framework, three groups of actors are pre-selected within resource capacity. To also accommodate actors that cannot be grouped into the three pre-selected groups in the research, this fourth question is added.

4 Methods

This chapter outlines the methods used in this research. It explains what kind of data was collected and how the data was collected and analyzed. Finally, it discusses how the results were validated.

4.1 Type of Study

To answer the research questions, new tasks for local governments, citizens/consumers, companies and non-governmental organizations needed to be clarified. Energy policy is a relative novelty for local governments. Similarly, individuals and collectives beyond the local government are confronted with new questions. This means that the boundaries between object of study and context are unclear (Schelly, 2016). Therefore, a qualitative research approach was chosen (Creswell, 2009). Various dimensions, views and understandings on the topic were explored using this approach, which is about interpretations of meanings (Flyvbjerg, 2001). Descriptions of the context were provided to increase the understanding of the study object.

4.1.1 Case Study

To explore the multiplicity of the researched aspects that were found in literature, a cross-regional comparative case study was conducted. Case studies are a common practice in spatial planning research. Case studies are defined as "*analyses of persons, events, decisions, periods, projects, policies, institutions, or other systems that are studied holistically by one or more method"* (Thomas, 2011, p. 513). A case study provides in-depth context-dependent knowledge of local practices (Flyvbjerg, 2006).

4.1.2 Case Study Area Selection

Local energy policies on existing housing is a relatively new phenomenon. Therefore, two frontrunner municipalities were needed as case study areas. The municipality of Texel and Amersfoort in the Netherlands were selected. In addition to their being frontrunners, they were selected based on the differences between each another. This criterion was inspired by Flyvbjerg (2006), who showed that a comparison between two atypical and opposite cases can lead to a deeper understanding about the causes of a problem.

A quick scan showed that the study areas were different based in terms of the size of their population, density, surface area, average house price and age of the building stock. In 2008, an ambition for an energy neutral Amersfoort in 2030 was expressed in the city's environmental policy plan. Amersfoort was put forward by the ministry of

Internal Affair as a frontrunner in facilitating a building companies' platform (Uyterlinde, 2015). A Block by Block pilot project was carried out in Amersfoort, and that platform of building companies still exists (RVO, 2014). Also in 2008, Texel articulated its ambition for energy independence by 2020. The measures needed to achieve that are explained in an action plan published in 2010 (Elswijk, 2010). The ambition for 2020 still exists. Since 2016, there are also policies for existing housing (Gemeente Texel, 2016).

A valuation of being frontrunners can be found in the scores the municipalities got from the Association of Dutch Municipalities (VNG) based on the energy ambition of their policy. Amersfoort scored 4 out of 5 and Texel 3 out of 5, based on self-reported policy efforts (VNG, 2017a, b).

4.2 Methods of Data Collection

A first orientation on the two case study areas was done. Online available documents, statistics, newspaper articles and websites were scanned. A selection of interviewees was made. Additional interviewees were selected by means of snowball sampling, interviewees were asked who they recommended as another interviewee. Relevant publicly unavailable documents were provided by two interviewees.

Nineteen interviews were held between the end of 2017 and the middle of 2018. Sixteen interviews were semi-structured and three were unstructured (see Appendix 1). The interviewees were divided into four groups based on their perspectives on the research topic. First, the G*overnmental* interviewee group consisted of senior local government civil servants with tasks related to energy in owner-occupied housing. Second, the *Private sector* group consisted of directors of building companies, building contractors and installers. Their company's revenue depends on the application of specific EERs. Third, *Intermediate* organizations link policy with citizens, as well as the market supply of EERs with consumer demand. Their revenue does not depend on the application of specific EERs. Interviewees in this group included a project leader, a former director and a consultant of an intermediate organization. Fourth, the *Owner-occupiers* group contained real estate agents, who are experts regarding owner-occupiers. In Texel, this was supplemented with interviews with three owner-occupiers. The abbreviations of the four groups, the two case study areas and the number of interviews form the codes of the interviewees used in the result chapter.

	Governmental (G)	*Private Sector (P)*	*Intermediate (I)*	*Owner-Occupier (O)*	Total
Texel (T)	1	2	5 (3 U, P)	5 (1 P)	13
Amersfoort (A)	2	2	1	1 (1 P)	6
Total	3	4	6	6	19

Figure 4.1 Interviews (U: Unstructured, P: Phone)

In Texel, one civil servant of the local government who had an advisory and executive role (1TG1) was interviewed. In Amersfoort, two interviews were conducted with civil servants of the local government. One interviewee was in an advisory role (14AG1), and the other was in an executive role (15AG2). In both case studies, two directors of building companies were interviewed (2TP1; 3TP2; 16AP1; 17AP2). In Texel two short unstructured interviews (6TI3; 8TI5) were conducted as preliminary orientation on intermediate organizations. One short unstructured interview (7TI4) by phone was aimed at cross-checking interview-statements from two interviewees (5TI2; 13TO5). The preliminary orientation led to the selection of two leading intermediate organizations in Texel (4TI1; 5TI2). One leading intermediate organization was selected in Amersfoort based on the interview statements of an interviewee from the local government (14AG1). An extended interview with an experienced project leader of this intermediate organization was conducted (18AI1). In Texel two real estate agents were interviewed (9TO1; 10TO2). The interview statements from one real estate agent in Amersfoort showed much overlap with those from Texel (19AO1), which is why no second real estate agent was interviewed. Interview statements form three owner-occupiers in Texel showed that their point of view was mainly influenced by their individual circumstances (11TO3; 12TO4; 13TO5). This resulted in decision not to interview owner-occupiers in Amersfoort.

In the semi-structured interviews, a list of open questions about the researched indicators was used (see Appendix 2). The questions were not asked literal in every interview. During the interviews, follow-up questions could be improvised and a conversation could take place. Fourteen semi-structured interviews were held in person, and two by phone. Three unstructured interviews took place as conversations by phone. Eighteen interviews were recorded and transcribed. During one unstructured interview, notes were taken and later transcribed.

Twelve interviewees got the opportunity fill in a questionnaire. They could provide feedback on the researched indicators (see Appendix 3). Ranking consisted of positioning the researched indicators from least decisive to most decisive for the further application of EERs in owner-occupied housing. Ranking was preferred over scoring because it forced the interviewees to choose one researched indicator over another. The outcome of the ranking were scores from 1 to 15. The filling in of the ranking questionnaires was often done in a hurry or with the interviewees not fully understanding how to rank the researched indicators. For this reason, this was considered quick and dirty data collection aimed to check the applicability and the relative importance of the researched aspects and indicators.

4.3 Methods of Analysis

All the transcriptions were labelled based on the topic of the interview statements. Labels were merged based on topic similarity, resulting in 128 labels. Labelling interview statements depended on the researcher's interpretation and was therefore part of the analysis (Cope, 2010). Interview statements were initially labelled inductively and were not assigned to the researched indicators. Subsequently, labels were deductively organized based on their relation to the researched indicators (Cope, 2010). Seven labels remained unassigned to the researched indicators. All of this was done with the qualitative data analysis software ATLAS.ti.

Certain interview statements that could not be verified through other sources were excluded. A few interview statements were used to strengthen the results from other researched indicators. Interview statements from one interviewee (7TI4) were not used, since the interview was too concise and beyond the scope of the research questions. Interview statement from one interviewee were combined with the statements of the interviewee's partner, since the couple complemented each other's words (5TI2).

The results followed from linking the statements of the interviewees with one another and, if possible, with available documents. Furthermore, the results were embedded in the researched aspects found in literature. An assessment of the researched indicators was made, thereby answering the research questions. Quotes of the interviews were used to illustrate the results.

Ranking the researched indicators led to a total score per researched indicator (the data from Texel and Amersfoort were combined). Any misunderstandings on the side of the interviewee regarding the ranking questionnaire were adjusted in the data. Due to the quick and dirty data collection, researched aspects that deviated more than 30% from average were considered in the results chapter.

4.4 Methods of Validation

The credibility and validity of the results were increased using triangulation. Data from different sources was cross-checked in order to look for regularities (O'Donoghue and Punch, 2003). The interview statements were cross-checked with each other. If possible, interview statements were also cross-checked with statements from available documents. The intrinsic biases from both the researcher and the interviewees were reduced by using the perspectives of different interviewees.

Credibility and validity were considered per interview statement. Providing references in the results increases credibility; still, the process of cross-checking can to some extend

remain unclear for the reader. To explain this process of cross-checking, two examples are presented. First, in the case study area of Amersfoort, interview statements on the local government budget were cross-checked with the interview statements from a local government policy document. Second, by selecting interviewees from four different groups (government, private sector, intermediate and owner-occupiers), different perspectives on the research topic were used.

5 Results

This chapter outlines the results from nineteen interviews, two local government websites, six documents, KNMI and CBS data. The results are structured around the two case study areas: Texel and Amersfoort. Furthermore, the results are embedded in the researched aspects described in the theory chapter. References to the interviews are composed of four components: interviewee number; case study area (T: Texel and A: Amersfoort); interviewee group (G: Governmental; P: Private sector; I: intermediate; O: Owner-occupier) and number within interviewee group.

