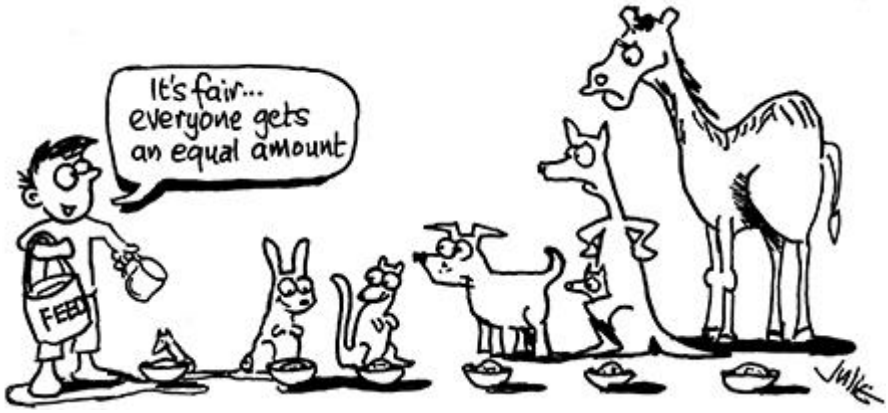
Equity in the Energy Transition

Understanding the physical and social provisioning systems as a solution for energy poverty in the energy transition

Keywords: Doughnut Economy, Human Needs, Provisioning systems, Capability Approach, Energy Justice, Social Capital, Socioeconomic Status, Energy poverty



(Donnely, 2014)

Master Thesis

Jaap van den Langenberg

MSc Spatial Planning
Cities, Water and Climate Change

Nijmegen, July 2021

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Preface

Welcome,

I am Jaap van den Langenberg and in front of you, you have my master thesis, 2021. Since I was 16th I have been committed to the green environment. Started as a gardener from secondary vocational education (MB), then obtained my University of Applied Science (HBO) with the study Garden and Landscape Design and with this thesis I have also successfully completed my university career in Spatial Planning and a specialization in Cities, Water and Climate Change. Now 30 years young, travelled a long way. With this knowledge in mind, you might think: Why this topic and why does not he do something with 'green in cities' or 'climate adaptation'? I've thought about that myself! I never thought I would come up with equity in the energy transition. However, guided by the inspiration of the Donut Economy Framework and related scientific articles I came to the topic of provisioning systems. You will notice that in my research the Donut Economic Framework is not a theoretical construct on which my research is based on. However, this framework has led to a view of research in its integrality and to connect the economy, ecology and social topics. I look back on this with due pride. At the same time, the Donut Economy Framework offered me to look at social and physical provisioning systems that affect us people with whom we are involved on a daily, but unconscious basis, and which can partly determine the quality of our lives. I never thought in advance that 'de mens' (human) should be at the heart of my research, but I am glad that this has happened. This refers to current events in our society such as the current governance style of the cabinet of 2021 and the change it demands from a welfare economy to an embedded economy in which society has a central place, as described in the Donut Economy. Nevertheless, it was a very educational period in which I was able to contribute to the social and scientific debate with the new acquired knowledge from this research. The research is particularly interesting for energy cooperatives, policy advisors, civil servants and fellow researchers.

I could not have completed this research without the proper guidance of Prof. Erwin van der Krabben. I thank him for sharing his knowledge and wisdom. In addition, I thank Reindert Augustijn and Anya van Beek of the province of Gelderland for using their network during my graduation internship at the province. In particular, I thank my partner, Anne Schmitz. She helped me to spend two days spreading around invitations in Ede, Zutphen and Arnhem. In addition, she supported me during the more difficult moments. Certainly, in COVID-19 time it was not always easy to work from home with limited contacts to be inspired during writing the master thesis.

Good luck reading, I hope it is as instructive for you as a reader as it has been for me as a writer.

Jaap van den Langenberg
Nijmegen, 9 July 2021

Abstract

With the transformation to renewable energy, governments have to invest in renewable energy projects. However, society also needs to bear the costs of this transformation. The problem is that 8% of the Netherlands live in energy poverty. Costs of the transition are pressuring on the disposable income for which reason households make less use of own energy services, affecting their quality of living. This can cause health problems and increase inequalities since households living in energy poverty cannot invest in renewable energy services. Research showed that alternatives on social and physical provisioning systems are needed and that community initiatives can provide both. The central assumption is that some of the core institutional elements of the provisioning system -state, homeowners with a low socio-economic status and community initiatives- and the interplay between them are conflicting. The goal is to understand how the physical (accessibility and affordability) and social (government and community initiatives) aspects of provisioning systems in the energy domain meet the needs of low-income homeowners in the province of Gelderland, the Netherlands. The research is conducted in a convergent mixed method approach with the strategy of case studies with document analysis and interviews, and a survey to answer the research question: *"To what extent do low-income homeowners in the Regional Energy Strategy regions: Arnhem-Nijmegen, FoodValley and CleanTech region, have access to local renewable energy cooperatives and projects, in terms of capabilities, government incentives, affordability and social inclusion?".* The qualitative research shows that affordable access can be created by making financial constructions available, but that social problems do not make it easy for the target group to get involved. This appears to require resources other than access to energy projects. Local Energy Cooperatives are also not seen as a panacea for vulnerable households. Collaboration between different social parties seem to offer a solution to get behind the front door of the households to work on both problems and a combination of instruments, programs and projects. The difference in organizational objectives also seem to have an impact on accessibility and therefore on the inclusiveness of Local Energy Cooperatives. However, the quantitative data shows that there are no significant results in which the capabilities of households affect accessibility to Local Energy Cooperatives or policy instruments made available and that the perception of trust and seeing other households as equal to them, do not affect fellow citizens. The conclusion is that three out of four activities of the Local Energy Cooperatives are accessible but it is not easy to ensure this accessibility. There is little enthusiasm from the target group. The energy bill is not the only concern of the target group since there are often underlying social problems. Creating financial guarantees for Local Energy Cooperatives is creating financial risks for municipalities which is undesirable. Organizational objectives furthermore affect accessibility of energy projects and due to insufficient capacity and tight budgets at municipality level this obstacle is increased. Besides, the target group is not eligible for government incentives to increasing sustainability of houses. Finally, Zutphen and Arnhem have a relative high extent of energy justice. Where Zutphen is highly cooperating with the Local Energy Cooperative. Arnhem does not specifically put emphasize on Local Energy Cooperatives. The province of Gelderland and Ede have a relatively low extent of energy justice. The province, since instruments are not useable for the target group and Ede since it is emphasizing a lot on neighborhood initiatives and it remains unclear how they combat energy poverty.

Limitations in the research are the skewed quantitative data and a low response which make the data not representative for the population as a whole, only for the sample used in this research. Recommended is to have further research in the lived experience and capabilities of homeowners with a low disposable income. Interesting is then to interview social teams, interest groups and the

relevant target group. Also, to have further research in the psychology of the target group, questioning how they think, how they want to be involved and how they need to be approached among others.

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Abbreviations

AO	Association of owners
CA	Capability Approach
CSO	Civil Society Organisation
CrA	Cronbach Alpha
DEF	Doughnut Economy Framework
DV	Dependent variable
ELMG	Energy Counter middle Gelderland
GHG	Green House Gas
HW	Human Wellbeing
IV	Independent variable
LEC	Local Energy Cooperative
PC	Production cooperatives
PS	Postcode rose scheme
RE	Renewable Energy
REIJE	Rijn en Ijssel Energy
RES	Regional Energy Strategy
RRE	Regulation Reduction Energy Consumption
SCE	Subsidy scheme for Cooperative Energy generation
SDG	Sustainable Development Goal
SES	Socioeconomic Status
SJS	Safe and Just Space
THN	Theory of Human Needs
UN	United Nations
VE	ValleiEnergy
VIF	Variance Inflation Factor
ZE	ZutphenEnergy

1. Introduction

In 2012 the Doughnut Economy framework has been introduced by Kate Raworth out of a need of a multi-dimensional and multi-disciplinary approach for sustainable development (Raworth, 2012). This framework highlights the interconnectedness between social, environmental and economic aspects and its dimensions crucial to achieving sustainable development in the boundaries of a thriving population and a low level of biophysical resource use. The framework (see page 9) itself works with two boundaries. The environmental (outer circle) ceiling and the social (inner circle) foundation which are linked to the Sustainable Development Goals (SDGs). Between those boundaries the safe and just space for humanity finds place in which people can live not only meeting their human needs and rights, but also thrive without depleting the environment. To develop policies concerning one dimension without sabotaging another will be a primary concern for a sustainable future. Therefore, the 'Safe and Just Space' (SJS) framework (Fanning, O'Neill, Daniel & Büchs, 2020) acts as a 'compass' for the future in which thoughtful planning is central to the question of how humans can thrive and the economy flourish without pushing the boundaries of planetary processes. However, thriving in the 'safe and just place' (O'Neill, Fanning, Lamb, & Steinberger, 2018) is complex because social and planetary boundaries for earth-system stability are interdependent. Different then the mainstream economy which considers supply and demand from household and businesses, the Doughnut is described as the 'embedded economy'. A model in which the earth and society are involved in the economy and incorporate activities of the households, the market, commons and the state. They are seen as the provisioning systems and differ from each other *" .. in terms of underlying values and principles, how financed and regulated (Powell, 2019)"* (O'Neill, Fanning, Lamb, & Steinberger, 2018) and foresee in both physical and social aspects of provisioning (Steinberger, 2020).

The Netherlands have committed themselves to the climate agreement of Paris with the consequence that a higher production of energy from renewable resources is necessary. However, they are behind compared to other European countries (euobserver,2020; Aardewijn, 2020; Lalor, 2020; Brelie, 2020; Kraaijenbrink,2020). The Ministry of Economic Affairs and Climate (2020) and the Province of Gelderland (2020) have developed climate plans, and the 'Planbureau voor de Leefomgeving' (Netherlands Environmental Assessment Agency, 2020) developed the Regional Energy Strategy (RES) for the Netherlands to transform from fossil fuel energy to renewable energy. Despite the commitments and transformations there is a counter-side. Achieving the set of goals requires investment in sustainable ways of societal partners, companies and citizens. To stimulate these investments and to cover costs, governments intervene with financial instruments, said interventions have consequences such as increased energy prices and tax rates (Planbureau voor de Leefomgeving, 2018). Netherlands Environmental Assessment Agency (2018), City affairs (2020), TNO (2020) and the Social Alliance (2020) emphasize that groups with a lower Socioeconomic Status (SES), are known as people who live in 'Energiearmoede' (energy poverty), in private and rent houses are affected harder with these financial consequences. Frist, these groups are vulnerable since this puts pressure on disposable income and they start compensating by turning of heaters. This gives them less access to the use of their own energy services and eventually can cause health problems. Second, these groups also do not have the financial ability to invest in sustainable energy. Subsequently, cannot make use of the subsidies to which they contribute financially due to the increased tax rates. The gap to transform from fossil-fuel energy to renewable energy gets larger and the inequalities between the income groups grow (Sociale Vraagstukken-redactie, 2019). Third,

they have less money for covering basic living needs which is affecting their quality of living. We assume that homeowners with a low SES do not have the ability to invest in renewable resources, but that provisioning systems and how they interact affect in order to thrive in a safe and just space for humanity. To make renewable energy affordable, accessible and social equitable a collective approach within communities can help to solve the problem (Janssen, 2020; Steinberger, 2020; Middlemiss et al., 2019)

1.1 Societal relevance

The Netherlands has committed itself to the Paris Agreement and to the SDGs. In addition, the United Nations (UN) released the Agenda 2030. It is emphasizing that 'to ensure that no one is left behind' and that access to energy should be affordable and accessible to all (United Nations, 2015). To meet the objectives of the agreements made, the Dutch government wrote a climate plan on national and regional level. The success of the climate plan depends on the effective cooperation between government layers, new forms of cooperation between (market) parties and an active involvement of citizens in the policy. Provinces have an important role in connecting and directing tasks in the physical environment when regional interests are present. The regions and therefore the provinces are seen as the scale level from which energy transition can be connected to the physical and social environment (Ministerie van Economische Zaken en Klimaat, 2020). The RES is developed as a tool to work together at regional level between societal partners, companies and citizen to achieve the goal of 35 TWh of renewable energy (Planbureau voor de Leefomgeving, 2020). Basically, this has to be provided from solar fields and panels on houses, and wind turbine fields (Planbureau voor de Leefomgeving, 2020). Monitoring is crucial as the policy processes of the energy transition are new and need to be explored. Both, the national and provincial climate plan are aware that the energy transition has financial consequences. Energy taxes are increasing because investments need to be made for the energy transition and tax money will be used to create subsidies which are developed to encourage society to invest in renewable energy (Ministerie van Economische Zaken en Klimaat, 2020; Provincie Gelderland, 2020). Questionable is, how 'fairly' the burdens and the benefits are distributed in society since it is pressuring on the income of households which is increasing inequalities and has impact on the quality of living. Furthermore, the question arises of how accessible this form of investment is for vulnerable groups of society. The assumption is that insights in the distribution of financial resources and the perspective of citizens could steer the quality and implementation of the energy transition of the climate agreement where necessary in the future. Within the framework of this research, recommendations can be made where to improve provisioning systems that make access to renewable energy resources affordable and socially equitable. Indirectly this research contributes to a more efficient regional energy transition in the province of Gelderland and is it contributing to the SDG's. In particular to SDG 7 *'Affordable and clean energy'* and SDG 11 *'Sustainable cities and communities'* (United Nations, 2020).

1.2 Scientifical relevance

Fossil-fuel energy systems are the largest contributors to Greenhouse Gas (GHG) emissions which foreseen in our human needs of energy services and additionally are the main drivers of climate change (Brand-Correa & Steinberger, 2017; Raworth 2020; Wood & Roelich, 2019; Otterman, Wiering & Helderman, 2014). Alternatives on social and physical provisioning systems are needed to create efficient pathways of energy demands in satisfying the needs of humans with a low level

of biophysical resource use (Raworth 2020; Fanning, et al., 2020; Wood & Roelich, 2019; Lamb & Steinberger, 2018; Brand-Correa & Steinberger, 2017). Households, markets, the commons and the state are considered to be core institutional elements and 'realms of provisioning' (Fanning et al. 2020; Raworth, 2020). Dr. Julia Steinberger (2020), Janssen (2020) and McCauley (2019) explain that 'the community' is a possible way out to decouple well-being from scarce resource use. Collective socio- technical provisioning systems as in *"...local supply network..."* (Steinberger, 2020, par. 9) at the community level can provide both the physical and social aspect. The assumption is that gaining insight in the provisioning systems can be useful to identify conflicts between the institutional arrangements and the needs of vulnerable households living in energy poverty.

Between 50 and 125 million Europeans and 8% of Dutch households live in energy poverty and 38% have difficulties making a decent living of their disposable income (TNO, 2020). It has economic and social implications such as affecting the quality of life and a less inclusive society (TNO, 2020; Demski, Thomas, Becker, Evensen & Pidgeon (2019), McCauley, Heffron, Stephan & Jenkins, 2019; Day, Walker & Simcock, 2016; Sovacool & Dworkin, 2015). Questionable, is this are underlying collective action problems or is it lacking a social inclusive character in society (Evans, 2004). Insights in energy poverty provides rich information to develop targeted policies, financial incentives, programmes or mobilise access to services which are relevant to energy justice in society (TNO, 2020; McCauley et al., 2019; Day et al., 2016; Sovacool & Dworkin, 2015). Insights in a social inclusive society should identify if there is the existence of social relations between networks, civil society and local government (Evans, 2004; Rydin & Pennington, 2010; Hayes, Gray &Edwards, 2008).

The relevance of this research is two folded. First, little research has been conducted on how the structuring of physical and social provisioning are influencing the human basic needs and how they can be satisfied. We seek to address this gap by researching how the provisioning systems influence the accessibility for low income homeowners with energy poverty to affordable renewable energy in community initiatives. Second, we wish to contribute to a better understanding of which living conditions create this unjust environment in the access to renewable energy resources for vulnerable households. The central assumption is that some of the core institutional elements of the provisioning systems -state, homeowners with a low SES and community initiatives- and the interplay between them are conflicting.

Research goal and question

The research goal is to understand how the physical (accessibility and affordability) and social (governments and community initiatives) aspects of provisioning systems in the energy transition meet the needs of low-income homeowners in Arnhem, Zutphen and Ede. Understanding the process of the provisioning systems goes beyond the mainstream economic processes and highlights the activities of the households, market, common and the state, as explained by the 'embedded economy' of Raworth. In this research this is explained as the province of Gelderland and municipalities (read: state) in the Regional Energy Strategy (RES) regions: Arnhem-Nijmegen, Foodvalley and CleanTech region; Homeowners with a low SES (read: vulnerable households): And local non-profit renewable energy cooperatives. Insights in these processes are useful to explain to why the access to renewable energy cooperatives and projects are not affordable and social equitable. This enables governments and local energy cooperatives to intervene in provisioning systems and tailor provisions to the needs of vulnerable groups. For the province of Gelderland these insights could be helpful when recalibrating the program management of the climate plan

and liveability. Hence the following research question with corresponding sub questions have been developed:

"To what extent do low-income homeowners in the Regional Energy Strategy regions: Arnhem-Nijmegen, FoodValley and CleanTech region, have access to local renewable energy cooperatives and projects, in terms of capabilities, government incentives, affordability and social inclusion?"

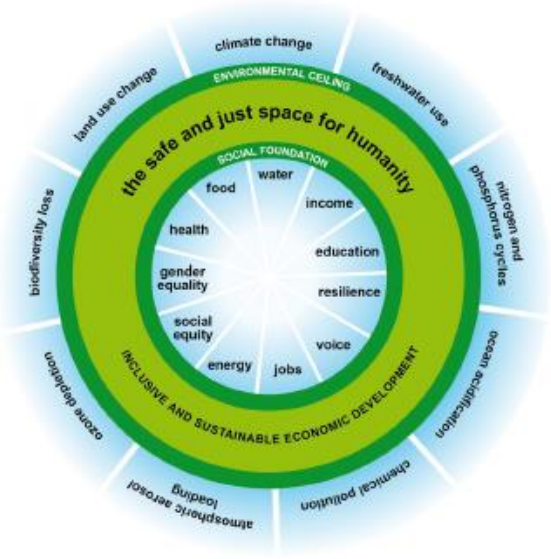
1. Which types of local energy cooperatives and projects can be distinguished?
2. What participation conditions have been set by the Regional Energy Strategies?
3. How does the government and local energy cooperatives incorporate social inclusion?
4. How does government facilitate access to the local energy cooperatives?
5. What are the underlying conditions to gain access in the local energy cooperatives and projects?
6. Do the capabilities and low socioeconomic status of vulnerable household influence access to local energy cooperatives?

2. Literature review

The central assumption of this research is that some of the core institutional elements of the provisioning system -state, vulnerable household and community initiatives- and the interplay between them are conflicting. The state and community initiatives are seen as alternatives to contribute in satisfying the needs of vulnerable households living in energy poverty. This chapter defines, conceptualize and operationalize these abstract terms based on fundamental theories and operational academical articles. First, we further elaborate on the starting point of the research, the Doughnut Economy Framework (DEF). Second, we concentrate on the broader theoretical literature of human needs and provisioning systems. Third, the theory of Energy Justice and conceptualization of energy poverty. Finally, the role of community initiatives and the theory of Social Capital.

2.1 Doughnut Economy, Human needs and provisioning systems

In the introduction an explanation of the DEF is partly given and will be further elaborated in this chapter. The DEF framework is the compass for this research and is used as the contribution to all three dimensions of the SDGs, the social, economic and ecological dimensions. The DEF divides the dimension in two boundaries. The environmental (outer circle) ceiling and the social (inner circle) foundation (fig. 1). Between those boundaries the safe and just space for humanity finds place in which people can live not only meeting their human needs and rights, but also thrive without depleting the environment. The social boundaries of the DEF are the basic human needs of human wellbeing and understood as widely agreed social norms adopted from the SDGs. This research is focusing on the dimensions of social equity and having access to affordable and clean energy. To satisfy the needs of homeowners with a low-income and move into the safe and just space, a greater equity in the distribution of resource is necessary. This means equal chances for poor and rich in society (Gough 2019).



Source: Oxfam. The 11 dimensions of the social foundation are illustrative and are based on governments' priorities for Rio+20. The nine dimensions of the environmental ceiling are based on the planetary boundaries set out by Rockström et al (2009b)

Figure 1, the Safe and Just Space for humanity to thrive in (Raworth, 2012).

Different articles and books (Steinberger 2020; Gough 2020; Gough 2017; Brand-Correa, Mattioli, Lamb, & Steinberger 2020; Lamb & Steinberger, 2017; Brand-Correa & Steinberger, 2017; O'Neill et al, 2018; Alkire, 2002) use and explain different theories of well-being. Lamb & Steinberger (2017) and Brand-Correa & Steinberger (2017) emphasize on an understanding of theories of well-being since *"…alternative starting points can lead to very different practical outcomes in the assessment of well-being and its implications for climate change mitigation." (Lamb and Steinberger, 2017, p.2).* Deciding on a typical approach seems to be consequential for *"conceptualizing the socio-technical provisioning systems that convert biophysical resources into well-being outcomes"* (Lamb & Steinberger, 2017, p. 1). Differences can be made between hedonic and eudaimonic theories. Hedonic, refers to happiness or subjective well-being and is assessing for instance, individual life satisfaction of their own desires and maximizing their own happiness. This seems to have its origin in the welfare economics with the satisfaction through market consumption with little focus on the social aspects of well-being, such as social justice. Eudaimonic theories focus on 'flourishing' and on the 'functioning's' that constitute a well-lived life. The eudaimonic approach has an objective view on studying the individual in the broader context, with the purpose of letting the individual flourish and participate within society. This is convenient when studying social institutions and political systems since they have the ability to let individuals flourish in their systems. This eudaimonistic approach is considered to be the basis of Sen and Nussbaum's, Capability Approach, Max-Neef's Humans Scale Development, and Doyal and Gough's Theory of Human Needs and refers to human needs, capabilities and multidimensional poverty. The eudaimonic lens helps to understand how the vulnerable in society can participate in the energy transition and keep on flourishing within society and their own life.

The book of Gough (2017) explains the Theory of Human Needs from Doyal and Gough (1991) and underpins the SJS framework from Kate Raworth. It adopts from the framework the social dimensions of wellbeing and is concerned with equity and justices, and how wellbeing is distributed between people. In order to reach a sustainable wellbeing they developed universal human needs. They rest on the belief that needs need to be satisfied to*"…avoid harm, to participate in society and to reflect critically upon the conditions in which they find themselves." (p3).* For effective participation in any form of social life the distinction has been made between two most basic human needs: *health* and *autonomy*. Without physical and mental health, it is not possible to participate in society and without autonomy it is not possible to make *"…informed choices about what should be done and how to go about doing it…" (*p.42). The universal human needs are *objective*, *plural, satiable* and *non-substitutable.* To satisfy these needs and to inform politics for public policy a foundational level of needs satisfaction is required. These are formulated as the *optimum* level when appropriate resources optimize the possibility for activities and participation in society. This is considered to be I*ntermediate* needs with the components of material and psychological goods, activities and relationships. Examples are nutritional food and water, appropriate healthcare and basic education. The *Constrained* optimum, is emphasizing on the difference in socio-economic resources and if fairly distributed over social groups to be able to reach an acceptable level of wellbeing. Important is to understand that satisfaction differs within different social context but also in goods, services, activities and relationships. To study the difference between universal needs and specific needs within different social groups Gough (2017) uses a dual strategy that studies two forms of knowledge: *Codified* and *Experientally grounded* or *practical* knowledge. The former

knowledge will be gathered from experts in the field. The latter knowledge will be gathered from understanding people in their everyday lives and contexts. The human needs, as also explained by Raworth (2020), are embedded in the socio-economic system since need satisfiers are depending on 'material needs' produced and distributed by the system. Four societal preconditions are needed: *production*, *reproduction, cultural transmission* and *political authority.* To let a social group flourish, by satisfying the intermediate needs, the societal preconditions should be present and are therefore hardly depending on *institutional satisfiers*. In terms of a sustainable wellbeing or sustainability this has to be *"…understood in three domains: economic, social and environmental…with each of them requiring its own provision for their 'continuance'."* (p. 51) Till this far there are two concepts of sustainable wellbeing: universal human needs (individual), and sustainable preconditions (collective) for satisfying those needs they are dependent on each other for an overall success. However, Gough (2017) is emphasizing that success can only be met by a fair distribution of these need satisfiers which can be considered as the burdens and benefits of different programmes which let rich and poor social classes equally count. In the context of climate change and the related issues of social justice and human rights, a moral compass and duty from agents and global and national institutions is then necessary. This cannot be met with only an altruistic behaviour, that is why universal needs and the Doughnut Economy are grounding on human rights. Two aspects of human rights are relating to this research since it is focusing on the physical and social provisioning system for human needs satisfaction. The first element is the *"…duty of assistance and provision."* (p.59) for instance the rights of access to energy, water or health care known as *"…positive' socio-economic rights."* (p58). Second, the obligation of agents and institutions "*…to fund adaptation and compensation programmes for those groups most affected (references in Gough 2015a)."* (p.58).

Max-Neef's Human Scale Development (1989) (HSD) explains that we should perceive and assess people and their processes as how geologist see different characteristic in stones as architects do. It eventually depends on the lens of the viewer. Emphasizing that in the system of hierarchy and only top down decision making (mainstream economy) it is not possible to respect the diversity, autonomy and the spaces in which humans live and act. To understand the reality it has to be a bottom up approach in which human are the protagonist. It is searching for the development of empowering within civil society which develops *"…the potential role of social actors, social participation and local communities"* (p. 9). Human needs should be seen as a system in which the needs are interrelated and interactive with the inclusion of subsistence. Stating that *"Fundamental human needs are finite, few and classifiable"* (p.18) and categorized as *Existential* and *Axiological*. *Existential* which demonstrates the interaction of needs: *being*: refers to personal or collective attributes. *Having*: institutions, norms, mechanisms and tools. *Doing*: actions, personal or collective. *Interacting*: the way people relate to and articulate to in time and space. Needs can be satisfied along the existential categories. *Axiological,* are the needs for *subsistence, protection, affection, understanding, participation, idleness', creation, identify* and *freedom*. Satisfaction for instance, can be understood as food and shelter of the fundamental need for subsistence. Also stating that "*Fundamental human needs (such as those contained in the system proposed) are the same in all cultures and in all historical periods. What changes, both over time and through cultures, is the way or the means by which the needs are satisfied."* (p.18). Meaning that, social and political systems have different ways of satisfying human needs. Max-Neef explains, when there is no satisfaction, human poverty reveals and generates a so called 'pathologies'. Pathologies arise in the way how economic processes are executed and designed in technocratic manner and the socio-

political system that creates difficulties in meeting the needs of satisfaction. "…*such as Understanding, Protection, Identity, Affection, Creation and Freedom"* (p. 22).

Sen and Nussbaum's Capability Approach (CA) generally is focusing on the fundamental capabilities of the individual, evaluating how those resources do work or do not work for their potentials (Robeyns, 2017; Brand-Correa and Steinberger, 2017; Nussbaum, 2003, Nussbaum 2000). Robeyns (2017) re-examined CA and generalized the core concepts *functioning* and *capabilities.* Functioning and capabilities need to be understood as being and doing. When people can be who they want, and doing what they want, they have the capability to do so. Functioning should be understood as achievement of the capabilities. If the individual can make use of different kind of functionings they have a larger capability to lead a certain type of life. The capability gives you the opportunity to function, *"…to convert primary goods into meaningful outcomes in their life; 'an individual's capability to function."* (Wood & Roelich, 2019, p. 117). To achieve this functioning and using the capabilities, it depends on the person's ability which is called *agency*. The level of wellbeing in this approach is related to the claim of freedom and how to achieve wellbeing as in certain doing and beings. More specifically there are differences between Sen and Nussbaum which can be explained by the basic capabilities since they significantly differ from each other and have a different purpose. Sen's basic capabilities seems to lack operational elements. The idea of avoiding or escaping poverty or deprivations from a cut-off point without mentioning certain standards or thresholds (Alkire, 2002). Nussbaum (2000) made a list of ten central human functional capabilities: *Bodily; Bodily Health; Bodily Integrity; Sense, Imagination, and Thought; Emotions; Practical Reason; Affiliation; Other species; Play; Control over One's Environment: Political and Material* (appendix A). This are seen as human rights and setting a threshold that involves practical reasoning and affiliation to make claims on government. Without practical reasoning one is not aware of the relevance of functioning, and a life without affiliative functioning is difficult to imagine (Nussbaum, 2000). *Basic*, are the capabilities with which a person was born with and how they cope with the capability to function. *Internal*, how the internal capabilities are in a mature stadium and use the available skills and physical preconditions to function with the ability it can. *Combined*, is the internal together with external capabilities for instance, the institutional environment to function (Nussbaum, 2003).

The assumption is that provisioning systems can meet the needs of human needs and we want to know what needs are at stake. We look at this point how human needs can be specified by the theories. To meet the human needs all three theories are aware of the fact that it is depending on how the socio-economic system is distributing resources in society. Differences can be found in the way of defining the human needs, satisfiers and the level of data collection. Brand-Correa & Steinberger (2017) argue that prerequisites for living well within society and achieving a satisfied wellbeing, human needs need to be universal and therefore *"…a finite number of self-evident (i.e. universal, recognizable by anyone), incommensurable (thus satiable, irreducible and non-substitutable) and non-hierarchical needs, which encompass the range of capabilities or dimensions of HW [Human Wellbeing]."* (p. 46). Basically, the two most basic human needs, *health* and *autonomy* need to be satisfied which can be divided in cognitive skills and opportunities. *Intermedia needs* can then obtain to satisfy in those needs. They are indicating that universal satisfaction of needs can lead to paternalism. To avoid this they emphasize to add a participatory approach. Brand-Correa et al., (2020) adopted the same argument. They see that needs can be saturated by minimum and maximum standards, meaning that there is a baseline for participation in social life. Gough (2017) wants to address *universalizability* to make it useful across space and time. It therefore concentrates on Doyal and Gough, and Nussbaum. Explaining that both begin with the individual

and are aware of the individual agency since *"...individual needs can never be satisfied independently of the social environment, but they must be conceptualized independently of any social environment."* (p. 210). Gough (2017) is emphasizing on the "thin" theory and the second "thickening" it out and the dual strategy. The thin theory can be understood as the most basic human needs as in health and autonomy. The thick part is to satisfy the most basic human needs by the intermediate needs. Explaining that the basic human needs must be met *"…to avoid harm, to participate in society, and to reflect critically upon the conditions in which they find themselves." (*p. 210). It is using the dual strategy that is focusing on both, experts in the field and the experience of people in everyday life. This seems to be a useful strategy for data collection and to generalize data. From the perspective of Nussbaum it is explaining that the 'functioning – capability' distinction help to avoid paternalism, this suggests that the CA helps to let people be free and give autonomous answers during the inquiry. Brand-Correa & Steinberger (2017) explaining that Max-Neef, and Doyal and Gough *"…are not identical, and they differ in terms of their exact definition of human needs. However, they have significant overlap in the overall core dimensions of wellbeing that they propose (see Alkire 2002)."* (p. 311) and are roughly compatible with the CA. They argue that Max-Neefs definition (beings, havings, doings and interacting) *"…include market-exchanged goods and services, but also personal and collective attitudes, institutions, norms, values, activities, and infrastructures."* (p.311). However, important is that they show the negative and positive interlinkages between needs and satisfiers. This is considered to be useful when bringing together experts and communities to deliberate on results (Brand-Correa et al., 2020) and to identify environmental limits or limits in economic activity (Brand-Correa & Steinberger, 2017). Brand-Correa & Steinberger (2017) explaining that Doyal and Gough have two basic categories of human needs: health and autonomy. Max-Neef has identified nine and can express them in four different ways, nevertheless the satisfiers *"…are culturally, socially, and temporally flexible." (p. 46)* which is contrasting with the Doyal and Gough but useful for in depth qualitative research to reflect on development pathways of communities. Day, Walker & Simcock (2016) studied energy poverty, to understand how energy and wellbeing are interconnected. It introduces the capability framework and assess the situation of households in the regional context. The CA *"…attempt to encompass wider human flourishing."* (p. 258) since capabilities space can give insights in largely overlooked areas and interventions could aim to increase the capabilities of individuals. However, critics are given on Nussbaum abstractable written list of capabilities and Sen's vague methodological specifics but seem to have the flexibility to adapt to the context of inquiry and gain rich information. Carpenter (2009) is explaining *"that the CA takes account for the fact that the playing field is bumpier for some groups than others, and offers ways of reconciling principles of equality and diversity in social justice."* (p. 357).