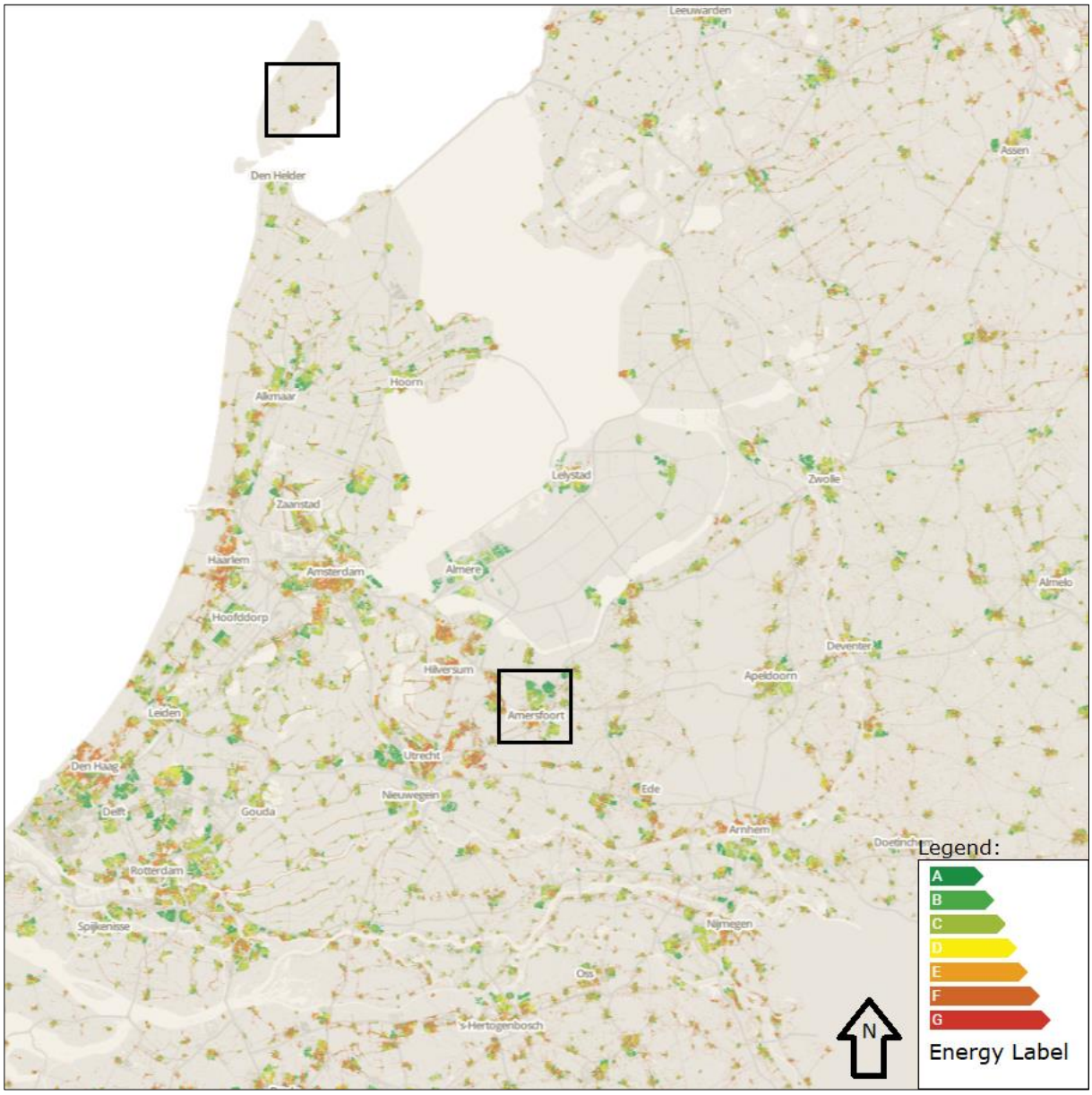

Figure 5.1 Energy Labels of Houses in a part of the Netherlands (St. MmM, 2018); Scale: 1:960000

5.1 Texel

In this section, the results of the study area Texel are described.

5.1.1 Geographical Capacity

Supporting natural, building and infrastructural characteristics

After introducing the study area Texel with a few key figures, the results are outlined on the natural, building and infrastructural characteristics. Finally, how the characteristics affect the realization of EERs in owner-occupied houses is assessed.

Texel is a municipality with 13.576 inhabitants. It is an island with a land surface of 161,12 km² (CBS, 2017b). The average price of a house is €258.000 (CBS, 2017a). The 6.547 houses in Texel, with an average building year of 1954, are old compared to a national average of 1966. Texel has a relatively large owner-occupied segment of 65% versus the 57% national average. Texel has 81% single-family houses versus the national average of 64%. Texel has no high-rise buildings and few apartments (Gemeente Texel, 2018). Therefore, there are hardly any owner-associations and no shared ownership in Texel. Policies focusing on this housing segment is missing (4TI1; 9TO1; 10TO2).

With 1893 sun hours measured in 2017 in de Kooy and plenty of roof surface, Texel is a suitable location for solar energy (KNMI, 2018; 4TI1; 9TO1; 10TO2). Many detached houses in an open landscape and an high average windspeed of 6,5 m/s make the heat demand of owner-occupied houses relatively high (4TI1; KNMI, 2018).

Interviewees see the relatively old building stock as obstructing the realization of EERs (1TG1; 3TP2; 5TI2). Owner-occupiers that took retrofit measures emphasize that with enough effort, retrofitting old houses to energy neutral and gasless houses is possible (1TG1; 12TO4; 13TO5). Concerning a large-scale renovation of a house build in 1914, an interviewee said:

"...those building companies nowadays. If it is not as it should, then it should be as it is. They can do a lot" (12TO4).

The local government has not made location and time planning concerning the shift to renewable energy in owner-occupied housing (Elswijk, 2010; 1TG1; 4TI1). This means it is not specified where various collective and individual technologies should be implemented.

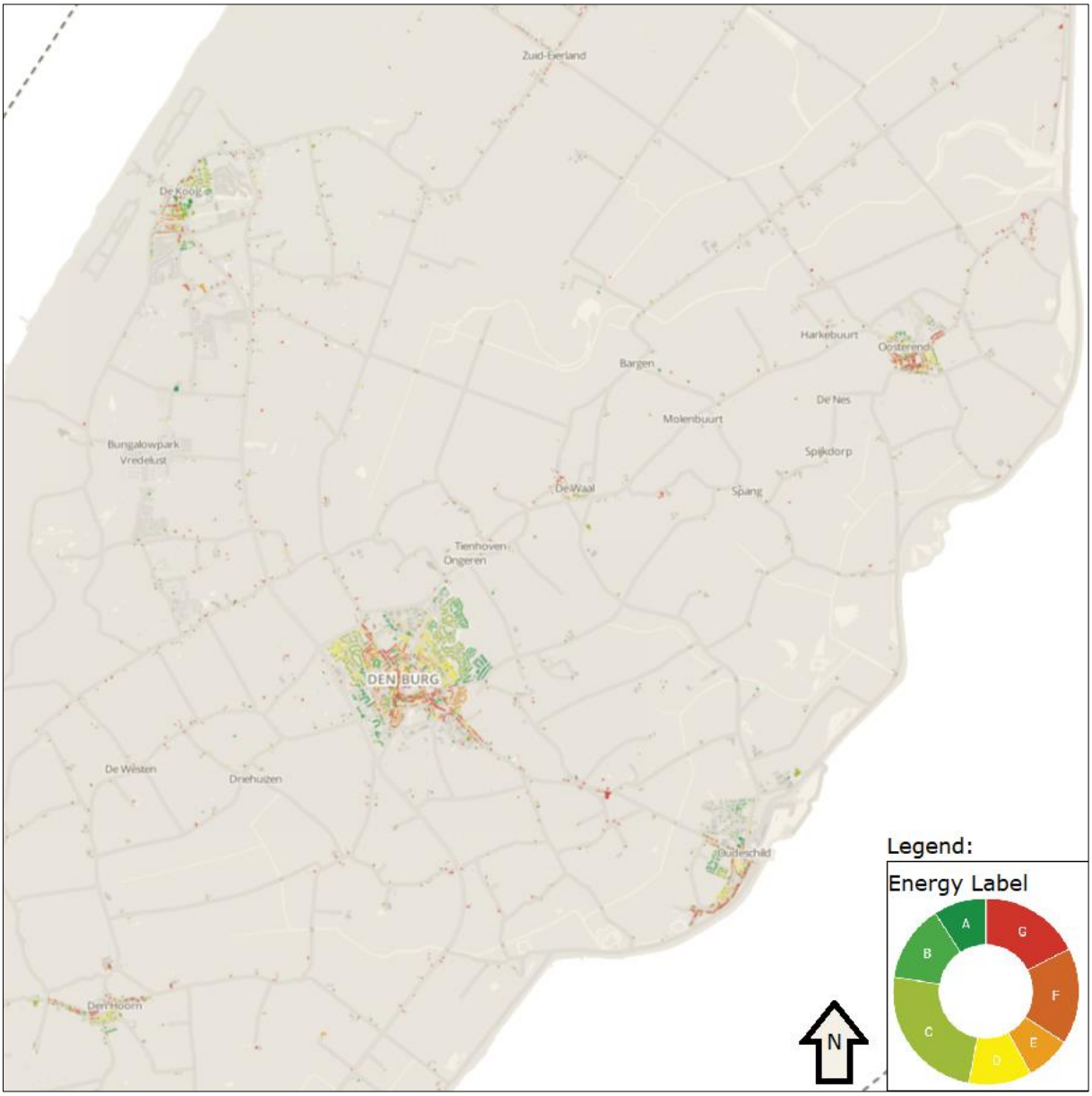

Figure 5.2 Energy Labels of Houses in a part of Texel (St. MmM, 2018); Scale: 1:60000

5.1.2 Resource Capacity

Owner-Occupiers: Capital

Capital is assessed based on the effect of money on the realization of EERs.

Interviewees describe access to money for owner-occupiers as decisive for realization of EERs (1TG1; 3TP2; 5TI2; 9TO1; 11TO3; 13TO5). One interviewee used the following metaphor:

"Texel people have a wallet of onion leather, if they open their wallet they start weeping right away" (9TO1)

Although for owner-occupiers that consider or have taken measures, money was not an obstruction (2TP1; 12TO4). Three interviewees mention the interest and payback period of EERs (5TI2; 10TO2; 11TO3). Real estate agents identify the problem of partly lost investment in EERs if a house is sold (9TO1; 10TO2). Three interviewees see the problem of energy in existing housing as a financing problem and comment on a lack of appropriate loan structures (4TI1; 5TI2; 13TO5).

To increase the access to money, the local government of Texel has set up a subsidy program in which early adaptors receive the highest subsidy (Gemeente Texel, 2016). The subsidy program aims to create showcase projects of energy neutral and gasless houses (1TG1; 4TI1; 11TO3). To prevent the existing wealth inequality becoming an energy inequality, a favorable loan structure was created by the local government. The two financial policies are aimed at a limited number of owner-occupiers (1TG1; 4TI1). The interviewees endorse retrofit subsidies for benefitting the realization of EERs. Though they mention that the interest in the current subsidy program is low (1TG1; 3TP2; 4TI1; 5TI2; 9TO1; 10TO2). Interviewees say this might be due to its high requirements (1TG1; 4TI1; 11TO3).

Owner-Occupiers: Information

Owner-occupiers' knowledge on retrofitting is outlined here. Information is assessed based on the effect of information on the realization of EERs.

Seven interviewees agree that there is a high demand for information among owner-occupiers. This includes technical information about specific measures and information on financial implications (1TG1; 2TP1; 4TI1; 5TI2; 9TO1; 11TO3; 12TO4).

"They really pull the information out of me, that is exciting, we had estimated together with the local government, a conversation of an hour. Well, under the two hours I never actually leave. People want to know so much and ask questions. But what about that?" (4TI1)

A lot of fragmented information can be found on the internet. Interviewees mention that information leads to raised awareness on the importance of EERs. Both installers and building contractors provide information, but are not always seen as impartial (2TP1; 3TP2; 10TO2; 12TO4). Interviewees acknowledge that impartial good quality information is not free, it must be paid by the taxpayer or the owner-occupier (4TI1; 5TI2; 11TO3). The local government organizes information evenings, publishes folders, runs media campaigns, has a website on the topic and runs a telephone information line in partnership with local governments from the region (1TG1). The local government delegates the organization of the information evenings to an energy advice office (1TG1; 4TI1). This advice office guides owner-occupiers in retrofitting their houses and provides energy analyses reports. Owner-occupiers need an energy efficiency guarantee statement from this energy office to apply for the current subsidy program (4TI1).

Owner-Occupiers: Supporting non-capital and non-informational properties

Supporting non-capital and non-informational properties are assessed based on the extent to which owner-occupiers give precedence to EER in relation to other housing features.

Interviewees describe a lack of priority for EERs by owner-occupiers (1TG1; 2TP1; 3TP2; 4TI1; 5TI2; 9TO1; 10TO2). In general, interviewees describe the owner-occupier as preferring a new kitchen over an energy efficient heating installation (9TO1; 10TO2). On the other hand, interviewees do see a slow shift towards prioritizing energy efficiency by owner-occupiers (1TG1; 3TP2; 9TO1; 10TO2). The owner-occupier that prioritizes energy efficiency is intrinsically motivated, which is expressed in other parts of their professional and personal life (3TP2; 5TI2; 11TO3; 12TO4; 13TO5). Owner-occupiers say that the wish the be self-reliant benefits the priority given to EERs (5TI2; 13TO5).

"...because I always like to be self-sufficient in many ways. I prefer to eat lettuce from my garden rather than from the supermarket" (13TO5)

The opportunity to combine EERs with a large renovation increases their priority (4TI1; 5TI2; 11TO3; 12TO4). The esthetical component of solar panels is described by an owner-occupier and a real estate agent as obstructing realization of EERs (9TO1; 11TO3).

Building Companies: Skills and Expertise

Skills and expertise of building companies on technology and business development are described here. These abilities are assessed based on the effect on the realization of EERs.

Interviewees say that building contractors and installers lack abilities (1TG1; 2TP1; 3TP2; 4TI1; 5TI2; 6TI3; 13TO5). One installer explains that installing companies lack experience with energy efficient technologies. If so, customers are forwarded to another installer (2TP1). An energy advisor says out that the technological development occurs quickly. This makes it challenging for companies keep their abilities up to date (4TI1).

Interviewees who interacted with building contractors, installers and energy advisors make positive remarks about their abilities (9TO1; 11TO3; 12TO4). Some building contractors and installers can be labeled as risk averse, possibly influenced supplier by contracts (1TG1; 4TI1; 5TI2; 6TI3; 8TI5; 9TO1). Other companies specialize in energy-efficient technologies (2TP1; 3TP2). One installer is praised for its abilities regarding EERs (4TI1; 11TO3; 12TO4; 13TO5). Interviewees mention that a pressing demand exists in the installing market. This leaves little time for advising to owner-occupiers on and calculating of energy efficient heating options (1TG1; 2TP1; 4TI1; 10TO2; 11TO3).

Building Companies: Cooperation

The collaborative abilities of building companies are described here. Cooperation is assessed based on the effect of cooperation on the realization of EERs.

Three components of collaboration in the private sector emerged from the interviews. First, interviewees say collaboration between companies is sufficient (2TP1; 3TP2; 9TO1). Second, interviewees say that contributing to this is the idea of an island identity. Texel is a small community and people know one another, which increases trust (1TG1; 2TP1; 5TI2; 9TO1; 11TO3; 12TO4). Third, an energy office functions as a platform between policy of the local government and the measures that can be offered by building companies (2TP1; 4TI1; 5TI2; 8TI5; 9TO1; 11TO3; 12TO4). In contrast to the positive remarks, one interviewee sees a lack of collaboration due to a fragmented building sector in Texel and throughout the Netherlands (1TG1).

Local Government: Budget

The financial means of the local government allocated to polices that benefit the realization of EERs are assessed by specifying the budget.

The local government say that Texel, being a small municipality, has little financial means for energy efficiency (1TG1). In the past, the local government has successfully

applied for provincial subsidies for energy efficiency. The current subsidy program is funded from provincial financial means (1TG1; 3TP2; 4TI1).

Local Government: Human Resources

Human resources, the number of FTE allocated to polices that benefit the realization of EERs is assessed by specifying the amount of FTE.

Within the local government, two to three people work on energy efficiency in existing owner-occupied housing. They work on other subjects too. The local government desires all its employees to contribute to the goals on energy efficiency. Less than one FTE is exclusively allocated to owner-occupied housing (1TG1; 3TP2; 4TI1; 5TI2; 6TI3; 11TO3; 12TO4).

5.1.3 Juridical Capacity

Clear Local Government's Role

The defined tasks of Texel's local government on the realization of EERs is outlined here. It is assessed based on the identified responsibilities.

The local government says it interprets its task legal. From this point of view, there is no official task for the local government. The primary task lies with the owner-occupier (1TG1). The local government has organized several energy efficiency subsidies distributed by the provincial and national government (by means of the Wadden fund). The local government considers itself a facilitator active between other governments and local initiatives (1TG1). The local government has delegated information providing tasks to an energy advice office. The impartiality of this office is ensured by offering owner-occupiers a free choice and be open for partnerships with all building companies that realize EERs (4TI1; 5TI2; 11TO3).

The views on the task of the local government are dispersed among other the interviewees. The local government as a source of information is mentioned three times (5TI2; 9TO1; 10TO2). In this sense, the local government helps owner-occupiers navigate the official rules, provides information about subsidies and provides technical information. Two interviewees see a limited task for the local government, in which they only enforce official rules (6TI3; 12TO4). Given the limited legal task of the local government, more stringent official rules from the national government interviewees say are desirable (1TG1; 6TI3).

Regulations

The official rules that benefit the realization of EERs in owner-occupied housing are outlined here. Regulations are assessed based on their effect on retrofit realization.

When asked about local official rules, seven interviewees refer to national official rules considering new housing (1TG1; 2TP1; 3TP2; 4TI1; 5TI2; 6TI3; 10TO2). The official rules are the national Building Ordinance (Bouwbesluit), it lays out an Energy Performance Coefficient (EPC). One interviewee proposes better enforcement of this ordinance (6TI3), but this is not a task of the local government. Additionally, the EPC could be more stringent and gasless new housing should be required. Benefitting as well as obstructing local official rules are currently non-existent (5TI2; 1TG1; 4TI1). The interviewees did not mention a need for more local official rules.

Official rules on the position of buildings are laid out in the local zoning plan (4TI1; 6TI3). This could obstruct owner-occupiers who want to insulate on the outside of their building, but this was never encountered by the interviewees. Provincial official rules on geological monuments are important in Texel and obstruct the possibility of ground heat technologies on a significant part of the island (4TI1; 5TI2; 13TO5). National, provincial and local official rules on monuments obstruct the possibilities of solar energy on roofs, but this was not mentioned as important (4TI1; 5TI2; 9TO1).

5.1.4 Economic Capacity

Policy evaluations

Policy evaluations are assessed by specifying actions taken to give a structured overview on the impacts of policies that benefit the realization of EERs.

Six interviewees agree that few impact overviews are conducted on EERs in owner-occupied housing (1TG1; 3TP2; 4TI1; 5TI2; 9TO1; 11TO3). The need to do more is expressed (1TG1). The ambition of an energy neutral Texel in 2020 is considered unrealistic (1TG1; 5TI2; 8TI5; 12TO4). The local government holds to the 2020 ambition to motivate citizens and companies (1TG1).