We adopt from this that the basic human needs (health and autonomy) and universal need satisfiers from Doyal and Gough are crucial to let people participate in society and live a flourished life. Furthermore, in the context of making policy recommendations it is important to get a generalized and therefore universal view of the satisfiers. The dual strategy gains insight from the academical and real-life perspective which could be useful when generalizing collected data. Then adding the Max-Neef's or the CA of Nussbaum could gain richer information from that real-life perspective of individuals or communities. From the literature it seems that Max-Neef's approach is more used in groups or communities but has the benefit of seeing positive and negative interrelations. Despite that, we adopt Nussbaum's CA since this seems more flexible. It can be specified on the context and focused on the individual. This is useful since we conduct research on

the household level. Emphasizing on the fact that society is heterogenous. Households and social groups differ from each other and have different needs and need different satisfiers.

However, the satisfaction of human needs can only be met by a fair distribution of need satisfiers. Steinberger (2020) explains that provisioning systems have this role and link (bio)physical and social processes and outcomes. The social outcomes then can be seen as achieving well-being within a bounded economy. *"the study of the on-going economic process that provides the flow of goods and services required by society to meet the needs of those who participate in its activities" (Gruchy 1987)."* (para. 8). When studying the provisioning systems it analyses physical and social provisioning systems. The physical provisioning systems can be understood as networks of physical elements, technologic infrastructure and their efficiencies, land use and supply chain. Social provisioning systems can be understood as social institutions like the governments, communities and markets but also the quality of the institutions, equity, political and cultural participation, social relationships, norms and cultures (Gough, 2019; O, Neill et al., 2018; Lamb & Steinberger, 2017; Brand-Correa & Steinberger, 2017). Lamb & Steinberger (2017) explain that the study of provisioning systems can be understood as the study of the socio-economic system which has overlap with elements of the social practices. The social theory can therefore be useful to critically assess the provisioning systems. Gough (2019) states that in mainstream economy *"…substitutable commodities are produced, exchanged and consumed."* (p. 536) but that need satisfiers are non-substitutable and therefore an economy should entail *"…a network of 'systems of provision' .[8]" (*p. 536). Fanning et al., (2018) sees the provisioning systems as more dynamic and complex, and can run both ways except of the *"…one-way causal relationship between resource use and social outcomes..." (p. 2)*. They see *"…provisioning systems as a set of related elements that work together in the transformation of resources to satisfy a foreseen human need."* (p. 3). Core elements are the households, markets, the commons, and the state which are interconnected between feedback and power relations, and can be known as the 'rules of the game'. The set of related elements are then interacting between ecological, technological, institutional and social elements. One of them can fail in using resources sustainably and/or satisfy in human needs. Mainly the technological and institutional elements of provisioning systems are of relevance to the SJS framework. Institutions have different underlying values and principles, and how they are financed or regulated, and which institutions are dominating the provision influences how goods and services are distributed. How they are distributed depends highly on state regulation and collective regulation of provisioning.

We assume that existing need satisfiers are non-substitutable and provided by the state which are conflicting with the purpose of creating access to affordable and sustainable energy for households in community initiatives. We adopt from this the core institutional elements and the different underlying values and principles since they influence the distribution of goods, services, activities and relationships.

Thus, the Theory of Human Needs is the baseline for reflecting what needs and satisfiers are necessary to meet the human basic needs of vulnerable households in society. The CA is supporting this research to identify the needs and capabilities of the vulnerable households. The provisioning systems are the indicators that must be investigated because they can provide in the satisfiers. Together they create insights in how the core institutional elements – vulnerable households, state and community initiatives- are conflicting between them, which is the first step to social equity. To come to equal chances in renewable energy aspects the Energy justice theory becomes useful.

2.2 Energy Justice and Energy poverty

McCauley, Heffron, Stephan & Jenkins (2013) developed a widely used approach and definition towards energy justice (Demski etal., 2019; Bombaerts, Jenkins, Sanuski 2020; Simcock & Mullen 2016; Thomson, Snell & Bouzarovski, 2017; TNO, 2020) which is based on the philosophical aspirations of empowerment, social justice, and public health that aims *"to provide all individuals, across all areas, with safe, affordable and sustainable energy"* (p. 1). It seeks to apply justice principles in social science research to energy policy, energy production and systems, energy consumption, energy activism, energy security, the energy trilemma of politics, economy and environment (Heffron, McCauley, & Sovacool, 2015), political economy of energy and climate change (Jenkins, McCauley, Heffron J., Stephan, & Rehner, 2016). The approach of McCauley et al. (2013) consist of three elements of distributional justice, procedural justice and justice as recognition. Mc Cauley et al. (2013) is explaining the different concepts and gives options on how to create equal chances for sustainable energy. *Distributional justice* is concerned with the recognition of the unequal allocation of the physical infrastructure and the environmental benefits and burdens as well as the access to energy services. For instance, the location of renewable sources from wind farms and the access to benefit from it, implying that its focus on both the production as the consumption. With regard to the consumption perspective it is emphasizing on the affordable access to energy services. It sees chances in a decentralization of the energy and a redistribution of benefits in financial and physical means. *Procedural justice* is concerned with who is, or who is not, included in decision-making processes. Alternatives for participation are mobilizing local knowledge, disclose information and include non-state actors in institutions. *Justice as recognition* highlights the need for recognizing the heterogeneity in society and that these should be free from physical threats and provide equal political rights. It explains that there are three misrecognitions: cultural dimension, non- recognition and disrespect. The cultural dimension can be understood as the differences in social groups in society and that there is non-recognition of acknowledging them. Disrespects arise when developers and investors do not respect the living environment of citizens even when people try to get attention by setting up campaigns and protests.

Sovacool & Dworkin (2015) expands the energy justice framework with not only focusing on an *"…integrated, synthetic concept; it also is a useful analytical tool for altering how energy problems exist or are framed"* (p. 437). It adds to it the cosmopolitan justice and explains that the energy justice can be used in different practical application tools. The cosmopolitan justice is embracing both distributive and procedural justices from which they should apply universally to each individual, as one who's needs need to be protected and respected. The application tools are: conceptual, analytical and decision-making tools. The *conceptual tool* integrates the distributive and procedural justices. It involves key elements as how unequal costs and externalities are distributed in communities, how access to energy systems can be equitable, and that information and participation is fairly organized towards decision-making processes. The *analytical tool* tries to understand, build in values into the energy systems and focus on the transformation to renewable energy with emphasis on who is involved and who needs to pay for it. Analytical concepts are virtue, utility, human rights, procedural justice, welfare and happiness (energy poverty), freedom (energy subsidies), prosperity (energy resources) and climate change with fairness, responsibility, and capacity. The *Decision-making tool* informs planners and consumers to make energy decisions. A decision-making framework is developed to make authority conscious about decisions to be made in practice from which decisions should relate to: availability, affordability, due process, good governance, sustainability, intragenerational equity and responsibility. However, Willand & Horne

(2018), Wood & Roelich (2019) and Middlemiss etal., (2019) explain that lots of literature as from McCauley et al. (2013) and Sovacool & Dworking (2015), *"…focused on the global scale of energy production, allocation, consumption, distribution and responsibilities on political, infrastructure and economic levels…"* (p. 61) but less on the experiences on (in)justices of vulnerable households, which is called the 'lived experience'. The CA is used in order to create energy justice on the level of households. The CA is known as a 'partial theory of justice' (Wood & Roelich, 2019), stating that *"…energy justice is grounded in the humanistic approach of the social and legal sciences (…)rather than the thermodynamic links between housing quality and energy performance. Specifically, it concerns ethical and moral values of susceptibility, power, control and human capabilities in interventions."* (p. 61). Reasoning for this approach is that outcomes for equal distribution are often based on indicators such as income which are *"…poor predictor of human wellbeing and other valued ends [23,24]."* (p. 62). They explain that, when one wants to increase wellbeing, interventions should be made based on the individual's potential. Like Willand & Horne (2018), Wood & Roelich (2019) and Middlemiss et al., (2019), followed Day et al. (2016) emphasizing on the fact that when "*Understanding energy use in the capabilities space also provides a means for identifying multiple sites of intervention, including some areas that are currently largely overlooked."* (p. 255) and to understand the interconnects of energy and wellbeing. Next to the CA they used the Energy Justice framework since this could gain insights in distributional and procedural fairness. The insights from both could help understand the full potential of the 'functioning' of households in energy poverty.

The authors also follow Day et al. (2016) in the definition of energy poverty as "*an inability to realize essential capabilities as a direct or indirect result of insufficient access to affordable, reliable and safe energy services, and taking into account available reasonable alternative means of realizing these capabilities.*" (p. 260). TNO (202) defines energy poverty as, insufficient access to energy services in the house caused by low-income, high energy bills and poorly isolated houses. When looking at Daly et al. (2016) it means that when living in energy poverty, people have the inability to use the societal preconditions and resources that are made available for instance, by governments which create financial incentives and eventually are able to use it in daily life and to improve one's own functioning. TNO (2020) is to narrowed and focused on the energy services in the home. We are looking for the underlying causes making it difficult for vulnerable households to make use of 'cheaper' sustainable energy and to connect with community initiatives. It is not possible to pinpoint a particular social group in society which lives in energy poverty. However, the assumption is that it is households within the lower SES. De Volskgezonheid en Zorg (2021) describes SES as the access that individuals or groups have to resources which contribute to stay in good health. Indicators to create the ability of having accesses to the distribution of goods and services are education level, income and employment situation. The definition includes the same message as that of Day et al. (2016). Both indicate that some capabilities are essential to know how to cope with the available societal preconditions for offering opportunities. Despite this, the truth is that it is about the position people have on the 'maatschappelijke ladder' (social ladder) (Volksgezonheid en Zorg, 2021; GGD Noord- en Oost- Gelderland). When having a higher education or a higher income, you are on the top of the ladder. When having no education or a low education, you have to look up towards the ladder.

However, McCauley et al. (2019) recognized the broad scope of energy justice in the transition to low carbon energy systems. Themes where identified around community, transition and finance with emphasis on two critical narratives of *"… (1) enabling the transition (2) embracing a holistic view of community;"* (p. 13). Suggested is to embrace a holistic view of community, explaining this

by acceptance, mobilisation, and empowerment. Public a*cceptance* of the local community towards positive and negative aspects of projects, indicators for instance are the visual impact, instal capacity, social deprivation and payment for implications of planning and engagement processes. Mobilisation *"…of the community to engage both cognitively and physically in planning processes must be considered alongside processes of resistance."* (p. 16), as participation of community groups in processes of procedural and distributional injustices. *Empowerment*, is the influence of organizations to raise awareness of subsidies to excluded groups. Groups which are disempowered from access to energy services because of capabilities. Interesting is to know how community initiatives are defined and which role they can play towards an energy just society.

Nevertheless, the concept of McCauley et al. (2013) will be used since the analytical perspective of Sovacool & Dworkin (2015) is comparable with the CA. The Energy justice approach then seems to be useful to identify if, and how, municipalities, province and community initiatives developed policies, policy instruments or assessment frameworks to increase participation. We also follow Day et al. (2016) which is underpinning the value of the CA which we also argued in §2.1.. Furthermore, the energy poverty definition of Day et al. (2016) is seen as a starting point which stimulates the research to measure the underlying causes of inabilities in vulnerable households. The indicators education level, income and situation of employment are then useful to identify in which SES the problem of energy poverty is occurring.

2.3 Role of community initiatives and Social Capital

Walker & Devine-Wright (2008) explains community renewable energy projects as grassroots community initiatives that *"…work on the 'hearts and minds' of local people and have wider catalytic effects in promoting positive beliefs and actions about renewable energy*." (p. 499). A distinction is made between initiatives which have the focus more on processes and outcomes. The process based renewable projects can be seen as a high degree of involvement of local people who stimulate project support and positive impact on acceptance and understanding the renewable energy generally. The outcome based renewable energy projects with a lower degree or no degree of local involvement could lead to resentment and objection. *"…equity and the distribution of costs and benefits have been shown to be important in local debates…and…community projects are no different"* (p. 499). Generally, the emphasis is that community renewable energy projects are supported by measures from government and other actors with funding for both households and community sectors. Important is that locals are involved as well having the benefits. Middlemis & Parrish (2010) investigated the role of grassroots initiatives and concluded that they can create low-carbon communities in disempowered and diverse social contexts from multiple capacities within communities and creating social change by breaking old social boundaries to take on responsibility for their environmental impact. They see community initiatives as *"…people with limited power, limited resources and limited ability to influence others. By their nature, grassroots initiatives are motivated by enthusiastic volunteers who often give generously of their time and resources to local initiatives."* (p. 7559). Otteman, Wiering & Helderman (2014) defines community initiatives for renewable energy (RE) as *"…decentralized, non-governmental initiatives of local communities and citizens to promote the production and consumption of renewable energy."* (p. 3) They explain that a distinction can be made from theoretical perspective, namely an agency- or structure-oriented approach. The *"Agency-oriented explanations tend to look at the incidental characteristics of individual projects. Community initiatives depend largely on unique individual features such as detailed local knowledge, intrinsic motivation, and leadership capabilities."* (p. 3) and "*Structure-*

oriented explanations…focus on the institutional contexts in which community projects are embedded. This ranges from local institutionalized structures to the meso- and macro-level of whole policy subsystems and country characteristics such as the formal legislation and the degree of centralization." (p. 3). Van der Schoor & Scholtens (2015) do not specifically define community initiatives but explains it as engaged citizen which take the role of producers or 'prosumers' of RE, which are embedded in social networks. They work together in local community energy initiatives *"…with institutionalizing and establish energy-cooperatives and similar organizations, which distribute energy to their own community or region."* (p. 667). Basically, the discussed definitions can be synthesized to indicators as local citizen voluntary and with funding want to invest in a form of associational life (Wilson, 1999) or social network, with the purpose of producing, consuming and also benefit from their venture, in their own region. According to Wilson (1999),this brings another aspect to the light, known as social capital.

Wilson (1999) follows Putnam and defines this as the vibrancy of the associational life in the local community. It consist of memberships of voluntary groups with norms and values which are embedded in social structures and practices but are based on interpersonal trust and willingness to cooperate. Rydin & Pennington (2000) see it as potential for people to develop their reputation, to trust others in society and *"…to discover how to organise themselves in order to gain benefit and avoid harms."* (p. 161). More explicit they listed that social capital consist of the networks between individuals and groups, the density of relationships and knowledge within networks, obligations and expectations regarding the relationships, the level of trust between individuals and groups and norms of routine behaviour. They see potentials in participation practices and programme success based on both *"…the existence of local organisations and networks and the existence of relationships or contacts across sectors or inequalities of power."* (p. 162). However, the outcome of having a successful social capital in grassroots-based co-operations is the *Institutional design* in which people within a community act and interact. This includes organisational matters and the norms and routine practices of interaction. Evans (2004) states key elements of social capital based and identified by various authors: *trust,* or *trust relationships, reciprocity, networks and partnerships*. Szreter & Woolcock (2004), Schuller (2007), Hawking & Maurer, (2009) Seferiadis et al., (2015), Cummings et al., (2019) made a distinction in social capital between: bonding, bridging and linking, arguing that these perspectives are mechanisms to connect types of network structure and state, and society relations. *Bonding* is about the shared trust and relationship between members and if they see each other as equals in the shared social identity. *Bridging* is focusing on the relationship on a socio-demographic level like SES which also refers to educational levels, but also differences in race and ethnicity play a role. *Linking* is the relationship and interaction between the households and the formal institution such as the community initiatives to question how trustful and respectful the relationships are. Szreter & Woolcock (2004) is following an argument from Putnam when he developed the concepts of 'bonding' and 'bridging. Explaining that norms of trust in associations did not *"…serve the best interest of the wider community, nor sometimes the best interests of some of those within the network."* (p. 654). This is an assumption that will be followed since we assume that this is one of the causes making community initiatives less accessible. Linking seems to be based on a lack of respect and trust in formal institution and often occurring in poorer communities. In § 2.2 we assume that households with a low-SES are living in energy poverty which then relates to the 'linking' part. With following Putnam's 'bonding' and 'bridging' we think to capture all aspects of which are discussed above. Essentially, they talk about trust, relationships and the associational structures based on norms and values. Important elements with bonding, bridging and linking are the elements of trust between people on different levels like education or income, trust and relationships and seeing each other as equal and the trust that people have in the institutions. We

consider this as important since we can investigate different perspectives and identify underlying causes on organizational and individual level. Social capital eventually is linked to social inclusion (Hayes, Gray, & Edwards, 2008). Social inclusion then is a concept to build a social cohesive society based on networks of social relations with norms and trust, and to improve social participation and integration for people who live in poverty, deprivation and disadvantages (Hayes, Gray, & Edwards, 2008). We should not forget that we study homeowners with a low disposable income in energy poverty that compromise on the quality of live. According to the TNO report (2020) this comes together with unemployment, poverty, social isolation and bad health. The assumption is that households get socially excluded. Questionable is, how they get socially included. In Evans, Joas, Sundback & Theobald (2004) they identified that Social Capital in it's different forms has different functions. One of the concerns is that how patterns of policy networks *"…are patterns of policy networks (in the environmental or sustainable development policy arena) are simply reflective of underlying collective action problems or whether the presence or absence of social capital has affected the character of these networks."* (p.19). The conceptualization of 'bridging' is then related to 'collaborative social capital'. Emphasize, is placed *"…on the conditions for networks and groups in civil society to be 'outward looking' in engaging with other groups, and with local government."* This is different than the 'bridging' conceptualization from before, since it moves away of trust social/family to engagement in society. We therefore also adopt from the 'bridging' concept based on the engagement in society but to make it measurable we use the conceptual elements: social cohesive society, social participation and integration since this related to poverty, deprivation and disadvantages which eventually can be related to energy poverty features. This could help to identify if pathways are made from governments perspective in relation to the LEC to let households in energy poverty engage within society.

2.4 Theoretical and conceptual Framework

We use the Theory of Human Needs (THN) from Doyal and Gough (1991). They argue that all human needs based on their theory need to be satisfied for a flourishing life and to attain a sustainable wellbeing. The basic needs are the universal preconditions for *health* and *autonomy,* which make it possible to participate effective in any form of social life and reflect critically upon the conditions in which they find themselves. It is of great importance that people have the basic autonomy of *"…the ability to make informed choices about what should be done and how to go about doing it…"*(Gough, 2017, p. 41). The assumption is that vulnerable households are not in the position to have this basic autonomy since the societal preconditions are missing. The universal preconditions are then regarded as satisfiers for the basic needs. We assume that the societal preconditions for equal access to sustainable energy in community initiatives and affordability to utilize RE are missing and need to be *produced* and corrected by *political authority.* As a consequence, the intermediate needs of s*afe physical environment, economic security, significant primary relationships* and *critical autonomy* as a basic need cannot be satisfied. To foresee the societal preconditions, it depends on *institutional satisfiers* which can be provided through institutions by a fair distribution of goods and services. Gough (2019) explains them as distributional, material and procedural preconditions. We see the provisioning systems as useful to gain insight on the institutional satisfier from which the physical and social provisioning systems organize these satisfiers.

The central assumption is that some of the core institutional elements of the provisioning systems -state, vulnerable households and community initiatives - and the interplay between them are conflicting. A distinction can be made between the causal relations.

First, we suppose that how state and collective regulations, and financing are produced and distributed have influence on the capabilities and autonomy of vulnerable households of investing in RE and how affordable and therefore accessible community initiatives are. This is applying to the energy justice. What resources are available? Are households involved in decision-making processes? and are they acknowledged for the need of having access to renewable energy? The theory names this: distributional justice, procedural justice and justice as recognition which we hypothesize. The assumption is, if the theoretical conditions are not met that vulnerable groups are excluded anyway from accessing RE in community initiatives and they do not have the ability to make informed choices. We adopt from the *distributional justice*, if the unequal allocation of the physical infrastructure and the access to energy services are recognized in collective regulations and financially incentives. From the *procedural justice* we adopt that the vulnerable households are included in decision making processes and if information and participation is 'fairly' organized towards decision making processes. From the *justice as recognition* we adopt, if there is non-recognition of acknowledging that households owning a house are limited in accessing community initiatives for renewable energy.

Second, we suppose that vulnerable households are also influenced by their own capabilities which affect their health and autonomy of investing in RE or making the decision of participating within community initiatives for RE. When health and autonomy are affected then the basic needs are not satisfied. Since basic needs are universal and need satisfiers are not, they vary across different social contexts. To identify need satisfiers in a heterogeneous society we will make use of the dual strategy in combination with the CA. With the dual strategy we aim to collect data from *codified* knowledge, such as scientific data, data from professional expertise and *experiential grounded/practical* knowledge from vulnerable households and their 'lived experiences' which applies to the CA. The combination of these approaches provide a nuanced and substantiated insights of the need satisfiers. The CA then provides insight in what people are able to do with the goods and services that are available to them and *"…a life that is worthy of the dignity of human beings."* (Holland, 2008). We see the human functional capabilities of *senses, imagination and thought*, *practical reason, affiliation* and *control over one's environment* as a starting point but are aware of the abstract notion of it and that they need to be specified to select essential capabilities. Essential capabilities can be seen as the vulnerabilities of households for instance, income, disabilities, chronic illness, occupancy rate or household situation among others (TNO, 2020).

Finally, we suppose that different underlying values and principles between community initiatives make community initiatives less inclusive. The social capital lens of bridging and linking seems to be a useful approach to identify if the set of organizational purposes and structures based on the underlying values and principles make community initiatives less accessible for vulnerable households. *Bridging* is focusing on the relationship on a socio-demographic level like SES which also refers to educational levels, but also differences in race and ethnicity play a role. *Linking* is the relationship and interaction between the households and the formal institution like the community initiatives to question how trustful and respectful the relationships are. This lens also seems to be suitable to combine with the lived experience since this highlight insights gained on how this is experienced from the perspective of the community initiatives and vulnerable households. Finally, we use the conceptual elements: *Social cohesive society, Social participation* and *Social integration* since this related to poverty, deprivation and disadvantages which eventually can be related to energy poverty features. This could help to identify if pathways are made from governments perspective in relation to the LEC to let households in energy poverty engage within society.

This research makes use of four theories. The THN will be the lens to achieve a basic need satisfaction for vulnerable households living in energy poverty. THN consist of different elements from which each element needs to be satisfied as mentioned before. The assumption is that there are some gaps why the basic needs satisfaction cannot be achieved. The different elements of the THN have their own dimensions, institutional satisfiers, societal preconditions, intermediate needs and basic needs, which need to be analysed and answered within the core institutional elements (state, vulnerable households, community initiatives), see fig. 2 and 3. The different elements will each be analysed by a different theoretical approach to understand and explain how needs can be satisfied, under the umbrella of the dual strategy from the THN (fig. 2).

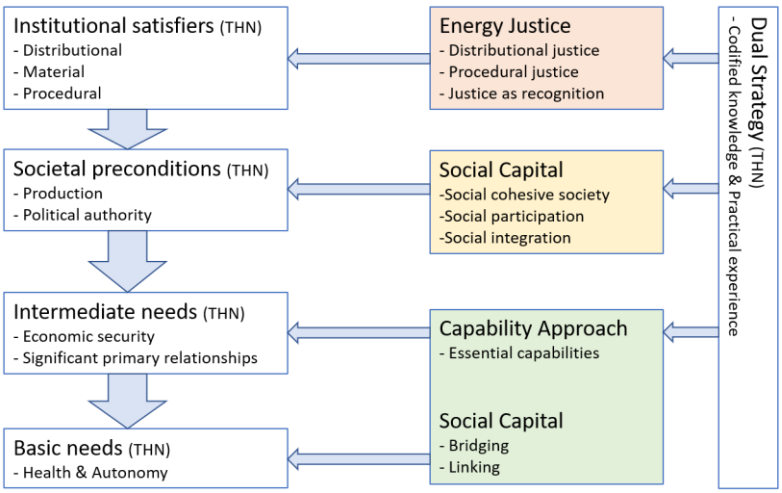


Figure 2, theoretical framework of the Theory of Human Needs, Energy justice, Social Capital and Capability Approach.

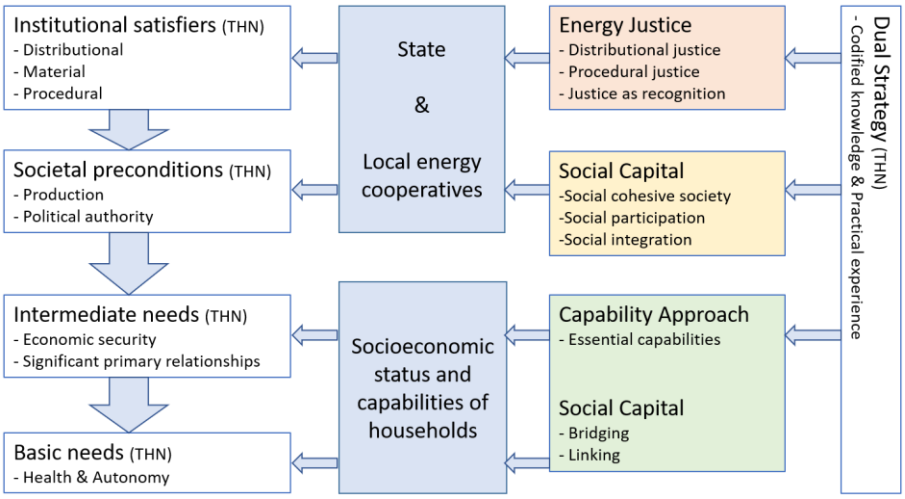


Figure 3, institutional elements integrated in theoretical framework

The first premise is, that the accessibility towards community initiatives for vulnerable households are depending on how the independent variables -social capital and institutional satisfiers (provisioning systems)- and how they are organized and regulated, has a direct causal relation towards the accessibility of community initiatives for vulnerable households (fig 4.). The second premise is that vulnerable households moderate between the independent and dependent variables. They are depending on the stated conditions of the independent variables and their own life situation can also be an indirect cause, which makes access to the community initiatives more difficult. The extent of accessibility then specifies the extent of energy justice.

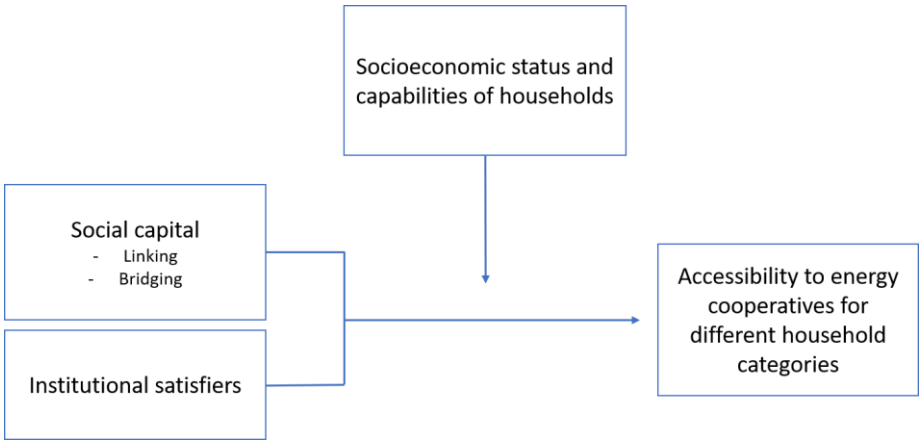


Figure 4, conceptual model of the research variables

3. Methodology

In this chapter the methodological choices are explained and discussed. First, the research strategy and design in relation to the research philosophy is discussed and argued. Furthermore, the data collection and analysis is explained and distinguished between qualitative and quantitative methods. Finally, the validity and reliability considerations are explained.

3.1 Research strategy and design

The pre-literature study (§ 2.1-2.2-2.3) shows that there is little knowledge available on how the organization of physical and social provisioning systems affect access to community initiatives for vulnerable homeowners. Since this research will be conducted for the province of Gelderland -a specific context- we assume that this is a unique situation and differs from other regions which requires an explorative attitude of the central assumption. However, we are testing this by partial hypothesize: We are looking at whether this depends on how the government regulates and implement its collective instrumentaria, the capabilities and living conditions of vulnerable homeowners or whether this is due to the underlying conditions that community initiatives set, which reduces inclusivity. The prediction is that it is a combination of all three. However, insights in all three are needed to understand and explain where interventions can be made so that access to community initiatives can be socially justified. This gives the research also an explanatory attitude.

For this research an ontological position of a bounded relativism and critical realist has been taken (Moon & Blackman, 2014). With the bounded relativism, it is assumed that the suppositions -related to state, community initiatives and households- are embedded in different contexts in which they work, live or how it is directed and therefore express different realities. The critical realist position relates to the dual strategy -mentioned in chapter 2- which is introduced to collect data from science and the lived experience. This critical realist approach then supports the data collected from the lived experiences and examine perceived data from scientifical resources critically. We take the epistemological position in, of constructionism and subjectivism. Constructionism, because we assume that the knowledge is perceived from the different contexts in which they actively are involved and are dependent on, but can independently exert little influence on it. For instance, the government makes incentives available as this is high on the agenda for the relevant administration which is depending on the coalitions made. Subjectivism, because the knowledge is taken from different households giving reasons from their personal experiences, abilities and living conditions what the necessary need is for the situation in question. The philosophical perspective is, thus, an interpretivism approach since we attempt to interpret the data with the aim of understanding the reasoning of institutional elements in the specific social and societal context.

We make use of the case study and survey strategy. Case study, since this is well recognised in the field of policy inquiry (Crowe, et al., 2011). We assume that each municipality and local energy cooperative (LEC) use different policies based on different values and principles. Furthermore, we focus on the lived experience and based on cultural backgrounds we assume that households have different ways of reasoning. Since these are unique real-life situations and cross-sectional, we need to interpret it context specific. This seems to be odd when using the experimental research strategy. However, the survey is part of the case study strategy. We expect to collect a larger set of data in a short time period through a survey compared to having extensive interviews data from households.

The cases studies are decided upon the following requirements: three case studies in the province of Gelderland, in three different RES-regions. Within each RES-region one municipality is chosen with one non-profit LEC. The LEC needs to have local energy projects that generate RE from

wind and sun collectively in parcs, on rooftops from government or institutional buildings and in neighbourhoods. With this variety we try to get a comprehensive dataset of which cooperatives and projects are more or less accessible and why. The survey will be used to accept or reject if low SES and capabilities influences the access to LEC and resources available to household. This reasoning makes the methodology of this research qualitative and quantitative. Characterizing itself as a mixed method approach (Creswell & Creswell, 2018). More specifically, since the quantitative and qualitative aspect are depending on each other but can be independently studied we use the convergent mixed method approach (Creswell & Creswell, 2018). It is basically inductive in character since the collected data from different government institutions, community initiatives and households are in each situation unique. However, it has deductive elements in it when testing the hypothesize.