The local government accounted for a previous subsidy program funded by the province of North-Holland for 2011–2015 (Gemeente Texel, 2015). The amount of energy saved has been calculated for the subsidized executed measures. The subsidy program focused on all new and existing housing. It is not clear how much energy was saved in the existing owner-occupied housing and what measures would have been taken without the subsidy (Gemeente Texel, 2015). Six interviewees agree that the subsidy program was useful, but to what extent is not clear (1TG1; 3TP2; 4TI1; 5TI2; 9TO1; 10TO2). On the subsidy program, one interviewee said:

"Is that ultimately the best way to use a euro to reach a goal, or were there other possibilities? That consideration is never seriously made, I believe" (1TG1)

An interviewee with public administration experience notes that critical evaluation at the end of a policy cycle is often difficult (5TI2). During data collection, two or three owner occupiers completed their EERs for the current subsidy program. A small group is still in the decision-making process or is completing the required paper work (Gemeente Texel, 2016; 1TG1; 4TI1). Even with subsidy owner-occupiers are still hesitant to realize EERs (1TG1; 4TI1; 11TO3). An energy advisor explained that owner-occupiers who dropped out during the orientation and choosing phase often decide to take individual measures (4TI1).

5.1.5 Political Capacity

Political Priority

The local government's acceptance benefitting polices for owner-occupied housing is assessed based on the identified political priority given to the realization of EERs.

Interviewees say that there is broad acceptance for the energy efficiency goals in existing owner-occupied housing. Both left- and right-wing members of the city council endorse the energy ambitions (1TG1; 10TO2; 12TO4). However, if energy projects influence the local government's financial means, the acceptance shrinks significantly (4TI1; 5TI2). Interviewees say that the critical stance in Texel's society towards wind and solar energy contradicts the ambitious energy goals (5TI2; 12TO4; 13TO5).

Actor Involvement

Here the engagement of owner-occupiers and building companies in policies that benefit the realization of EERs in owner-occupied housing is assessed based on the identified actor involvement.

The workgroup Sustainable Texel and later the foundation Sustainable Texel, a local citizen initiative, were important in creating acceptance for environmental policies (1TG1; 3TP2). According to one interviewee, they were also inspired by an idea of independence:

"…it is questionable, if there is a problem, you get help from the other side, as the rest of the world is called here" (1TG1)

Four interviewees are positive about the active engagement in EERs of companies in Texel (1TG1; 3TP2; 4TI1; 12TO4). One interviewee does not share this optimism and sees companies of Texel lagging behind the rest of the world (5TI2). No examples are seen in which companies were actively involved in policy.

An interviewee says that the engagement of owner-occupiers benefits from the many interactions local government administrators have with people on the street (9TO1). Three interviewees describe a growing engagement of owner-occupiers (1TG1; 4TI1; 10TO2). Most interviewees describe the engagement of owner-occupiers in negative terms; a conservative attitude is mentioned as a main reason (3TP2; 4TI1; 5TI2; 9TO1; 11TO3; 12TO4).

5.2 Amersfoort

After providing background information, the results of the study area Amersfoort are described.

In 2010, the local government initiated the project Energy Efficiency in the Neighborhood (Energiebesparing in de Wijk) to achieve an energy neutral city in 2030. This initiative became the platform 033Energie. It is a platform for building companies that realize EERs to distribute information and increase collaboration. In 2011, the local government handed over the leadership task of 033Energie (st. Blok voor Blok Amersfoort) to the affiliated companies and organizations, it kept being a member of the platform (033Energie, 2015).

5.2.1 Geographical Capacity

Supporting natural, building and infrastructural characteristics

The study area Amersfoort is introduced with a few key figures. Next, the area is assessed based on natural, building and infrastructural characteristics that effect retrofit realization in owner-occupied houses.

Amersfoort is a municipality with 154.712 inhabitants and a land surface of 62,86 km² (CBS, 2017b). The average price of a house is €222.000 (CBS, 2017a). The 66.014 houses in Amersfoort, with an average building year of 1974, are new compared to a national average of 1966. The owner-occupied segment of 58% is around national average of 57%. With 65% single-family houses, the housing stock is similar to a Dutch average of 64% (Gemeente Amersfoort, 2017).

The building stock consists of many apartments. For this reason, the local government, in partnership with 033Energie, has specific policies for owner-associations. Interviewees say the process of retrofitting for owner-associations is time consuming. Realization of EERs depends on the level of organization and the amount of savings of an owner association, as well as the possibility to combine EERs with building block maintenance (14AG1; 15AG2; 16AP1; 18AI1).

In the historic center of Amersfoort, the cultural-historical characteristics clash with the possibility to apply EERs. The local government tries to resolve this by allowing solar panels on historical houses if not visible from the street (14AG1; 15AG2; 16AP1).

The approach of 033Energie is based on common house types. For each area, a concept house is retrofitted to be energy neutral. If retrofitting to energy neutrality is too ambitious for an owner-occupier, no-regret measures towards energy neutral are advised

to prevent disinvestments. This allows a retrofit to an energy neutral house in the future without making prior measures useless (16AP1; 18AI1).

In a policy document a vision is described for the future of heating, the local government explores a different approach for every area (Gemeente Amersfoort, 2018; 14AG1; 18AI1). The heat vision is based on technologies that fit the common house types, expected investment in gas pipelines, public space, sewerage, social housing and current citizens' initiatives (Gemeente Amersfoort, 2018). District-based visions are created for collective heat networks or individual retrofits to all electric. Implementation and execution are not yet clear.

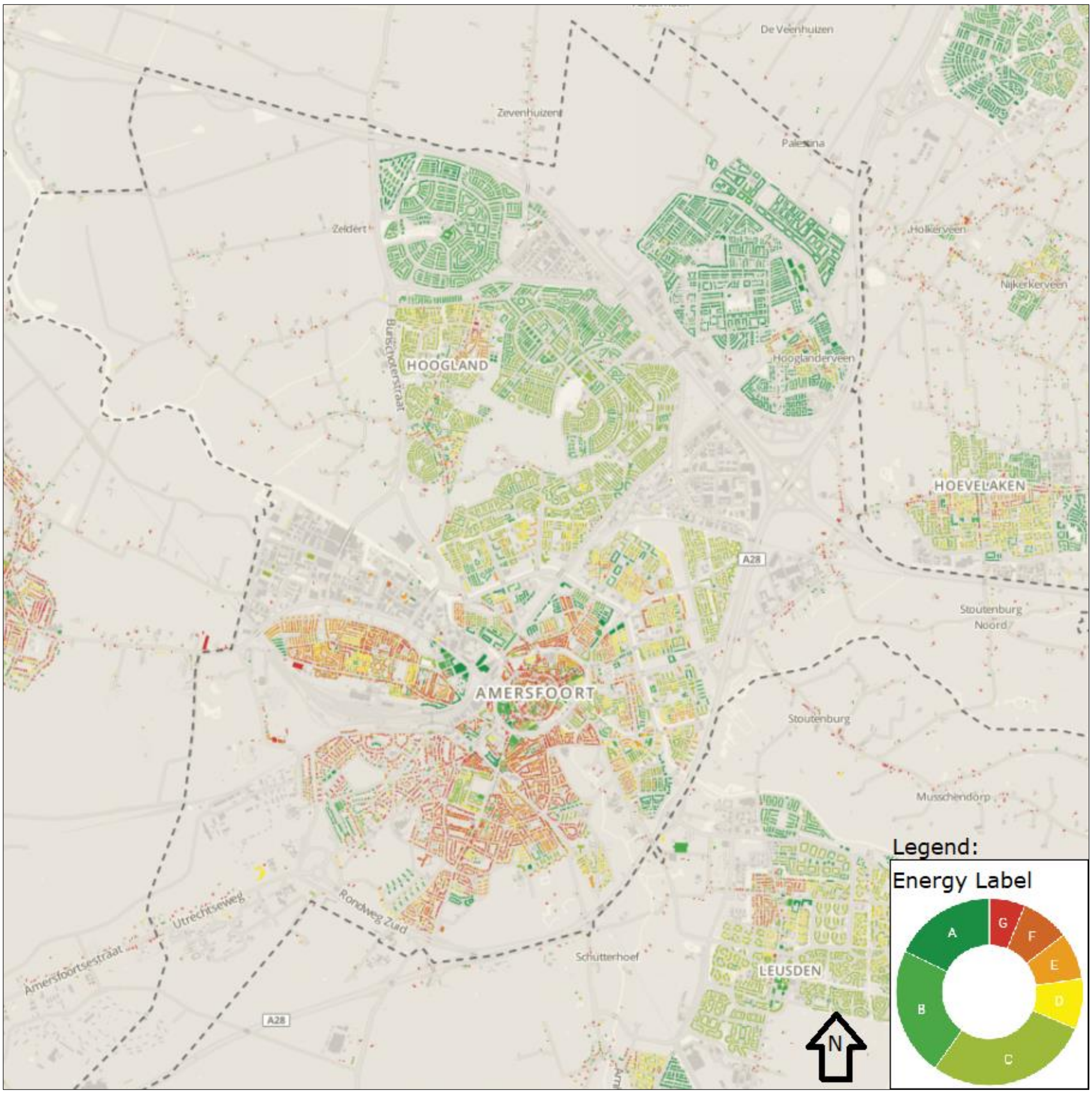

Figure 5.3 Energy Labels of Houses in a part of Amersfoort (St. MmM, 2018); Scale: 1:60000

5.2.2 Resource Capacity

Owner-Occupiers: Capital

Capital is assessed based on the effect of money on the realization of EERs.

Interviewees describe money in the form of a loan or savings as decisive (17AP2; 18AI1; 19AO1). It is mentioned that the current low interest rate on savings is an opportunity for realization of EERs (19AO1). Interviewees agree that investment in EERs is partly lost when selling a house (18AI1; 19AO1).

Interviewees observe hesitating financial institutions and obstructing financial rules that are obstructing owner-occupiers to realize EERs (14AG1; 15AG2; 16AP1; 18AI1). To solve this finance problem, 033Energie is setting up a loan structure in partnership with financial institutions. Local governments in the region provide a financial guarantee for owner associations (14AG1; 16AP1; 18AI1). Additionally Amersfoort is advocating through VNG to the national government to enact official rules concerning building-related loans for individual owner-occupiers (14AG1; Gemeente Amersfoort, 2018). The local government and 033Energie state that for implementation of build-related loans, the regional or national level is more appropriate than the local level (14AG1; 15AG2; 18AI1).