In each case study we analyse the following elements: First, we identify the role and types of LEC and which energy projects can be distinguished. Second, we identify if vulnerable households are recognized in RES. What participation conditions have been set and what the comparisons or differences are between the three RES regions. Third, we make use of the conceptual elements of social inclusion to identify if it is incorporated in governmental policies and LEC organizational purposes and structures and how they are incorporated. Fourth, we use the conceptual elements of the Energy Justice theory to identify if resources are available to the LEC and vulnerable households. Additionally, if the vulnerable households are involved in decision-making processes and whether there is recognition of the vulnerable households in political agreements and how they are applicable to them. To create common sense the data is expressed in economic, communicative and physical policy instruments (Hoogerwerf & Herweijer, 2014). Finally, we make use of the survey strategy and include three theories and the SES indicator: Energy justice with the elements distributional justice and procedural justice, social capital with the elements bridging and linking, and the CA with the elements practical reason, affiliation, control of one's environment and bodily health. We attempt to identify if the low SES and the capabilities of households influences households to gain access towards provided financial incentives and community networks that enable them to create access to LEC themselves, and if not, which underlying causes contribute that they cannot make use of facilities.

3.2 Data collection and analysis

When making use of the case study approach it involves multiple resources which consist of quantitative and qualitative evidence (Crowe, et al., 2011). Together they form a data triangulation which increases the internal validity of the research.

3.2.1 Desk research and Semi-structured interviews

Desk research

Desk research is conducted in three different phases. First, literature review as preparation of the problem statement, theoretical- and conceptual framework. Second, literature review is used to develop the methodology and its underlying research strategies and methods, data collection, sampling, data analysis, survey and interview questions, reliability and validity, and potential threats. Both literature is derived from books, academic journals, policy documents and questionnaire or survey reports. Third, a systematic document analysis is conducted based on cases. This means that there is a one-to-one relationship between for instance government and policies

(Olsen, 2012), - which partly or fully- depending on data from interviews- answering sub questions 1, 2, 3, 4 and 5. For this research this means that documents related to the RES, governments and LEC are kept the same and are plausible chosen. Documents related to governments consist of coalition agreements, program budgets or additional policy documents which are content specific and municipal websites. For the LEC we analyse, if available, into business plans, participation approaches, financial plans and LEC websites. Furthermore, on keywords: energy poverty, poverty, local energy cooperative, social, participation, financial, role and inclusion. Data towards sub question 4 was analysed by identifying and distinguishing between the type of policy instruments: Communicative, economical an physical which refers to government incentives.

Semi-structured Interviews

The semi-structured interview is used to verify information, to clarify gaps in the literature, to gain new unwritten information and to find contradictions towards document analysis. The interview is kept semi-structured to delve deeper into a certain topic, if necessary, with the purpose of providing richer information. The interview was guided by questions (see appendix B) and topics based on the sub question 1, 2, 3, 4 and 5. The questionnaire is designed and formulated based on main elements of the sub questions and used theoretical elements, after the document analysis (see table 1). These elements are used as coding procedure for the analysis. The qualitative data of interviews is first transcribed and later analyzed in Atlas.ti. Within the transcripts the grounded theory method is used. Meaning that we used the method of open coding, axial coding and selective coding (Charmaz 2006; Charmaz & Belgrave, 2012). However, we do not have the purpose of identifying a unified theory (Creswell & Poth, 2018) it is still seen as a sufficient method to find relevant data. Furthermore, we only used the selective coding since it is expected that open coding gives more data but not preferably relevant. The axial coding will not be done in Atlast.ti but this is related to the findings from the document analysis, based on our own interpretation. The analysis in Atlas.ti was separated by the respondents of LEC and the government since the questionnaire is designed on the main elements in the sub questions which were relevant to the respondent group. For the LEC this are sub question 1, 2, 3, 5 and for government it is sub questions 1, 2, 3, 4, 5. Moreover, we are aware that reporting the intersubjective interpretations of findings and that people by themselves subjectively interpreting their own situation. However, this fits the philosophical interpretivism approach. We attempt to bring the context of the document analysis and the context of the respondent together to the core elements of the sub questions. Since we cannot share the whole analysis in the report we kept ourselves to quotations relevant to the content related to the sub question. Quotes are embedded in text or as illustration of the summary given before. Furthermore, it was decided to interview from the three municipalities and LEC one respondent, as well as one person from the province of Gelderland (see §3.3 for sampling). After selective coding, data obtained by the interviews is used in quotes in the results. The quotes, as already explained in the beginning, clarify gaps in the literature, to gain new unwritten information and to find contradictions towards the document analysis. To keep the respondents anonymous the quotations of the source reference is presented with the name of the municipality (see table 2).

Sub question	Coding
1 & 2	Role of energy cooperatives
	Role of municipality
3	Social inclusion
	Collaboration
	Conditions/policy
4	Resources: Communicative
	Resources: Economic
	Resourves: Physical
5	Affordability
All	Dependency

Table 2, coding scheme for analysis in Atlas.ti (Langenberg, 2021)

Source reference	Type of Respondents
Zutphen	Municipality of Zutphen
	ZutphenEnergy
Ede	Municipality of Ede
	ValleiEnergy
Arnhem	Municipality of Arnhem
	Rijn en Ijssel Energy
Province	Province of Gelderland

Table 1, source reference of quotations in report (Langenberg, 2021)

3.2.2 Survey

Survey data description and setting

The survey is used to examine the relationship between the moderate variable and the independent (IV) and dependent variables (DV). To see if, and what, relationship is between the capabilities of vulnerable households, the access to societal preconditions, the perception of trust and equality to gain access or to stimulate participation in LEC. The survey gives answer to sub-question 6. The survey is spread under 1500 citizens in three municipalities (see § 3.2.1). Additionally, 500 extra invitations for the survey were spread to increase the responses. The invitation of the survey is distributed by the researcher in a physical matter, by foot. Based on the confidence level of 95% and a margin of error of 5% a minimum of 306 (Kruisman, 2021) respondents needed to be retrieved. The survey consists of 46 questions (see appendix C). To fill in the survey a link and a QR-code are posted on the invitation (see appendix C). The survey has the Dutch language since we expect to have mainly Dutch respondents in the chosen neighbourhoods. The survey takes approximately ten minutes to complete. We tried to boost the response rate and reliability by putting the invitation and survey in the format and software of the province of Gelderland. Unfortunately, the survey is expected to be politically too sensitive which could cause political discussion between citizen and the political board. After three weeks we received 150 response. Since this was too low to be representative the survey is spread online via Facebook and newsletters of neighbourhood organizations, printed by the 'Voedselbank' to spread among the target group with a low disposable income. Furthermore, the snowball method was used in the network of the organizations aforementioned and my own network. In total 2000 invitations were spread.

Dependent and independent variables (see table 3)

The DV is operationalized in a question which measures, on a nominal scale, the access to LEC defined as whether or not there is access to LEC.

Moreover, the survey questions are divided in four IVs. First, measuring s*ocioeconomic status* on a nominal scale by differences in educational level. The question is inspired by indicators of 'Volksgezondheid en Zorg' (Public health and care, 2021).

Second, measuring the *CA* on a Likert scale (Totally agree (1) – Totally disagree (5)) with emphasize on *Practical reason, Control of one's environment, Bodily health and Affiliation* to identify if capabilities and energy poverty indicators influence participating in LEC or access to government resources. Questions are formulated in relation to energy poverty indicators of TNO (2020): income, disabilities and chronic illness. With the assumption that they are overlapping and measuring the

same construct. Inspiration is drawn from academic journal (Bartiaux et al. 2018), European quality of life survey (Eurofound, 2017) and World Values Survey 2017-2021 (World Values Survey, 2017).

Third, measuring *accessibility to Government incentives* on a Likert scale (Totally agree (1) – Totally disagree (5). The questions have the purpose to identify accessibility to available resources and the perception of having a voice towards government. Inspirations are based on the academic journal of William & Doyon (2019).

Finally, measuring *Social Capital theory* on a Likert scale (Totally agree (1) – Totally disagree (5)) with emphasize on *trust* and *equality* in household in different income situation, with a different cultural background and educational level and trust in formal institutions. Questions are inspired by, and based on Putnam's assessments tool (John F. Kennedy School of Government, Harvard University, 2000) and World Values Survey 2017-2021 (World Values Survey, 2017). They are formulated in a way to identify the perception towards different sociodemographic groups and institutions.

Moderation variables

The moderation variables are composed based on the theoretical framework and conceptual model. Since we assume that the low SES and capabilities are influencing the path to gain access towards financial incentives and community networks. Therefore, first, the CA is moderated with the procedural justice element of the Energy Justice Theory. Second, the CA is moderated with the elements equality and trust of the Social Capital Theory.

Control variables

The control variables are the variables of which we assume that they might affect the access to LEC. First, we assume that the SES is influenced by additional energy poverty characteristics such as work status and household composition. This is measuring the socio economic situation on a nominal scale which is inspired by TNO (TNO, 2020), CBS (Cremers & Boumans, 2018) and DNB Household Survey (CentERdata, 2020). Furthermore, the research is emphasizing on homeowners. Therefore, we add measurements to make the distinction between type of living of homeowners and tenants. The distinction is measured on an ordinal and nominal scale.

Analysis

The quantitative data will be collected from Qualtrics which transfers the data in an Excel file which can be used to upload it in SPSS. In SPSS the data will be analysed by logistic regression since the DV is binary. Before starting with the analysis of logistic regression some steps needed to be taken. First, data is cleaned up by deleting falsely completed survey and missing values which will be coded as -99. Second, variables were attached to right measurement scales. Dummy variables were created and variables which were negative are recursed. Third, internal consistency of theoretical constructs were tested on acceptability (>0.7) through the Cronbach's Alpha (Creswell & Creswell, 2018). Furthermore, descriptive statistics were executed. Nominal and ordinal variables are presented as *N, valid* and *cumulative percentages.* Variables based on Likert scale measurements are presented as *Median* and *Standard Deviations*. Finally, before starting the logistic regression analysis the multicollinearity and Mahalanobis distance test was executed. For the former to avoid biased estimations of the coefficients between two or more predictor variables and the latter to identify outliers in the multivariate data. The multicollinearity is tested on the ´Variance Inflation Factor´ (VIF). The threshold for VIF is different per author and is an ongoing discussion between

academics. Some talk about a VIF > 2.5 and others use 10 (Field, 2018; Alin, 2010; Dormann et al., 2012) Then we checked the condition index with the Variance proportions. When the Condition indexes are between 5-10 there is weak multicollinearity and between 30-100 for strong multicollinearity (Alin, 2010; Dormann et al., 2012; Hae Kim, 2019) . When the Variance proportions of two or more are higher than 0.8 and correspond to a higher value than 30 the predictor variables are multicollinear (Hae Kim, 2019). The Mahalanobis distance is tested on the p-value. When the p-value is <.001 there is a significance that there are multivariate outliers (Penny,1996; McLachlan, 1999).

Then, the logistic regression is analysed based on the fit of the model as a whole and to explain the probability of the DV. The variables are implemented in the models in a hierarchical way (Creswell & Creswell, 2018). This means that variables will be added in different models, in a step-by-step approach based on the theory and conceptual model. The fit of the models will be compared to see if the model will be improved by the additional variables. To check the models, we test the significance (<.05) and to check whether the model predict better than the one before we compare the Chi-square and -2 likelihood, which represents the deviance between the predicted and observed. The probabilities will be analysed based on the odds-ratios of the IV in relation to the DV. The odds-ratio lies between 0 and 1. If the odds ratio is higher than 1, the respondents have a higher chance to fall in the calculated category than in the reference category. If it is between 0 and 1 they have a lower chance to fall in the calculated category than the reference category. Finally, the moderation variables are testing if low SES and the capabilities do have a positive or negative effect on trust and equity or how information is accessible to the respondents which is influencing the access to LEC.

Variables	Values	Theoretical constructs
Dependent variabel		
Aware of local energycooperatives	No (0) - Yes (1)	
Independent variables		
Educational level_Dummy	HBO (0), <HBO(1), University (2)	Indicator - Socioeconomic status Practical reasoning - Capability approach
GOV_perception of of having a voice	1 -5 Stongly agree--> Strongly disagree	Government incentives
GOV_Perceptionofaccessible information	1 -5 Stongly agree (1) - Strongly disagree (5)	Government incentives
SocCap_Trust_Equality	1 -5 Stongly agree (1) - Strongly disagree (5)	Linking - Social Capital
CAP_incomedependency	1 -5 Stongly agree (1) - Strongly disagree (5)	Control of one's environment and Bodily Health - Capability Approach
CAP_Depending on other's	1 -5 Stongly agree (1) - Strongly disagree (5)	Control of one's environment - Capability Approach
CAP_Loneliness - affiliation	1 -5 Stongly agree (1) - Strongly disagree (5)	Affiliation - Capability Approach
Moderation variables		
CAP_GOV_Perceptionofaccessibility		Capability Approach * Government incentives
CAP_SocCap_Trust_Equality		Capability Approach * Social Capital
Control variables		
Age_Dummy	45 - 65 (0), < 25 - 45(1), 66 - 76 >(2)	
Type of living_Dummy	Owner-occupied home (0), Tenant private sector (1), Tenant housing corporation (2)	

Table 3, operationalization variables related to theoretical constructs (Langenberg, 2021)

3.3 Sampling

Besides what we study it is also to define whom we study. The samples are first chosen on non-probability. Distinctions are made between the case studies, survey samples and samples of respondents for interviews. In § 3.1 criteria are set for the case studies and respondents for the survey. These criteria count automatically for the samples.

Case study

The case studies were first determined on the basis of data from the 'statistisch zakboek' (statistical pocket book) (Provincie Gelderland, 2021). The determining indicator was the average disposable income per household, per municipality. Students were excluded from the dates. We choose two municipalities whose average disposable income is low (Arnhem and Zutphen) and one known to pay attention to citizen participation (Ede). When we look at the LEC, these are determined on factors such as energy saving activities and types of sustainable energy projects, collective solar

panels, solar farm and wind farm projects and the attainability of the cooperative in the municipality. This has been determined and verified by contacting employees of the LEC and the website.

Sampling respondents for interviews

For the sampling three different samples are characterized. First, for the LEC. Second, for the municipality. Finally, for the province of Gelderland. Since we are investigating the policies and financial incentives on municipality and provincial level applicable to the LEC and the lived experiences from households. The respondent from the LEC is characterized as a board member or someone who is intermediary between the board of the LEC and municipality and is an expert in the lived experiences with households. The respondent on government level is characterized as a (policy)advisor with connection to energy transition, energy cooperatives and alderman. The respondent on provincial level is characterized as someone who develops the program of the energy transition with relation to energy poverty and the LEC.

Sampling survey respondents

The survey is conducted among low, middle- and high-income groups in the rental and owner-occupied housing sector. The main target group for this study is the homeowners with a low disposable income since we think these are after the low-income rental occupied housing sector the most vulnerable. To decide on a sample and to spread the invitation of the survey indicators from the central office for statistics (CBS) are used (CBS, 2021). Indicators are 40% of the lowest disposable income and 20% of the highest disposable income. As indicator the price of houses is used to spread the invitations for the survey evenly. Housing prices between 50.000 – 250.000 for low SES and 250.001 – 450.000> for high SES. Housing prices were identified and analysed with websites as Funda, Postocodebijadres.nl and Weetmeer.nl to identify 'the value of living'. Subsequently, the samples are verified with employees of LECs or municipal officials. Samples consist of neighbourhoods in Arnhem are for low SES: Geitenkamp, Presikhaaf (east & west) and Malburgen-noord. For high SES: Burgemeesterwijk. In Zutphen for low SES are: Waterkwartier (South & Middle). For high SES: Zuidwijken and Leesten, In Ede for low SES: de Steinen, de Horstenen de Burgten and for high SES: Ede- Zuid (sideways of Klinkerbergerweg).

3.5 Reliability and Validity

To conduct a sound scientific research, it is important to be aware of the reliability and validity of the research. For this research we have to distinguish between qualitative and quantitative elements. This, however, directly increases the reliability and validity since research is conducted in a methodological triangulation method (Bryman & Becker, 2012).

Reliability

"Accuracy refers in particular to the measurement instruments that are used, such as questionnaires…The variable to be measured should be captured as correctly and precisely as possible…" (Thiel, 2014, p. 48). First, we attempt to make it accurate by conducting a thorough literature review. This resulted in proven concepts to develop the variables. Second, the quantitative part has been inspired by proven assessment tools and survey formats as explained in § 3.1 and 3.2.2 to develop and formulate survey questions. Finally, the survey questions are based on the theoretical constructs mentioned in §2.5. Also, the survey questions and interview questions

received feedback from a variety of experts in the field from LEC, employees of province and a supervisor of Radboud University.

"Consistency revolves around the idea of repeatability: under similar circumstances the same measurement will lead to similar results" (Thiel, 2014, p. 48). First, we attempt to make it consistent by taking a sample as large as possible from the data that could be compared in three different cases studies. This encourages the way of repeatability. We attempt to take the maximum of what is possible to investigate the variables in the time available. An attempt has been made to formulate the questions in the most simple and straightforward way, aiming to a B1 level. For the qualitative part the interview questions were used consistent in every interview, relevant to the respondent group. To examine the internal consistency of the quantitative part, Cronbach's alpha test was used (Creswell & Creswell, 2018).

Internal and external validity

Internal validity's point is about the question of *"has the researcher really measured the effect they intended to measure?"* (Thiel, 2014, p. 49). Internal validity is about establishing a correct causal relation and to draw no wrong conclusion (Yin, 2003). Criteria are to operationalize a theoretical construct adequately and *"does the presupposed (causal) relationship between the independent and dependent variable actually does exist."* (Thiel, 2014, p. 49). As already mentioned the internal validity for quantitative research is strengthened by conducting a thorough literature review to work towards accurate operationalization of variables and questionnaire designs. For the qualitative part with feedback from experts in the field. Also, the method of grounded theory by coding is increasing the internal validity. Furthermore, to limit the chance of drawing wrong conclusions we attempt to keep the quantitative parsimonious and to simplify qualitative data with established theoretical constructs.

"External validity described that the extent to which a study can be generalized." (Thiel, 2014, p. 49). A distinction needs to be made between the population validity and ecological validity. According to the former we attempt to generalize the findings from our sample to the larger group of homeowners with a low disposable income. However, this depends on the respond rate of this particular sample and the survey as a whole. We tried to enlarge the response from this group by handing out extra invitations for the survey (see 3.2.2 survey). The ecological validity attempts to be captured by using proven theoretical constructs which makes the research generalizable in different settings.

Potential threats

With this research we take the risk to investigate a social group in society from which is assumed that it is lacking the knowledge, interest, attitude or ability to fill in the survey or understand the topic of the survey questions. This means that answers perhaps are not honest and conscientiously given or to receive a low response rate of the low-income homeowners. Despite of that, an attempt has been made to overcome part of this threat by formulating the survey questions as simple as possible in a B1 level. This is based on receiving feedback from experts in different fields. Unfortunately, a pilot-test is not executed since this did not fit in the time path. Lastly, a potential threat is the interpretation of the research interferences in both qualitative and quantitative data analysis. To overcome this phenomenon, good schooling is preferable and the student should be aware of the subjective interference in the research. To capture this, the research is executed to

the best of my knowledge and conscious attention has been paid to avoid the subjective interpretation.

4. Findings and results

In this chapter the findings of the qualitative data consisting of document analysis and interviews are presented and the results of the quantitative data conducted in a logistic regression analysis are presented. In the qualitative data we first discuss the roles and types of energy cooperatives and projects in the three RES regions. Second, we identified the participation conditions in the RES-regions. Third, how social inclusion is incorporated in government and LEC. Fourth, we identified the government incentives. Lastly, the underlying conditions to gain access in LEC. In quantitative data we describe the statistical data received from the survey and the different variables and models conducted from regression analysis.

4.1 Document analysis and interviews

4.1.1 Role and types of energy cooperatives and projects in the three RES regions.

With investigating sub question 1 two types of cooperatives were identified (HIER en RVO, 2020). First, LECs which play a social role and is the first contact for municipalities in the energy transition. They pursue social goals and deal with aspects such as generate energy, energy trading, consulting in energy savings, recruitment campaigns, collective purchasing actions for solar panels and actions for saving energy. They develop wind farms and solar farms, and roofs with solar panels. Revenue is generated from collective purchasing actions, energy supply, production and advisory orders. According to the respondents in interviews it becomes clear that the LEC is more then only generating and trading energy, they do more than just focus on the energy domain, a broader social role is desired (see quotes, full interview transcripts are included in Appendix B. Atlas.ti files can be requested)

"You can see that ZutphenEnergie acts partly between the municipality and residents that tries to translate the working boundary, also known as the system world, from the government to the living world of the residents." (Province)

"The task that LEC have is you broaden so that more people receive your knowledge and they want to connect with you than just the green of the population. Make sure you can speak for the entire neighbourhood. I don't see that enough yet, there's still a lot to do." (Province)

"In our energy poverty project, we want to draw up an approach together with them so that they can work together even more closely. We don't know exactly what that will look like. I can imagine that the energy counter, so also the energy cooperative will take on the task of coordination for the coaches who work at the energy bank." (Arnhem)

"…have a city connector every two years. (…) I am not limiting myself specifically to the energy domain, because the opportunities lie in the connection. If we were just as technical as in the beginning, when we were founded, we will not grow. At some point you have to make connections with the wider society." (Zutphen)

Second, Production (management) cooperatives (PC) can be part of the local energy cooperative such as a residents' group or another party such as a developer, company, energy company or housing corporation. This type of cooperative is only concerned with the generation of energy, from one or more product installations, often this amounts to solar on roof.

Furthermore, a distinction can be made in type of energy projects that can be developed and by whom. The distinction is made between collective solar on roofs and in solar farms, collective

wind and energy saving activities. First, the collective sun on roofs can be initiated and developed by the LEC. There are also options to initiated independently in form of Association of Owners (AO) or as an PC. From the former this is expressed in for instance, a form that LEC uses, or rents roofs from the government, institutions or private individuals such as roofs of farms from which the AO and PC can make use of. When initiating independently the responsibilities of costs of investing in solar panels, maintenance and insurance are different. In the former the AO or PC independently takes on responsibility in the latter the LEC. Both can make use of the 'postcoderoosregeling' (Postcode rose scheme, PS) when developing a solar roof or field. Since the 1st of April this has been changed to an 'Subsidieregeling Coöperatieve Energieopwekking' (Subsidy Scheme for Cooperative Energy Generation, SCE). The PS is the 'Reduced Tariff Scheme', which provides a 15-year reduction in energy tax. However, the business case of these projects were depending on the energy tax and that in turn depends on the politics. The SCE is based on an agreement in the market prices and is guaranteed for 15 years. Also, the revenues for LECs are also guaranteed, which mean that it should stimulate the development of energy generation. Second, collective sun in solar farms consist of a system in which the cooperative is (partly) a shareholder in a 'bv' (private company). This refers to full or shared ownership. In the case of a shared ownership, the parties jointly own one private company and each has a part of the shares. Financial interest and risks are shared. The number of shares then determines which part of the sun's assets is allocated to the cooperative. This shared ownership is common in collective wind farms, such as the example at 'Ijsselwind' in which four LECs will jointly develop the wind farm (HIER en RVO, 2020). In these projects the LEC make use of equity and debt, usually from banks, or raise new member capital. The member's capital consists of investments. They get a financial return on this. The SDE+ subsidy is often used for wind projects. This allows a fixed price for electricity to be guaranteed for fifteen years. Smaller windmills use a PS. There are also energy saving activities. These activities are mainly performed by LECs and vary in focus on raising awareness and providing information, advising on making the home more sustainable and actively assisting in implementing saving measures. This can be done by being informed via website, newsletters or neighbourhood and regional meetings or in from of a central 'Energieloket' (energy counter). Every municipality has its own regional energy counter and every LEC has its own energy store/counter connected to the cooperative. The energy counter provides products for energy saving products. It is a consultant in how to save energy, how to generate renewable energy or how to invest renewable energy projects. Often the employees from LECs also work in the regional energy counter. Both can make use of energy coaches to gain assistance when you need tailored-made advice for your own living. The organizations can make use of the 'Regeling Reductie Energieverbruik' (Energy Consumption Reduction Scheme). It provides in the costs to train an energy coach. The municipalities see the LECs as their extension to reach the residents. In table 4, 5 and 6 the role of LEC, type of energy projects and forms of participation are highlighted.

Type of energy cooperatives	Role of energy cooperatives
Local energy cooperatives	Connecting system world with the lived world
	Pursue social goals
	generate energy
	Energy trading
	Consulting in energy savings
	Recruitment campaigns
	Collective purchasing actions for solar panels and actions for saving energy
Production (management) cooperatives	Part of the local energy cooperative such as a residents' group or another party such as a developer, company, energy company or housing corporation.
	Concerned with the generation of energy, from one or more product installations, often this amounts to solar on roof.

Table 6, the two type energy cooperatives and the role they have (Langenberg, 2021)

Type of energy projects
Collective solar roof
Collective solar farm
Collective wind farm
Energy saving activities

Table 4, the type of energy projects within LEC (Langenberg, 2021)

Forms of participation
Postcode rose scheme
Financial participation (shares)
Energy coaches

Table 5, the forms of participation in LEC (Langenberg, 2021).

4.1.2 Participation conditions in the Regional Energy Strategies

In order to present the results of sub question 2 in a clear manner, they are subdivided into three participation conditions: communication, (financial) participation, and responsibilities and roles (table 7). Identified from the documents of the CleanTech region (2021), FoodValley (2021) and Arnhem – Nijmegen (2021).

First, *communication*. The CleanTech Region underlines the importance of participation from the planning process. It has been agreed to involve local organisations and residents as a starting point at municipal level in the participation process. The next step, to RES 2.0, is to focus on more intensive participation of residents. Anchoring local ownership and financial participation is part of that. This is further elaborated both on process and on content. The focus at FoodValley was on the process of the RES 1.0 in the informal participation and early involvement of the interested party. It has set up a civil society forum for this purpose. In the RES, the Civil Society Forum emphasizes the importance of open communication and the discussion points. From the Civil Society Forum and local participation processes, advice on feasibility and affordability can be developed, to make trade-offs for the RES. It also indicates that communication is streamlined and communication and participation continue to be professionalized. Municipalities and initiators, in the Arnhem-Nijmegen region, engage with residents and other stakeholders at every solar and wind project to create support and discuss how it can benefited by the environment, in whatever form. The municipalities invite residents to become involved in policies about wind and solar and the associated project participation. Meetings and citizen panels were used for this purpose. There is a transparent playing field so that stakeholders and residents know when and within which frameworks they can talk. Towards 2.0 there will be a shift. *"Residents go from 'meeweten' (knowing along) to 'meedenken' (thinking along)."*(p. 52). Citizen panels, citizens' council and tailor-made participation processes will contribute to this.

Second, *financial participation.* The CleanTech region, FoodValley and Arnhem-Nijmegen are together and indicate the importance of financial participation in this according to the four categories of the 'participatiewaaier': Co-ownership, financial participation, environmental fund

and local settlement (see table 8) Each member, regardless of whether individually invested in the project or not, decides. Decisions concern the course of the project and what the proceeds are spent on. This also gives the people with a narrow income control and influence. It aims for local ownership in which the proceeds are invested back into the local community. It is 50% local property so that control remains within the community. For the CleanTech region and Arnhem-Nijmegen, they also use the social tender. This ensures that everyone (financially and/or socially) can benefit from the plans. Municipalities are supported by social tenders.

Third, *responsibilities and roles.* CleanTech region, FoodValley and Arnhem-Nijmegen want to make agreements about policy and implementation to achieve and guarantee 50% local ownership. The LECs assume this responsibility and, together with other stakeholders, look at what is needed politically. The CleanTech region describes this as the 'coöperatieve aanpak' (cooperative approach). It focuses on involving local residents as early as possible. All three argue that the municipality is responsible for securing local ownership. How the CleanTech region does this depends on the role they choose and the size of the project. Three scenarios are described: Facilitating municipality, stimulating and developing municipality. The facilitating municipality focuses on organizing local ownership through clear policies and spatial frameworks. Where possible, it steers on the desired outcome and checks whether the project complies with the set policy. However, it is limited in enforcing local property. The stimulating municipality, is based on 'invitation planning' and has a lot of control. It sends out tenders and to set out the maximum preconditions. As the developing municipality, the municipality is the developer of the energy project. It invests in projects itself by buying up land or using its own property. The municipality has the maximum control in this role and can also achieve the maximum return. The municipality itself takes many financial risks and loses its independent position. FoodValley argues that the choice and level of involvement of residents and local residents and neighbouring municipalities lies with the municipality itself. The initiator is responsible for the participation process and securing 50% local ownership when carrying out solar or wind projects. When the municipality has drawn up policy frameworks, the municipality can give direction to the implementation and facilitate it. The municipality can take on roles that vary from owner, tenderer, partner or facilitator to a local initiative. As a tenderer, the municipal policy frameworks can set preconditions in a tender procedure. Think of preconditions such as 50% local ownership, financial benefits for the environment in question, who is involved in the project. According to an interview, fulfilling the role from the municipality is closely related to the communication towards residents.

"You really have to have contact and convince a few times. That is quite a lot of communication and the municipality should really play a role in that, which the cooperative cannot do." (Ede)

The RES supports project development and local ownership. It aims to increase the chances of successful local ownership. A 'revolverende ontwikkelfonds' (revolving development fund) has been developed to support start-up or existing LECs in the first phase of an energy project. Furthermore, it wants a contribution with cheap loans for less able residents. The municipality must facilitate this, including a guarantee. As a stick behind the door, the RES has instructed the municipalities in the RES 1.0 to indicate what the participation policy will be. The RES Arnhem-Nijmegen talks about the principle 'local first'. It indicates that municipalities are responsible for participation of residents. It wants to work closely with LECs for local participation. It applies customization so that each municipality takes care of this itself and does this from its own 'rules of the game' and policy. This guarantees participation in local policy and can offer opportunities for customization. In the future, it will see that resident participation is becoming increasingly important. It wants not only the

immediate local resident but also the silent middle group to speak. This is another task for the municipality.

Co-ownership	Financial participation	Environmental fund	Nneighborhood scheme
Local residents also benefit as co-owners of a wind or solar project, through an association or cooperative.	Local residents take a risk-bearing part in a project, for example through shares, certificates or bonds.	Part of the proceeds will go to social causes in the neighbourhood, such as a sports club or neighborhood association.	Direct residents receive benefits, for example in the form of making their homes more sustainable or discounting green electricity.