Owner-Occupiers: Information

Here knowledge that benefits owner-occupiers realize EERs is described. Information is assessed based on its effect on retrofit realization.

Interviewees agree that there is high demand for information (16AP1; 17AP2; 18AI1; 19AO1). A building contractor and real estate agent emphasizes that information on the internet is fragmented (16AP1; 19AO1). Another building contractor says that owner-occupiers know about the possibilities of specific measures (17AP2). An interviewee from the local government says that information is available (15AG2).

Facilitation of citizens' initiatives, neighborhood meetings, a heat scan and 3000 free customized energy advices (EPAs) were used to increase awareness (14AG1; 15AG2; 16AP1; 18AI1; 19AO1). 033Energie provides information to owner-occupiers through the municipal sustainable buildings desk. It has a physical location as the Centre for Sustainable Renovation (Centrum voor Duurzaam Renoveren), in which several measures are showcased. The local government partners in this by strategically using the alderman, publishing letters, making the neighborhood center available and contacting the media during events.

The information distributed by 033Energie comes from companies of the platform. For example, an allied bank provides financial information. 033Energie tries to adapt the

information to different target groups (14AG1; 15AG2; 16AP1; 18AI1). The local government emphasizes that while they help create awareness on EERs, the allied companies are in charge of marketing and sales (15AG2).

An interviewee says installers are a good source of information (19AO1), although some owner-occupiers do not trust installers (17AP2; 18AI1).

Owner-Occupiers: Supporting non-capital and non-informational properties

How much owner-occupiers give precedence to EERs in relation to other housing features forms the assessment of the supporting non-capital and non-informational properties.

Interviewees describe a lack of priority by owner-occupiers for EERs (15AG2; 16AP1; 17AP2; 18AI1; 19AO1; 033Energie, 2015). A real estate agent mentions a disparity between what is learned in professional training on energy efficiency and the lack of importance house buyers ascribe to this. This can be explained by the current high demand for housing (19AO1). Interviewees describe opportunities to increase given priority by means of combining EERs with attributes, such as healthy indoor climate, elderly proof renovations and maintenance renovations (14AG1; 16AP1; 17AP2; 18AI1). An interviewee says that processes such as fear of missing out and peer pressure influence given priority of EERs. These processes drive the shift towards prioritizing EERs (15AG2). This shift is observed by three other interviewees, who see a growing prioritizing of EERs among owner-occupiers (16AP1; 17AP2; 19AO1). As one of them puts it:

"…take solar panels as an example. You really see that more often. It spread like ripples. Like, one hears in a social setting that it works and it is cost-effective" (19AO1)

Building Companies: Skills and Expertise

Abilities of building companies regarding technology and business development are described here. Skills and expertise are assessed based on their effect on retrofit realization.

All interviewees say that building contractors and installers lack abilities (14AG1; 15AG2; 16AP1; 17AP2; 18AI1; 19AO1). Although some comment positively about individual measures that companies are offering (15AG2; 17AP2). Interviewees see a lack of abilities to realize retrofits resulting in houses without a monthly energy bill (NOM: nul-op-de-meter) (16AP1; 18AI1).

033Energie notes that there is a constant pressure from governments and owner-occupiers to come up with more companies that can deliver NOM retrofits (18AI1). The abilities to build airtight houses and install good quality ventilation and energy efficient heating are missing in most building companies, as one building constructor points out

(16AP1). It takes investment in staff training to acquire the abilities to build airtight houses (15AG2; 16AP1). Compared to building constructions, the options in energy efficient climate and heat installations increased greatly (17AP2). Not all installers can communicate this to their customers (17AP2; 19AO1). Interviewees say that to increase the abilities of building contractors and installing companies, a specialization in energy efficiency is needed (16AP1, 17AP2). An affiliated building contractor of the 033Energie platform is mentioned as a specialist in EERs. The building contractor invests in and proftits a lot from 033Energie (15AG2; 17AP2; 18AI1).

Building Companies: Cooperation

The collaborative abilities of building companies are outlined here. It is assessed based on the effect of cooperation on retrofit realization.

Interviewees describe the collaboration between the companies in the 033Energie platform in positive terms (14AG1; 15AG2; 16AP1; 18AI1). Although self-interest puts the ability to collaborate under pressure, it does not prevail (16AP1; 17AP2).

Due to fragmentation of the building sector, successful collaboration is challenging (16AP1; 17AP2; 18AI1). 033Energie tries to overcome this by increasing collaboration among advisors, building contractors, installing companies, insulation companies and governments. Neighboring municipalities are interested in the concept and are partnering with 033Energie (18AI1). Interviewees explain the importance of collaboration between the energy advisors and building contractors. The former focused on explaining the possibilities and raising awareness, the latter on practical building construction experience (15AG2; 16AP1; 18AI1). A building contractor stresses the importance of collaboration between installers and building contractors:

"…many building contractors can build a shell. But it is precisely the technology combined with the entire shell that does it. Building contractors really should gain expertise is this and installers must get much more appreciation for the building side." (16AP1)

Housing associations are an important partner, especially in areas where the ownership is fragmented between housing associations and owner-occupiers (14AG1). Housing associations and 033Energie used to partner more closely. Changing ambitions of the housing association and a tender won by a building contractor from outside the 033Energie platform led to looser partnership (17AP2; 18AI1).

Local Government: Budget

Budget is assessed by specifying the financial means allocated to polices that benefit the realization of EERs.

Various interviewees mention different numbers, but they agree that the local government has little financial means for EERs in owner-occupied housing (14AG1; 15AG2; 16AP1). The local government states publicly it cannot live up to its ambitions of directing the municipality to CO_2-neutrality in 2030 if the financial means are not increased (Gemeente Amersfoort, 2018). In the past, the local government has successfully applied for provincial and national subsidies benefitting energy efficiency. These programs have been completed (14AG1; 15AG2; 16AP1). In 2010–2014, more financial means were allocated to EERs. At the end of 2014, the local government was preventively financially supervised by the province of Utrecht; currently this is not the case. In 2019, the local government decides whether more financial means can be allocated to EERs (14AG1). Today, 033Energie is funded by a provincial subsidy of the Economic Board of Utrecht based on its energy goals and due to its contribution to employment (14AG1; 15AG2; 16AP1). An interviewee says that the debate about finance is changing, risk-bearing investments in renewable energy projects is considered now by the local government (14AG1; 18AI1).

Local Government: Human Resources

Specifying the number of FTEs allocated to polices that benefit the realization of EERs is assessed here.

The local government allocates less than one FTE exclusively to polices on EERs in owner-occupied housing, although it desires that all its employees contribute to the goals for energy efficiency (14AG1; 15AG2). One interviewee mentioned that:

> *"We are now in the situation with very little capacity. Due to cut backs of the recent years. So that is actually one FTE, that's me, who does the whole topic on energy transition and everything. So that's a bit difficult."* (14AG1).

5.2.3 Juridical Capacity

Clear Local Government's Role

The defined tasks of Amersfoort's local government on the realization of EERs is described here. This is assessed based on the identified responsibility of the local government.

In 2008 and 2009, the local government considered itself directing the process of EERs in owner-occupied housing. This has since changed:

"*We have an ambition and we always say to achieve this ambition, we have to do it together with people in the city. Therefore, it is a shared responsibility, we always emphasize that."* (14AG1)

The local government facilitates contact between stakeholders (14AG1; 15AG2; 18AI1). It has no financial stake in 033Energie and is not represented on its board. Representatives of the local government do attend all meetings of the platform. The task to provide owner-occupiers with information lies with 033Energie (14AG1; 033Energie, 2015). An interviewee says the local government increases the trustworthiness of the platform (15AG2).

033Energie appreciates the administrative assistance of the local government's environmental department in the form of small funding, explain current official rules and functioning as a point of contact on other policy areas (16AP1; 18AI1). Within the local government, the sub department of environment within the department of housing, employment and climate is leading the process. Relevant departments are adopting ideas about energy, but a hierarchical relation with the program manager is missing, which complicates implementation. Similarly, a relation is missing between the sub department of housing and the owner-occupier (14AG1).

For the future, more direction from the local government is expected in the shift to energy efficient housing (14AG1; 15AG2; 16AP1; 17AP2; 18AI1; Gemeente Amersfoort, 2018). In this shift there is a tension between the local governments ambitions and its legal tasks (15AG2). This direction could lead to creating a district-oriented energy plan. This is in line with the views of the national government and VNG (14AG1; 18AI1).

From the start, 033Energie's impartiality has been an important issue for the local government. Impartiality was ensured by making 033Energie an open platform for building companies. Building companies do, however, need to meet the preconditions and make the needed investments:

"Every building contractor can participate. So that's the precondition. If you want to join, please do. But it requires an enormous investment." (15AG2)

The impartiality of 033Energie towards owner-occupiers is ensured by giving owner-occupiers a free choice after advice for the realization of EERs (14AG1; 15AG2; 16AP1; 18AI1).

Regulations

Here an outline is given of the official rules that benefit the realization of EERs in owner-occupied housing. These regulations are assessed based on their effect on retrofit realization.

A need for official rules to carry out the shift from gas to renewable energy based heating is expressed by an interviewee. It has been explored by the local government whether local taxes based on real estate value could be energy label dependent, but this is legally and practically considered impossible (14AG1).

The local government is exploring the possibilities of more stringent energy efficiency requirements when issuing an environmental permit for renovations. Furthermore, the local government considers waiving the environmental permit fees if an owner-occupier retrofits to an energy neutral house. A decision about these two measures will be made in 2019. The implementation of the new environmental law, that replaces current environmental law, affects decision making (Gemeente Amersfoort, 2018). Implementation of the new environmental law has been postponed to 2021.

Interviewees mention that official rules on the protected city view of the old city obstruct introducing solar energy, as do the requirements of the architectural appearance committee (14AG1; 15AG2; Gemeente Amersfoort, 2018). The environmental department has partnered with the department for monuments and the department for permits as much as possible (14AG1; 15AG2). Flora and fauna regulations are integrated in the 033Energie showcase projects by means of bat amenities (14AG1; 15AG2; 18AI1). Interviewees place little emphasis on national regulations on new housing (14AG1; 15AG2; 16AP1).

5.2.4 Economic Capacity

Policy evaluations

The actions taken to give a structured overview on the impacts of policies that benefit the realization of EERs are outlined here. This is assessed by specifying policy evaluations.

Interviewees agree that little impact overviews are made on EERs in owner-occupied housing. The need and usefulness of evaluations are expressed (14AG1; 15AG2; 16AP1; 18AI1). The local government is monitoring the energy consumption of the municipality, but this is not linked to policies (14AG1). Interviewees from the local government and 033Energie stress that give an impact overview on energy policy in existing housing is complex (14AG1; 15AG2; 18AI1). Other policy partners continually demand quantitative impact overviews (15AG2).

Currently, 033Energie must account to the EBU for the granted subsidies (14AG1; 18AI1). 033Energie is evaluated on energy efficiency, contribution to employment, innovation and as an experiment (033Energie, 2015). An interviewee said:

"We do evaluate, but we do that intuitively… …we will soon reflect on why it was crowded in one neighborhood and in the other nobody appeared. Besides, you have no time for such things. All those subsidy projects, it is just pushing through and as fast as possible, a little trial and error actually" (18AI1)

Several interviewees consider the ambition of an energy neutral Amersfoort in 2030 challenging or unrealistic (14AG1; 16AP1; 17AP2; 18AI1). Others mention that the 2030 ambition has given citizens and companies the opportunity to hold the local government accountable (15AG2; 16AP1) and has given the 033Energie platform a framework to perform its activities (18AI1).

A provincial subsidy application states that under previous subsidy schemes, 4000 houses have been refurbished, resulting in at least two energy label level improvements, and 750 individual measures have been taken. This is not specified for owner-occupied housing (033Energie, 2015). For seven different house types in Amersfoort, the NOM concepts with the affiliated companies are mentioned in two document (033Energie, 2017; Gemeente Amersfoort, 2018). 033Energie believes that the intensive citizens' initiatives approach is cost-inefficient, but is necessary due to hesitant owner-occupiers (033Energie, 2015).

5.2.5 Political Capacity

Political Priority

The acceptance in local government benefitting polices for owner-occupied housing is assessed based on the identified political priority given to the realization of EERs.

Interviewees say acceptance changed over the past ten years, depending on the various aldermen (14AG1; 15AG2; 16AP1). The ambition of energy neutrality in 2030 was pushed by the alderman of environment in 2008. During data collection, an alderman of sustainability and an alderman of environment worked on energy in the existing housing. A building contractor mentions that it is difficult to have contact with two aldermen (16AP1). Interviewees from the local government see two aldermen as broad acceptance from the city council (14AG1; 15AG2). Regarding administrative acceptance, 033Energie is pleased with the administrative assistance they have received in the past years (16AP1; 18AI1).

Actor Involvement

In this part, the engagement of owner-occupiers and building companies in policies to realize EERs is described. Actor involvement is assessed by means of the identified engagement in policies.

Amersfoort has many active citizens' initiatives facilitated by the local government. This has benefited the creation awareness on the topic. Furthermore, it has led to successful EERs projects for owner-associations. It is unclear how much this has led to actual energy reductions (14AG1; 15AG2; 18AI1). One interviewee describes the area Soesterkwartier, widely considered full of successful citizens' initiatives:

"Busses full of aldermen go through those neighborhoods. But it is not at all the case that more energy-saving measures are taken..." (18AI1)

Engagement is limited to a select group of enthusiasts (15AG2). A collective approach in which owner-occupiers collaborate in large scale retrofits is considered promising. Nonetheless, this has been difficult to realize so far, despite efforts (16AP1; 17AP2, 19AO1).

A similar dichotomy between a minority of enthusiast specialists and a cautious majority can be observed in the private sector. Companies specialized in EERs are actively engaged in local policy implementation (16AP1; 18AI1). However, most the building contractors do not focus on EERs (15AG2).

5.3 Combined Results

5.3.1 Geographical Capacity

- Amersfoort's natural, building and infrastructure characteristics are more like Dutch average compared to Texel's.
- Texel has more sun hours than Amersfoort.
- An approach to realize retrofits in apartments blocks is only observed in Amersfoort.
- In Texel and Amersfoort, it is demonstrated that old buildings are obstructing but not preventing EERs.
- Common house types in areas of Amersfoort benefit the development retrofitted concept houses.
- Both local governments have not made definitive plans on collective versus individual heating technologies. The future of gas delivery remains uncertain. The local government of Amersfoort has made a first explorative vision on this.

5.3.2 Resource Capacity

Owner-Occupiers

For realization of EERs access to money is decisive. Owner-occupiers consider interest rate on EERs, payback period, risk of lost investment and interest rate on savings. There is a problem to finance EERs. The subsidy program and favorable loans for early adaptors of Texel's local government do not solve this problem. In Amersfoort, a financial guarantee for owner-associations and build related loans for individual owner-occupiers are developed on a regional scale.

Owner-occupiers demand high-quality, impartial and trustworthy information on EERs. Information is available but fragmented. It can be offered by building companies. Local governments use various media to increase awareness on retrofits and facilitate information platforms. In Texel, early adaptors can get personally guidance in the retrofit process. 033Energie in Amersfoort forms a platform for companies to distribute information on EERs.

Owner-occupiers generally do not prioritize EERs, although the priority given to EERs is increasing. In Texel, owner-occupiers' who are intrinsically motivated and want to be self-reliant are contributing to this increase. In Amersfoort, desire for a healthier indoor-climate contributes. Additionally, the possibility to combine EERs with renovations increases the given priority in Amersfoort and Texel.

Building Companies

Interviewees mention that building contractors and installers lack necessary abilities. A minority of building companies specialize in EERs. In Texel, pressing demand for installers, risk aversion and supplier contracts are obstructing retrofit realization. In Amersfoort, little investment in training and staff and a lack of communication abilities of installers obstructs realization.

In Texel, collaboration among building companies is sufficient, helped by the fact that it is a small island community. In Texel and Amersfoort, collaboration is considered difficult due to a fragmented building sector. Efforts facilitated by local governments are undertaken to increase collaboration. In Amersfoort and Texel there are platforms that increase collaboration among building companies.

Local Governments

Local governments have little financial means to realize EERs, provincial governments provide current financial means. Additional financial means are needed for Amersfoort's local government to live up to its own ambitions, no decision on this is made yet. Local governments allocate less than one FTE exclusively to EERs in owner-occupied housing.

5.3.3 Juridical Capacity

The local government of Texel sees no legal task to realize EERs in owner-occupied housing. It facilitates local initiatives and platforms with financial means of other governments. In Amersfoort and Texel there is a question of impartiality of the platforms. Impartiality is dealt with by giving owner-occupiers after EERs advice a free choice. In Amersfoort, 033Energie is open to other building companies. Views on the tasks of the local government of Texel are dispersed. Amersfoort's local government was more directive. It is uncertain how it can acquire direction to create a district-oriented energy plan.

Local governments do not have official rules to impose retrofit realization. In Texel a need for more national official rules is expressed. Official rules on monuments obstruct the realization of EERs. The local government of Amersfoort investigates the use of environmental permits to stimulate EERs.

5.3.4 Economic Capacity

Few policy impact overviews were performed in Amersfoort and Texel. The local government of Texel and 033Energie account for granted subsidies. 033Energie expresses their approach is necessary, but cost-inefficient. In both study areas the need for evaluations is expressed.

5.3.5 Political Capacity

In Texel, the energy ambitions of the local government are widely accepted. If policies are financed by the local government, the acceptance shrinks. In Amersfoort, a varying acceptance is described, depending on the various aldermen.

The realization of EERs in owner-occupied housing benefits from local citizens projects on energy efficiency. They create acceptance in local governments for polices and create awareness among owner-occupiers. A select group of enthusiast owner-occupiers is engaged with the realization of EERs. Most owner-occupiers are unengaged and described as conservative. A select group of specialized building companies are engaged with polices on EERs. Most building companies are unengaged and described as risk-averse.

5.3.6 Ranking the Researched Indicators

Interviewees were asked to rank the discussed topics of the interview. The interview topics were the researched indicators. Interviewees from both two study areas positioned the researched indicators of owner-occupiers above indicators on building companies, local governments and the physical environment. These indicators are: *capital*, *information* and *non-capital and informational (given priority)*. These were placed above the other researched indicators (1TG1; 3TP2; 4TI1; 5TI2; 8TI5; 9TO1; 10TO2; 11TO3; 14AG1; 15AG2; 17AP2; 18AI1).

Regulations and the existence of *policy evaluations* are said to be the least important. These two researched indicators concern the local government (1TG1; 3TP2; 4TI1; 5TI2; 8TI5; 9TO1; 10TO2; 11TO3; 14AG1; 15AG2; 17AP2; 18AI1).

6 Discussion

The results are discussed, following the structure of the research questions. To generalize the results for Dutch municipalities relations are made with parts of the theoretical framework. Literature of the theoretical framework are based on studies of European municipalities. Furthermore, the case study areas of this study are frontrunner municipalities. Therefore, these results can cautiously be generalized for municipalities in the Netherlands.

1. *What characteristics of geographical capacity enable governance capacity?*
   In the realization of energy efficient retrofits of owner-occupied houses.