Table 8, components of the 'Participatiewaaier' (participation range). (HIER en RVO, 2020)

<table>
<tr><th colspan="2"></th><th>CleantTech Regio</th><th>FoodValley</th><th>Arnhem-Nijmegen</th></tr>
<tr><td colspan="2" rowspan="3">Communication</td><td>Starting point in participation process is involvment of local organizations and inhabitants.</td><td>Early involvment of stakeholders by using citizen forum and local participation processes.</td><td>Early involvment of stakeholders and inhabitants by conversation, citizen panels, citizen council and tailor-made participation processes.</td></tr>
<tr><td rowspan="2">More intensive participation in RES 2.0</td><td rowspan="2">transparency in having a voice and when to have a voice</td><td>transparency in information, having a voice and when to have a voice</td></tr>
<tr><td>Participation in RES 2.0 shift from co-knowing to co-thinking</td></tr>
<tr><td colspan="2" rowspan="2">Financial participation</td><td colspan="3">Participatiewaaier': 1) Co-ownership, 2) Financial participation, 3) Environmental fund, 4) Neighborhood scheme.</td></tr>
<tr><td>Gives room for inhabitants with a tight budget to participate</td><td>Less wealthy residents should also be given the opportunity to participate in energy projects.</td><td>For everyone financial and social benefits with social tenders</td></tr>
<tr><td rowspan="6">Responsibilities and roles</td><td>Local energy cooperative</td><td>Minimal 50 % locally ownership and acceptance</td><td>Minimal 50 % locally ownership and acceptance</td><td>Minimal 50 % locally ownership and acceptance</td></tr>
<tr><td rowspan="5">Municipality</td><td>Responsible to guarantee locally ownership</td><td>Responsible to guarantee locally ownership</td><td>Responsible to guarantee locally ownership</td></tr>
<tr><td>Roles:
1) Facilitating, 2) Stimulating 3) development</td><td rowspan="2">Roles:
1) Owner, 2) Contracting authority, 3) Partner,
4) Facilitator in local initiative</td><td rowspan="2">Responsible for the silent middle group</td></tr>
<tr><td rowspan="3">Social tenders</td></tr>
<tr><td>Initiator of solar of windprojects responsible for 50% locally ownership. Municipality could guide or steer with policy frameworks or facilitate</td><td rowspan="2">Social tenders</td></tr>
<tr><td>financial guarantee</td></tr>
</table>

Table 7, the identified participations conditions from the three RES- regions CleanTech, FoodValley and Arnhem-Nijmegen (Langenberg, 2021)

4.1.3 Social inclusion in government and local energy cooperatives

With investigating sub-question 3, social inclusion was identified from the coalition agreement (2018), program budgets from 2021 onwards and policy documents related to social inclusion. The social inclusion elements are divided among the conceptual elements: social cohesive society, social participation and social integration or within a combination of all three elements.

Government level

First, the S*ocial cohesive society.* The municipality of Zutphen aims for a strong social base in which energy poverty is combated in collaboration with housing corporations and LECs. The social basis means a strong set of residents, (residents) initiatives, (social) entrepreneurs and professional organizations. The organization focuses on participation and partnership. For this purpose, the Zutphenfunds facilitates to support initiatives in society such as liveability. They can receive both guidance and support in kind as well as financially. Furthermore, social neighbourhood analysis are carried out to gain insight into carrying capacity and load. To combat energy poverty together with, among others, the housing associations and the LEC, for rentals. From the interview (see quotes) with the municipality of Zutphen it became clear that there is no formal agreement or collaboration between the municipality and LECs. The two collaborate in an informal way on project level since the municipality has no capacity to put emphasize on a broadly formulated inclusion policy. On project level it states that it establishes the relationship with the social task in the neighbourhood. Since financial resources are not sufficient it is not possible to guarantee inclusion. However, there are practical examples how the municipality is incorporating social inclusion. For instance with the project Zonnestroom, a solar farm in which vulnerable households did not have to invest to participate or by creating employment by training the unemployed.

"... formally there is no institutional subsidy, informally there is cooperation."

"We do this from the energy transition by connecting with social challenges in the district. We really do that at the project level. There are no general policy frameworks that regulate the connection to inclusion and energy transition."

"We also have specific situations where we lead the residents to work and also make agreements with them and another initiative about certain neighbourhoods where they are active."

Ede also aims for a strong social base. It has drawn up an inclusion policy for this, whereby entrepreneurs, civil society organisations (CSO) and other parties will contribute to an inclusive society. It wants to improve the well-being and the well-being of the inhabitants or at least keep them the same. The formal appeal was to reduce support and care and to make residents self-aware as much as possible. The achievement here is to subsidize welfare work, residents' initiatives and voluntary organizations. Cooperation within the social base is facilitated and accessible activities for residents are stimulated. Coordination is ensured between the use of the social base, the demand of residents and objectives of the area agenda. A sub-goal they set is that more (vulnerable) residents participate in society in all its facets. Think of the physical and mental thresholds they experience and stimulating independent living for as long as possible. Ede is aware that the level of the district is the starting point and that there are challenges such as *"... linking social, physical and safety challenges (integral and area-oriented work) in combination with strengthening the involvement and self-reliance of residents."* (ChristenUnie, CDA, GemeenteBelangen, VVD &

GroenLinks, 2020, p. 89) An investment fund has been set up aiming to give a boost to the liveability of neighbourhoods. In doing so, it wants to link opportunities with other domains, "*... for example, by means of an integrated neighbourhood approach and linking physical and social tasks to restructuring tasks.*" (ChristenUnie, CDA, GemeenteBelangen, VVD & GroenLinks, 2020, p. 24). It points to the policy program Liveability 2020-2024 of the province of Gelderland. With the aim of reaching a 'Wijken/dorpendeal' (neighbourhood/village deal). However, from the interview(see quote) it became clear that in practice it seems difficult to bring the social domain and the spatial(which is related to energy) domain together.

"In one way or another you have little to do with each other in daily life in the social and spatial domain. So there is still work to be done."

Arnhem aims to help at least 2500 households in energy poverty to reduce energy bills in three years. They want to approach this group in collaboration with the Energy Bank. When there are problems other than energy bills and income, it is collaborating with the social neighbourhood teams (see quote).

"Cooperation with, for instance, social neighbourhood teams and debt relief should also contribute to gain insight into households in energy poverty."

Based on the climate plan 2021 – 2030 (2020), the province of Gelderland focuses on a broad and inclusive society. It centres on projects in vulnerable neighbourhoods. Together with municipalities, CSOs and social initiatives, it looks at financial possibilities to prevent energy poverty and energy remains affordable for everyone. This provides an action perspective for residents, entrepreneurs and LECs and includes vulnerable parties. The province supports by offering action perspectives at a district-oriented or individual level. Energy counters and incentive loan 'Toekomstbestendig Wonen; (Future-proof Living) are examples which focus on the individual and at district level. Continuity and security are guaranteed by long-term programming in energy counters and incentive loans. From the Liveability 2020-2024 program (2020), it aims to stimulate parties by focusing on exclusivity, extra attention is paid to vulnerable neighbourhoods and villages. Specifically, it has four program components: Knowledge, 'leefbaarheidsalliantie' (liveability alliance), village deals and 'everyone participates'. With the knowledge program, the knowledge exchange between municipalities and residents wants this with support of liveability alliance and facilitating the delivery of methods and tools such as workshops and lesson packages. Furthermore, insight into the well-being of the Gelderlanders as part of the Monitor 'Brede Welvaart' (broad prosperity), knowledge about activating vulnerable neighbourhoods and villages. The Liveability Alliance was founded for practical support. In particular, they strengthen entrepreneurship in voluntary organizations and connect (possible) initiatives so that they can inspire each other. From the program village deals, agreements are made to cooperate between residents, the municipality, entrepreneurs, CSOs and the province of Gelderland. In the 'Iedereen doet mee' (Everyone participates) program section, it supports poverty reduction initiatives. Poverty affects inclusivity since it means that residents cannot fully participate in society. The municipality supports the individual financially. The province supports (regional) projects. For example, it supports the distribution centre of the 'Voedselbank' (Food Bank) with modernizing and making it more sustainable, which is a link between poverty and energy transition. From the theme of loneliness, it wants to improve loneliness through knowledge exchange as stated in program part: Knowledge. It supports the municipalities in this. Additionally, it focuses on organizations outside the Liveability

Alliance with which they want to reach target groups that are less involved or heard for various other reasons.

Second, *Social participation*. Zutphen aims to ensure that everyone participates according to their own talents and own abilities of their social network and developed a participation tool, "right to challenge". Ede developed the 'Edese participatie aanpak' (Ede participation approach). The approach aims to clarify who is involved, who has what role, within which frameworks participation is possible and what happens to the proceeds. Ede also developed 'Ede does' a platform to support neighbourhood or citizen initiatives from which people can sign up or support by donating money. From the interview (see quotes) it becomes clear that Ede is also increasing social inclusion to provide access for vulnerable group with financial guarantees in project Meikade, a solar project and facilities towards energy savings. However, how to include households with low disposable incomes is difficult since they have different interest or priorities. The ultimately purpose of the energy transition is that everyone participates.

"Recently a project Meikade. A solar project, solar power plant for people with lower incomes. We have developed this custom made for that group, so that they can also participate in that project. (...) What we also do is involve RRE (Regulation Reduction Energy Consumption) and applications. See if we can make supply for people on lower incomes..."

'I don't know how you get these people involved. Low-income groups have other concerns. The energy transition is the last thing they're worried about, I have the idea. (…) The goal of the energy transition is for everyone to participate."

Third, *Social integration*. Zutphen is searching for a better integration by improvements in communication within society. They want to do this by using their own (social) media channels and informing residents online and offline. The aim is to let every resident participate in Zutphen, whereby they appeal to everyone's own talents and possibilities and that of his/her social network. Mapping households with an accumulation of problems like unemployment, addiction, debt, poverty, psychological problems and/or low literacy. Arnhem focuses on low income groups among Arnhemmers so that they can participate in all areas of life. An effort made by the municipality of Arnhem is to reduce the fixed costs such as waste tax and the costs on the energy bill. It focuses on households that spend more than 10% of their income on energy bills. Furthermore, it is committed to improving a more inclusive municipal communication with this in order to ensure that everyone feels understood and seen. Understandable language such as applying language level B1 becomes standard for general communication. It also wants Arnhemmers to be able to participate independently in society. They can approach one of the eight social neighbourhood teams or teams living environment. The municipality recognizes that stress and social exclusion come from poverty and debt. They want to help Arnhemmers out of debt as effectively as possible. One appointment they make is that when offering facilities, neighbourhood teams get space for what is needed. The municipality stands for inclusion and wants to make Arnhem an inclusive city. The municipality of Arnhem wants to show itself by engaging in conversations with residents about diversity in society. During the interview (see quote) it was explained that the Energybank focuses specifically on households in energy poverty, and not the LEC. Since there are several organizations active - it may be possible - that they will operate together to improve social integration with the LEC as a coordinating role. In table 9 the social inclusive actions of governments are highlighted.

"For now, it looks like the three of them are going to figure out how they're going to do it and then you can imagine that the energy cooperative focus on the coordination, Energybank on finding the right coaches and get involved with the people and kombiSOL recruiting people and visiting households."

	Zutphen	Ede	Arnhem	Province of Gelderland
Social cohesive society	Strong social base: there is a powerful whole of residents, (professional residents) initiatives, (social) entrepreneurs and organizations.	Our subsidy policy is geared to social base. We implement the inclusion policy: We encourage entrepreneurs, social organizations and third parties to contribute to an inclusive society.	In 3 years, at least 2,500 households in energy poverty will be helped to reduce their energy bills. A network of parties, including the Energy Bank, will help to achieve this goal	Based on the liveability program, it offers programs such as village deals and quality of life alliances in which it takes the role of connecting, advising and sharing knowledge. It also supports poverty alleviation and loneliness
	To combat energy poverty together with, among others, the housing associations and the local energy cooperative, for tenants.	A stronger social base with more/more focused activities and residents who are committed in the neighborhood so that: - The well-being of our residents remains the same or improves. - There is less entitlement to formal support and care. - Residents are active longer and seek support from each other; as many residents as possible are self-reliant and cooperative.		Based on the climate plan, it supports the municipality, residents, entrepreneurs and energy cooperatives with subsidies, loans, to provide perspective for action, such as in energy counters and incentive loans.
	Connection to social task on project level	Developing integrated neighborhood approaches (from a social, safety and spatial perspective) in coordination with and cooperation with the environmental vision and social basis. .		Monitoring the well-being of the people of Gelderland through monitor 'Brede Welvaart"
	Insights into carrying capacity and burden through a social neighborhood analysis			
Social participation	Participation-tool 'Right to challenge'.	Supporting and facilitating residents' initiatives, including through 'Ede Doet'.		
		Edese participation approach		
	Creating employment by training unemployed	Stimulate participation by requesting subssidies for energycoaches and develop projects for less wealthy residents		
Social integration	Involving residents through their own (social) media, or by informing them or inviting them to (online and offline) meetings.		Commitment to all Arnhem residents with a low income so that they can participate sufficiently in all areas of life. We offer Arnhem residents who are temporarily or structurally dependent on help a basis for their livelihood.	
	The aim is for everyone to participate in Zutphen, whereby we appeal to everyone's own talents and possibilities and that of his/her social network. By mapping households with an accumulation of problems: no work, addiction, debt, poverty and psychological problems, and ow literacy.		Improvement towards more inclusive municipal communication Optimize contacts from care providers and (social) neighborhood teams towards Arnhem residents with a support need to improve access to social facilities	
	Combat energy poverty in collaboration with the Energy bank and Schuldhulpmaatje		Making power visible in Arnhem society and having conversations with citizens who are concerned about diversity in society	
	Creating employment by training unemployed			

Table 9, highlights of social inclusive actions of governments (Langenberg, 2021)

Local energy cooperatives

Besides a little paragraph of Zutphen Energy policies on social inclusion in literature from the three LEC could not be found. The results below are based on interviews. It was not possible to divide them amongst the three conceptual models of inclusion. Basically, in interviews the question was asked *'how inclusion is guaranteed in the energy cooperatives?'*

First, ZutphenEnergie (ZE) shows in the business plan with research statistics that it is aware of the lower income group as a target group. The strategy is *"... a target group analysis and segmentation combined with demographic data should lead to better results. The marketing strategy and communication can therefore be better tailored to the experience and needs of the target group."* (ZutphenEnergie, 2017, p. 12). The interview does not discuss this further. However, it is indicated that the policy focuses on minima (population group with a minimum income wage or less). *"We put down 4000 panels for the Minima and approached them. They got a discount of 5.5 cents per kWH, which means that they have the cheapest electricity in the Netherlands for 15 years."* (ZutphenEnergie, 2017, p. 12). Based on the interview it became clear that concrete actions have been taken to this end. Firstly, together with the Energy bank, identify and compensate households that have a payment problem and are struggling to get shut down from energy supplier. A pre-paid energy service system can offer a solution. Secondly, energy coaches especially for tenants to change behaviour. Thirdly, a collaboration with debt shell. Fourthly, the Solar Power project especially for minima. It has been indicated that there are topics concerning vulnerable groups during meetings within the LECs, with no policy concerning them. Rather, these are things that are considered in the execution. *"That doesn't appear in policy pieces, but those are "do" lists."* (Zutphen-interview). Furthermore, they work together with the social domain in which they also want to get people to work in the energy transition. ZE is also affiliated with a poverty network 'Verbindtkracht' (connect power) in which it wants to help households out of energy poverty. Ultimately, the interview showed that (see quotes) research must also contribute to an improvement in social inclusion. It is important to find out what incentives the vulnerable target groups need. These kinds of insights are needed to grow and make connections with the wider society. Potency is seen in a 'connector'. Furthermore, it tries to reach minima by sending letters, however this seems to have little effect.

"We've also been working on how do you approach these people? Among other things, we did this with the organization 'Duwtje' (nudge). Who look at psychology and how do you get into the picture of those people. That too was not enough. There is still too little knowledge about the psychological of these groups. What incentives do these people need to participate."

"Through letters to really reach everyone and precisely those vulnerable groups and then I have doubts about the revenue of that. I think it really works when people are really at the door."

ValleiEnergie (VE) has no specific policies and objectives on social inclusion. It is indicated, also mentioned by the government, that there is a project called Meikade. This project has a PS for which no investment needs to be made. This makes it accessible for households with low disposable incomes to participate. Based on the interview (see quotes) it has been discovered that, for this target group to participate letters are sent, but it needs to be explained in more detail. It is seen as a complex task because sometimes people do not understand it. The reaction does show that it is appreciated as a positive challenge. Potential is seen to partner with social neighbourhood teams.

"Yes letters. Send letters. Also for vulnerable groups. Vulnerable groups need to be explained in more detail. Sometimes I get people I can't even understand who don't even understand what's in the letter. They have to start somewhere other than VE."

"I'm going to try more and more for that. I also want it as an entrance for the energy transition.".

Rijn and Ijssel Energy (REIJE) has no specific policies and objectives on social inclusion. In the interview the respondent argues that they want to be dependent on their own continuity. The energy generation projects are therefore financial projects and not social participation projects. Money has to be put in for this and that is at odds with the target group that is in energy poverty. It has also been argued that it cannot be used in the budget because administrative costs are too high and that it cannot be audited administratively. It may also be the case that it only yields returns after 20 years, which is then the added value for someone who is less wealthy. It is indicated that they have an ideal component in which it supports neighbourhood initiatives. REIJE provides employees and volunteers who are members. The volunteers are a relatively large group with low incomes, but this does not necessarily have to be low educated. REIJE would like to focus more on low income groups, but there is no information to make it part of the objective.