Geographical capacity consists of supporting *natural*, *building* and *infrastructural* characteristics. Kranzl et al. (2014) found that natural climate and geological characteristics enable realization of EERs. Sun hours and windspeed were the climate characteristics considered in this research. Although Texel has more sun hours than Amersfoort, this does not seem to enable the realization of EERs.

Results on building characteristics show that age, ownership structure and common house type influence the realization of EERs (Kranzl et al., 2014; Næss and Vogel, 2012). Results from Texel and Amersfoort show the existence of new buildings enables the realization of energy efficient retrofits. The local government of Amersfoort has developed policies that are based on ownership structure and areas with a common house type. These policies can potentially enable the realization of EERs.

EERs policies in Amersfoort denote that infrastructural characteristics enable the realization of EERs. What infrastructural characteristics enable the realization of EERs depends on future authorities of local governments (Næss and Vogel, 2012). The local government of Texel has no policies on this, this can be explained by its small size.

It is described by Rooijers and Kruit (2018) that local governments need a designating authority to require energy suppliers to stop gas delivery in specific areas. This to prevent lock-in situations. All Dutch municipalities need a long-term approach to designate gasless areas. For the future it is expected that also small municipalities such as Texel need to develop policies on this. This suggests a need for spatial planning, which can perform a strategic and regulatory role enabling the realization of EERs on the local level (Williams, 2013). The strategic role can be performed by identifying long term visions in what areas gas delivery will be stopped. This takes analysis on interrelated parts of infrastructure and buildings. It has to be developed in dialogue with stakeholders

like energy providers. Small local governments such as Texel will be challenged to come up with enough resources to do this.

Future regulations on gas delivery have to be enforced, this is the regulatory role of planning. It can be integrated in the current enforcement tasks of local governments in the Netherlands. Differences between the local government of Texel and Amersfoort are less likely to arise.

The only characteristic of geographical capacity that enables the realization of energy efficient retrofits of owner-occupied houses that is found in this research is the age of the building stock. The ownership structure of buildings and common house type in an area motivate policies of the local government in Amersfoort. These characteristics can potentially enable governance capacity.

2. *What elements of resource capacity enable governance capacity?*
   In the realization of energy efficient retrofits of owner-occupied houses.

Resource capacity was differentiated in three groups (Mees and Driessen, 2011). Inspired by van Doren et al. (2016b); owner-occupiers, building companies and local governments. This suited this research. Resource capacity is discussed based on; *capital*, *information*, *supporting non-capital & non-informational properties*, *budget*, *human resources*, *skills and expertise* and *cooperation* (Dang et al., 2016; Mees and Driessen, 2011; van Doren et al., 2016a; van Doren et al., 2016b; Wilson et al., 2015).

Owner-Occupiers

Results on the availability of money for owner-occupiers suggest it enables the realization of EERs (van Doren et al., 2016b; Wilson et al., 2015). This is suggested by case study research in Amersfoort and Texel and it is supported by results of the questionnaire. Several considerations and problems exist regarding capital of owner-occupiers. Therefore, the local government of Texel has a subsidy scheme. Amersfoort's local government's advocating practices suggest the finance problem cannot be solved on the local level. This corresponds with Hers et al. (2018), who suggests financial policies on the national level.

Results on the availability of information suggest it enables the realization of EERs (van Doren et al., 2016b; Wilson et al., 2015). Results on building platforms in Amersfoort and Texel suggest that they can provide information to owner-occupiers. In order to prevent fragmentation of information.

This research did not cover all the supporting non-capital and non-informational properties that enable the realization EERs. This suggests further research on owner-

occupier's decision-making process, including a control group of non-retrofitters. The bias towards capital and informational attributes that Wilson et al. (2015) found was taken into account in this research. Results on the given precedence by owner-occupiers to EERs suggests it increases. Other non-capital and non-informational properties such as a healthier indoor climate and self-reliance play a role for owner-occupiers (van Doren et al., 2016a).

Three elements of the owner-occupier's resource capacity enable governance capacity in the realization of energy efficient retrofits; capital, information and supporting non-capital & non-informational properties. This suggests clarity on the importance of owner-occupiers in the realization of EERs. This is supported by the results of the questionnaire and described by Wilson et al. (2015).

Building Companies

The results on the building companies abilities suggest that skills and expertise enable the realization of EERs (van Doren et al., 2016b; Wilson et al., 2015). The observed lack of abilities suggests that there are few specialized building companies. Different barriers are observed in the study areas Texel and Amersfoort. Barriers as pressing demand, risk aversion, vendor lock-ins (supplier contracts), little training and lack of communication skills. This case study research cannot give clarity on the extend these barriers are typical for the study areas.

Results on cooperation between building companies suggests cooperation enables retrofit realization (van Doren et al., 2016a). Cooperation appears affected by different local conditions, this results in different policy efforts. This suggest divergent business structures and networks in the case study areas (Geels, 2002; Gustavsson et al., 2009). Interview results suggests fragmentation of the building sector. In this context local governments partner with other public- private- and civic actors to realize EERs (Betsill and Bulkeley, 2006). This suggests a need for collaborative planning to enable the realization of EERs (Williams, 2013). Being frontrunners the local government in Texel and Amersfoort both have facilitated building company's platforms. In Texel the platform consists of an energy advice office that has tight links with a few building companies. In Amersfoort it is set up at a larger scale in which also for example financial institutions collaborate. What they have in common is the ability to create learning experiences for local governments and create new partnerships between building companies and local governments. The differences can be attributed to a small island community versus a medium sized city.

Several barriers and context dependencies exist, but the two elements of the of building company's resource capacity enable governance capacity in the realization of energy efficient retrofits; skills and expertise and cooperation.

Local Governments

Interview results from Texel and Amersfoort denote little budget and human resources. There are budgetary dependencies for provincial resources (Emelianoff, 2014). Local governments budgets influence the resource capacity of building company's and owner-occupiers. Therefore, local governments budget and human resources enable the governance capacity in the realization of energy efficient retrofits.

3. *What elements of juridical, economic and political capacity enable governance capacity?*
   In the realization of energy efficient retrofits in owner-occupied housing.

Results on a clear role of local governments, regulations, policy evaluations, political priority and active involvement of actors are discussed following the structure of Nelissen's JEP-triangle (Dang et al., 2016; Hoppe et al., 2016a; Mees and Driessen, 2011; 2002; Sullivan et al., 2013; Van Gossum et al., 2011).

Juridical Capacity

Results from interviews suggest that there is a question of local government leadership (Nelissen, 2002; Sullivan et al., 2013). Local governments of Texel and Amersfoort have high ambitions but have no legal tasks. Interview results suggest that the local governments of Texel and Amersfoort initiate and facilitate initiatives as building companies' platforms and hereby enable the realization of EERs. Results from interviewing local experts on building platforms suggest that openness and free choice ensures impartiality. A clear local government's role expressed in initiating and facilitating building company's platforms enables governance capacity in the realization of EERs.

Results from interviews denote that currently no local regulations exist in the Netherlands that enable the realization of EERs (Mees and Driessen, 2011). The result from the questionnaire suggest local regulations are less important than other elements. Currently no local regulations enable governance capacity in the realization of EERs.

Facilitating and initiating building company's enables realization. But the question of leadership remains. The results from the study area Amersfoort suggest uncertainty on the role of local governments in district-oriented energy plans. Further research on the roles and boundaries of local governments can take the distinction of Geels (2011) into account (Liefferink, 2006). First, local governments can be the primary actor of the national energy transition. Second, municipalities can be locations where radical innovations are developed. Third, local governments can have a limited role in the energy

transition, with a greater role for market dynamic and large established firms (Geels, 2011).

Economic Capacity

Both the local government of Amersfoort and Texel seem to perform little policy evaluations (Hoppe et al., 2016a; Nelissen, 2002). Results on the policy evaluations documents do not make clear to what extent policies on the realization of EERs are effective. The extent to which policy evaluations are useful in enabling the realization of EERs in owner-occupied housing is unknown. Results based on interviews do suggest a certain use of policy evaluations. Therefore, policy evaluations do enable governance capacity in the realization of energy efficient retrofits of owner-occupied housing.

Political Capacity

Results from interviews suggest high political priority given to polices that enable the realization of EERs in owner-occupied housing (Mees and Driessen, 2011). In both Texel and Amersfoort results from interviews suggest that political priority relies on the alderman in charge and the impact of polices on the local government's budget. Therefore, political priority enables governance capacity in the realization of EERs in owner-occupied housing.

Actors were earlier in this research defined as individuals and collectives that purposively try to generate or prevent change (Bos et al., 2013). Results from interviews suggest that not all actors are involved in generating change (Dang et al., 2016; Van Gossum et al., 2011). Involvement of a select group of specialized building companies enable the realization of EERs. Individually and through collective citizens initiatives a select group of enthusiast owner-occupiers is involved in policies that enable the realization of EERs.

4. *Which actors are involved in the local energy transition in owner-occupied housing?*

Actors were earlier in this research differentiated in public- private- and civic actors (Betsill and Bulkeley, 2006). Geels (2010) explained that private actors lack enough incentives to address energy efficiency problems. This is also suggested by the results of the interviews and the questionnaire in this research. Actors involved in the local energy transition are *local governments*, *building companies* and *owner-occupiers*. In Texel and Amersfoort there is a fourth group of actors. For methodological purposes they were defined as actors that link policy with citizens and link market supply of EERs with consumer demand. The results from the two case study areas suggest that these actors can be building companies' platforms, energy advice offices or citizens' projects. They enable access to information for owner-occupiers and cooperation for building companies

on the realization of EERs. In the local energy transition in owner-occupied housing, apart from local governments, building companies and owner-occupiers, building company's platforms, energy advice offices and groups of citizens are involved.

The concept of governance capacity did not give a suitable framework to research these actors. Therefore, for further research the *Multi Actor Perspective* (MAP) from Avelino and Wittmayer (2016) is proposed. In MAP, actors are divided in four sectors: state, market, community and third sector. Each of these sectors harbors both niche and regime actors. The sectors are formed based on the contested and blurred boundaries between formal vs informal, profit vs non-profit and public vs private. Based on their level of aggregation, actors are subdivided into sectoral actors (government, energy sector, building construction sector), organizational actors (firm, governmental department) and individual actors (policy maker, consumer, entrepreneur) (Avelino and Wittmayer, 2016).

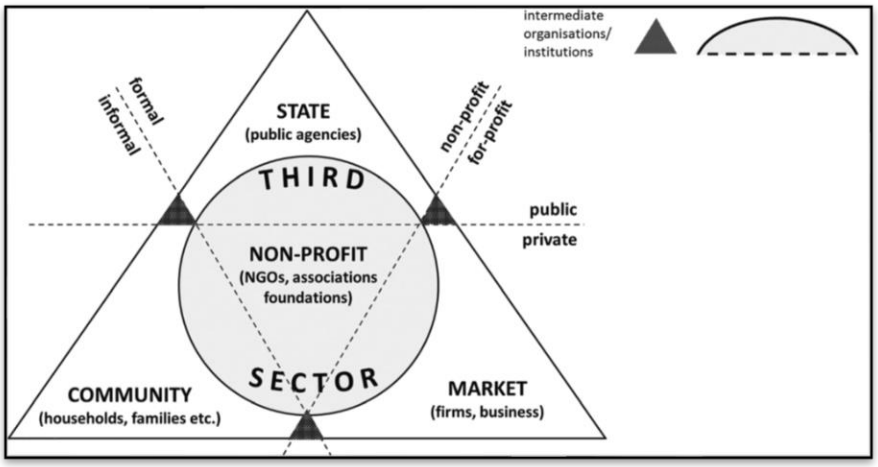

Figure 6.1 Multi Actor Perspective (Avelino and Wittmayer, 2016).

The fourth group of actors in this research is located above the line between formal vs informal. For a more detailed analyses further research is proposed.

6.1 Limitations

The data for the results were validated as much as possible, but this was not perfect. To increase the credibility of the results, three limitations of this research are described.

First, interviewees only shared knowledge based on their point of view. Real estate agents speak to owner-occupiers on a day to day basis. Nonetheless, their view is limited to the time an owner-occupier sells or buys a house. This holds true for every interviewee. This suggests more research based on more interviewees.

Second, qualitative case study research is about interpreting the interpretation of interviewees. By validating the interviewee statements, the biases of the researcher were

reduced, but they did not disappear. If researchers cooperate with each other, researchers can check for consistency in coding. This suggest more cooperative research.

Third, cross-checking results on 13 indicators in nineteen interview transcripts, two local government websites, six documents, KNMI and CBS data was challenging. Not all results could be triangulated. Certain results were considered legitimate based on the researched context but could not be triangulated. This suggest more research based on more documents.

7 Conclusions

What aspects of governance capacity enable the local energy transition in owner-occupied housing?

The resources of owner-occupiers, local governments and building companies enable the shift from a fossil- to a renewable-energy-based owner-occupied housing. Owner-occupiers are found to be the most important actors that can generate change. Their access to capital and information enables the energy transition. It is found that the barriers of access to capital cannot be solved locally, and also that building companies can provide information. Nevertheless, the building sector is characterized by fragmentation. Impartial building companies' platforms can increase the abilities of affiliated companies; they can link policy with citizens and market supply of energy-efficient retrofits with consumer demand

The local government's facilitation of building companies impacts the available resources. It is found that if the energy transition impacts the local government budget, political priority shrinks. The actors' involvement is found to be depended on a few owner-occupiers and building companies.

In terms of the physical environment, it is found that the energy transition is constrained by building characteristics age of buildings and ownership structure. Regarding the infrastructural characteristics, it is found that it depends on future authorities of local governments whether it can enable the energy transition. What can be concluded for now is that local governments have a role to perform in strategic and regulative planning to prevent lock in situations.

The window of opportunity for energy efficient retrofits in owner-occupied housing is the period when conditions help large-scale realization. The findings of this research implicate that this period has not yet arrived. There is still a situation full of barriers that make local energy reductions goals are not met. Local governments, building companies and owner-occupiers experience different barriers. Owner-occupiers are found to be the most important actors that can generate change. Their access to capital, information and the contexts of their daily lives enables the local energy transition. This means that owner-occupiers are key to create a win-win-win situation for local governments, building companies and owner-occupiers in the energy transition.

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9 Appendices

9.1 Appendix 1: List of Interviews

Code	*Function*	*Organization*	*Date*
Texel			
1TG1	Sr. Policy Advisor	Local Government	20-11-2017
2TP1	Director	Building Company	24-11-2017
3TP2	Director	Building Company	22-11-2017
4TI1	Energy Advisor	Energy Advice Office	21-11-2017
5TI2	Consultant	Energy Supplier	23-11-2017
6TI3 (U/P)	Former Director	Energy Supplier	07-11-2017
7TI4 (U/P)	Project Leader	Energy Advice Office	27-11-2017
8TI5 (U/P)	Energy Advisor	Energy Advice Office	09-11-2017
9TO1	Real Estate Agent	Real Estate Agency	21-11-2017
10TO2	Real Estate Agent	Real Estate Agency	21-11-2017
11TO3	Owner-Occupier	-	23-11-2017
12TO4	Owner-Occupier	-	23-11-2017
13TO5	Owner-Occupier	-	27-11-2017
Amersfoort			
14AG1	Sr. Policy Advisor	Local Government	28-11-2017
15AG2	Project Leader	Local Government	04-12-2017
16AP1	Director	Building Company	16-11-2017
17AP2	Director	Building Company	28-11-2017
18AI1	Project Leader	Energy Advice Office	02-12-2017
19AO1 (P)	Real Estate Agent	Real Estate Agency	17-04-2018

U: Unstructured / P: Phone

9.2 Appendix 2: Interview Questions

1. Wat doet u voor dagelijks taken binnen uw functie voor (project)?
2. Kunt u vertellen hoe ...(project)... tot stand is gekomen?
3. Wat is de rol van ...(afdeling/organisatie)... hierin?
4. Wat zou u als de verantwoordelijkheid van de gemeente ...(plaats)... omschrijven binnen het onderwerp energiebesparing in koopwoningen?
    a. Hoe zou u de mate van duidelijkheid hierover beschrijven?
5. Is er een leidend persoon, afdeling of organisatie geweest in het proces?
    a. Is die er nu?
6. Kunt u beschrijven hoe het politieke draagvlak voor energiebesparing in koopwoningen is geweest?
    a. Hoe is het politieke draagvlak op dit moment?
7. In hoeverre speelt de beschikbaarheid van financiering een rol in de toepassing van energiebesparende maatregelen in koopwoningen?
    a. Hoe beïnvloedt dit het beleid / de werkwijze van ...(organisatie)...?
8. In hoeverre speelt de beschikbaarheid van informatie een rol in de toepassing van energiebesparende maatregelen in koopwoningen?
    a. Hoe beïnvloedt dit het beleid / de werkwijze van ...(organisatie)...?
9. In hoeverre speelt de verleende prioriteit door huiseigenaren aan energiebesparende maatregelen een rol in de verdere toepassing?
    a. Hoe beïnvloedt dit het beleid / de werkwijze van ...(organisatie)...?
10. Hoe zou u de betrokkenheid vanuit huiseigenaren bij beleid voor energiebesparing in de gebouwde omgeving beschrijven?
11. Hoe zou u de betrokkenheid vanuit advies- bouw- en installatiebedrijven bij beleid voor energiebesparing in de gebouwde omgeving beschrijven?
12. Hoe zou u de samenwerking tussen advies-, bouw en installatiebedrijven omschrijven?
13. Wat kunt u zeggen over de vaardigheid en deskundigheid van deze bedrijven?
14. In hoeverre spelen volgens u de fysieke eigenschappen van de omgeving en de woning een rol in de verdere toepassing van energiebesparende maatregelen?
    a. En hoe zit dit met de eigendomsvormen?

15. Welke gemeentelijke regels, regelingen, voorschriften etc. bepalen volgens u de praktijk van energiezuinige renovaties en hernieuwbare energieopwekking in koopwoningen?
    a. Hoe zit dit op hogere bestuurlijke schaalniveaus?
16. In hoeverre is het beleid voor energiebesparende maatregelen op doelmatigheid en doeltreffendheid geëvalueerd?
17. Wat is er u bekend over de financiële middelen voor energiebesparende maatregelen binnen de gemeente ...(plaats)...?
18. Wat is er u bekend over het totaal toegewezen personeel voor energiebesparende maatregelen binnen de gemeente ...(plaats)...?

9.3 Appendix 3: Questionnaire

Welke aspecten van energiezuinige renovaties en hernieuwbare energieopwekking in koopwoningen zijn volgens u het meest bepalend voor verdere toepassing?

(1=meest bepalend; 15=minst bepalend)

	Aspecten	**Rangschikking (1-15)**
Huiseigenaren	Beschikbaarheid van financiering	
	Beschikbaarheid van informatie	
	Mate van prioritering	
	Mate van betrokkenheid bij beleid	
Gemeente	Grootte v.d. toegewezen financiële middelen	
	Aantal aangewezen personeel (FTE's)	
	Duidelijkheid over eigen rol	
	Aanwezigheid van regelgeving	
	Aanwezigheid van beleidsevaluaties	
	Mate van politieke prioritering	
	Aanwezigheid van leiderschap (persoon/ afdeling/organisatie)	
Bouw en installatiebedrijven	Mate van vaardigheid en deskundigheid	
	Mate van samenwerking tussen bedrijven	
	Mate van betrokkenheid bij beleid	
Woningen	Invloed van gebouw karakteristieken	
Overig	…	