"Yes, that's because it's not one of our goals. We have a socially very involved board but if you look at the nature of the co-operation, we have made the choice to think in our own continuity that we can create a portfolio of energy generation projects, we have focused on energy generation projects. These are financial participation projects and not social participation projects where money simply needs to be invested and that is at odds with a target group that is in the energy poverty corner."

'It's not entirely clear to us whether those low-income groups, who are not volunteering and don't cause a lot of problems, are not [unclear] the objective of the co-operation. To set that up would be useful information for us and that could well become our policy but don't have the information for that at the moment."

4.1.4 Access to Local Energy Cooperatives based on governments facilities

In orde to create a common sense about how access can be facilitated by governments, the findings are distinguished in type of policy instruments.

From the coalition agreement (2019) of the province of Gelderland 'Gelderland wordt duurzaam' (Gelderland becomes sustainable) they emphasize on making facilities tangible in the energy transition. Realizing physical locations where citizens and entrepreneurs can get information, supporting LECs and their mutual cooperation and highlighting cost reductions for residents and businesses and increasing independence. Energy poverty is discussed with Housing Corporations in Gelderland and the national government. From the climate plan 2021-2030 (2020) with the theme the 'Gebouwde omgeving' (Built environment) it wants to raise awareness and the importance of energy saving measures. The homeowners level of knowledge about energy savings needs to be raised, the bargaining power of homeowners strengthened as well as the need of financial instruments. In the energy transition, it is added that justice in the distribution of costs, benefits and risks between parties involved is desired. It is recognized that financial capacity is needed. A revolving fund can be set up to pre-finance the energy transition costs for tenants and homeowners. Guarantees are also possible. Participation for the interested party should be made possible. Knowledge, the accessibility of language and actively providing information are part of this. This requires the province's ability to use connecting forms of work. Cooperation with social

initiatives because they provide insight into how the way of working, of the government, organizations and business need change. In order to address the importance of raising awareness of energy-saving measures the province puts emphasize professional network of energy counters and energy cooperatives, and an action perspective for private homeowners. The former offers structural support aimed at continuity and professionalization of the energy counters and energy cooperatives. Energy counters aim to inform residents, support residents' initiatives, and think along and work on sustainability solutions for homes. Energy cooperatives are expanding from purchasing and producing RE to cooperative companies that work on housing insulation and the operation of a district heat grid. The latter objective offers the incentive loan Future-Proof Living. From the theme electricity, sustainable energy generation, the energy cooperatives are seen as an important party. Cooperatives play an important role in participation and contribute to the realization of sustainable generation. The subsidy scheme is about local RE projects as well as stimulating to realize RE projects. Energy cooperatives, non-profit legal entities and (cooperating) Associations of Owners (VvE) can make use of this subsidy scheme. There is also a financial instrument such as encouraging owners of large roofs to install solar panels with the 'Verzilver uw dak' (Project Redeem Your Roof). During the interview (see quotes) it became clear that there are also different projects and programs which are available. Stated was that the LEC is not a panacea for vulnerable groups to participate in the energy transition. A combination of projects, programs and instruments are the solution to let vulnerable groups participate in the energy transition. For instance, ´Wijken van de Toekomst´ (districts of the future) and the executive phase, the 'proeftuinen' (testing garden). In addition, there is also the transform program, which is a collective financial instrument. This program is also working on a pilot with the municipality of Deventer in which it looks at whether it has to be paid back through the credit bank, or if the debt does not have to be paid back. When this is not possible, it also assumes that it will not be refunded.

"In Transform, people must have an income to use the custom loan. There are also people who are in debt restructuring who also do not have financial space for a custom loan, they do not pass the test. The municipality of Deventer is one of the municipalities that participates in Transform. Deventer is the province of Overijssel. Is together with the credit bank, Sallant, where the municipality in a pilot links the guarantee fund to the credit bank and then the credit bank is allowed to lend those people money. That comes from some kind of reserve. Without the intervention of the applicant, this is done through a kind of building pot how the measures are financed. That is the first municipality in the East of the country to do so in this way."

"The LEC can help, inform and engage people and develop supply. So, part of the offer should always be financing measures, there is no other way. "

"You need a combination of solutions to make the energy transition possible. I do think that the LEC can play an important role. We also see that happening at ZutphenEnergy which is a cooperative. Which also actively contributed to the application for a testing garden."

In the coalition agreement (2018) the municipality of Zutphen states that it is ambitious in the energy transition and the climate agenda. It wants to take an exemplary role for the inhabitants and invest so that this makes a strengthened socioeconomic Zutphen with (financial) benefit for the inhabitants. In 2030 Zutphen will be energy neutral, with which the municipality wants to support initiatives for the generation of clean energy. It embraces the Cleantech Region and the municipality is acting actively. The programme budget (2021) wants to reduce housing costs because sustainability must become self-evident and energy efficiency and affordability go hand in hand.

That means a lower energy bill. It also indicates that a partnership is being entered with corporations and LECs to combat energy poverty among tenants among others. However, as aforementioned, the municipality also recognizes a vulnerable group by providing subsidies to LECs to carry out projects especially targeting households with a low disposable income. This is however with no success since it is difficult to get the target group involved in LEC.

"In addition, we have provided ZutphenEnergy with the subsidy to involve the vulnerable groups, unfortunately this has not yet proved successful."

"We do give them the opportunity, but I realize very well that the range is relatively limited."

The municipality of Zutphen communicates through the website which resources are available for LECs and energy projects for residents. Through the municipal website it refers to relevant themes related to the LEC and the regional energy counter in Zutphen. Together with the municipality, they organize and facilitate actions for RE and energy saving actions. It communicates energy saving actions organized from the regional energy counter and ZE through the website. One of the energy related actions available consist of economic and physical policy instruments such as 2000 pieces gift vouchers of €50,-. Free services are also communicated and made available such as a free house scan, free visit of the energy coach from ZE, free step-by-step plan to make it more sustainable, planning of future neighbour actions, solar panels on roofs at a competitive price as a collective, including three online meetings and home insulation at a competitive price. There is also reference to economic policy instruments such as a collective solar panel action or in a solar park with a PS. It refers for advice to the regional energy counter and ZE. Accordion to the interview (see quotes) various policy instruments and projects are used to include the vulnerable groups in the energy transition. Subsidies for energy coaches and ZE to develop a solar project are available. They searching for alternative economical instruments within the project of transform and they subsidize education for unemployed people in energy poverty.

"We try to reach them as much as possible with those coaches and measures such as ZutphenEnergy, in addition we try to develop instruments together with Transform, that is our commitment there. And of course, with the co-operation in our performance agreements to organize the energy transition, so that they will also invest in certain neighbourhoods where we also have our commitment, we align that."

"We want to train people in the future and especially in the realization and implementation, work will come back to grid operators or to operators. That's what we want to train them for."

"Yes we do have contact with the 'woning abonnement' (house subscription). To see what we can do for the target group in collaboration with Transform because there are not yet so many banks that want to invest or lend without a guarantee. So we're out there looking for what are the alternatives. "

In the board agreement (2018) of the municipality of Ede, the municipality indicates that it makes room for initiatives from society and acts as a connector between groups and interests. The municipality supports where necessary and sets the frameworks when necessary. To support the initiatives, the municipality is committed to make information and expectations accessible. When taking decisions, it wants to respect the interests of all inhabitants of Ede. They want to use village councils, district organizations and other advocacy groups. They take sustainability as a common

thread for the board agreement. This concerns the transition to RE sources and the challenges for the climate. They want to achieve this through a sustainable financial perspective. Everyone must participate and strives for customization and freedom of choice for the vulnerable residents. As aforementioned, they also developed the project Meikade for vulnerable households to participate.The municipality of Ede states in the program budget (2021) that: "*in order to achieve goals in the administrative agreement, funding is needed at the current level because the current budget has always been used occasionally in recent years."* (ChristenUnie, CDA, GemeenteBelangen, VVD & GroenLinks, 2020, p. 18) It indicates to prepare and achieve a challenge from the climate agreement it depends on state resources. Resources are communicated by the municipality website. First, Ede communicates relevant themes related to the LEC and the regional energy counter in Ede with economic and physical policy instruments. Sustainability subsidies are made available for making a house more sustainable. After using the search function with the search terms: energy, sustainable energy solar panels, saving and energy project introduction is referred to: generating RE yourself, 120 Edenians can save up to €100 per year by switching to local sustainable energy, Future-proof Housing Loan and Incentive Loan 'Duurzaamheid Rechtspersonen' (Sustainability Legal entities). Sustainability, for Edese homes €445,000 for energy savings the subject: solar project also for households with a minimum income and solar fields in preparation. Furthermore, it is described that residents, CSOs and entrepreneurs can set up initiatives in solar farms or wind turbines. If there is interest, you can look at the wind and sundial. This is linked to the second communicative policy instrument, website www.ede-natuurlijk.nl. This concerns a neutral website for sustainability, energy or climate actions, initiatives or investments. The website informs and offers services and projects. Two related to the LEC, ValleiEnergy. This concerns '*120 Edenians can save up to €100 euros per year by switching to local renewable energy*' and *'solar project also for households with a minimum income'*. For the first topic, up to a maximum annual income of €40,024 (single or household) can save money and contribute to sustainable energy. No money needs to be invested for this project. It will save €60-100 per year for 15 years, depending on the power consumption on the Meikade solar power plant project of Cooperative ValleiEnergy. Finally, a communicative instrument which is a participation approach, as also explained in 4.1.3, is available for initiators of sustainable initiatives. According to the interview (see quotes) the municipality made an energy project accessible. The municipality has started to provide a financial guarantee for the LEC which had led to a development of a project as project Meikade. However, with financial risks which are not appreciated by the council.

"Simply put, with a guarantee it doesn't actually cost you anything if things go well. So, you're kind of a guarantor. If things go well, the energy cooperative can borrow cheaply and we can offer things cheaply to lower incomes but we don't have to pay for it ourselves. We then make strength of the municipal robustness, so to speak."

"Many financial risks that people within the municipality do not like."

In the Coalition Agreement (2018), Arnhem indicates that it wants to make a difference in the energy transition and has set up a climate fund to achieve objectives in the policy plan 'New Energy Made in Arnhem'. New Energy Made in Arnhem is the programme for a climate-neutral and sustainable Arnhem with which it sets concrete measures to fulfil the objective of the Paris Agreement (municipality of Arnhem and The Day After Tomorrow, 2019). The starting point of the report *"... is that every Arnhemmer can come along with the energy transition, and that the distribution of social burdens is fair and sustainable. We do it together, honestly and sustainably and the Arnhemmer is paramount."* (p. 12). Besides this, as already mentioned in 4.1.3, the municipality

wants to help 2500 households in energy poverty to reduce energy bills. According to the interview homeowners are recognized and are 10% of the target group. Furthermore, it is acknowledged that they have to improve language to low literate since they need to get understanding of the energy transition.

"We think that private individuals make up about 10% of the target group."

"At all, there is a lot of low literacy, which means that we really have to be much more creative in our communication. So what we are trying to do is that we can reach the group via ArnhemAAN and through a partner such as Energiebank and kombiSOL. That's still difficult."

Furthermore, the municipality of Arnhem refers via the communication tool, the website, to energy saving tips, referring to REIJE including a link to the website. The REIJE is described as an all-clear about energy saving, generating sustainable energy, waste, home insulation, solar energy, LED lighting, financing and local initiatives. It then refers to the subject of energy counters where informed of free advice on energy saving and generation in and around the house. Relevant is a second communication tool 'Energieloket Midden Gelderland' (Energy counter middle Gelderland-ELMG) for residents and businesses in the Arnhem region. The ELMG is an accessible platform to be. According to the interview (see quote) with the municipality of Arnhem was explained that they invite everyone in district meetings. However, as expected was underrepresented. It is an issue.

“we have recently held neighbourhood interviews and everyone was invited, and as you can expect this group was under-represented. (...) We not only organized vulnerable neighbourhoods online, but also went into the neighbourhood with kombiSOL's van. With this we have been in the neighbourhoods where we do not expect people to participate in an online conversation, but we are still looking for how we can consistently shape this participation for this target group. So how can we explicitly look for people with a migration background or socioeconomic status"

Informed and to be helped on the way with energy measures. “ELMG's employees are also employees of REIJE” (Arnhem). References are made via the website to LEC or subsidy schemes for energy measures in and around the house. The topic of sustainable subsidies relates to incentive loans for homeowners for which income or property is needed. Relevant is the economic policy instrument reduced rate in case of collective generation (postcode rose scheme). It informs about the arrangement. Furthermore, members of cooperatives and Association of Owners can receive a refund of the energy tax on the jointly generated RE. Moreover, it refers to energy-conscious living to energy saving tips and also to REIJE. It also refers to a third communicative policy instrument, Arnhem AAN which is a long-term urban campaign on sustainable energy. The goal is to enthuse residents and businesses to save or generate energy. To get the inhabitants enthusiastic, examples of neighbourhood initiatives such as initiatives by companies are used. It consists of a core team with AANjagers, which has an AANjaagfonds from the municipality of Arnhem. It can use this to realize energy and climate projects at district level. In addition, there is also ‘Lijn 2030’ (Line 2030) for which residents can request a stop, the so-called Halte (Stop) 2030 (kombiSOL). Line 2030 consists of a Volkswagen Van with a specialist to help residents make their homes and living environment more sustainable. The Stop 2030 employs employees of ELMG and the municipality.

“The energy counter, and therefore actually the energy cooperatives, has the coaches and they were with us, called ‘woonwens coaches’ (housing wishes coaches) but we also have the energy bank in Arnhem. that was started to help people with very low incomes. And they work together.”

“When we come behind the front door, we have the energy coach, who goes 4 or 5 times to support with advice and products. We then look at the owners via the loan from Future-proof living. That tailor-made advice is then for people with a low income.”

However, in general, according to some of the respondents in the interviews (see quotes) spread over the three municipalities they perceive the financial instruments are limited to the individual level. Financial constructions are based on loans from which households are not in favour, since they have bad experience with loans or are afraid to go in dept.

"Loans help limited. "

"We now find that we only know loans. That doesn't solve the financial gap from a homeowner.. It just helps to arrange pre-financing. That's generally not enough to get people in the legs. It's got to do for them.

"Future-proof living loan (...) research shows that very few people are willing to invest from a loan, most want to do it from their own money or savings account. "

Finally, municipalities are in limited in the commitment they can give to the phenomenon of energy poverty (see quotes). Municipalities do lack capacity and budget. The province of Gelderland is the province is now making money available that they no longer expect to get back or need in return.

“The municipality itself is also investing. It's just not enough. This has to do with the fact that the national governemnt has not made funds available. The resources made available are insufficient. Partly we have funding because we can do that, we do this from our own resources."

“Yes, we are also working towards a different situation because we think we will come into a financially different framework because the Government, as the executor of the climate agreement, should invest gana at municipal level, but at the moment there is no capacity available and it is doing what is there. The Energy cooperative is switched *as briefly as possible* and we get a lot of knowledge from there because there are a lot of volunteers working there who inspire us and can help guide us from their *knowledge. This means that we focus on implementation because we then use our budget as efficiently as possible..”*

"We were hopeful of incentives from the council, application from europe, province and a third rail. We did not receive one of them. Now we are looking at how we can arrange it with cofinancing. We could have helped households could help if money came from the province or another."

Instruments	Zutphen	Ede	Arnhem	Province of Gelderland
Communicative	Information and referral from the municipal website to the regional energy desk and ZutphenEnergie	Information and referral from the municipal website to the regional energy desk. This is connected to ValleiEnergie	Information and referral from the municipal website to: - Rijn en Ijssel Energy Cooperative (REIJE) - 'Energieloket Midden Gelderland' (ELMG). 'ELMG' refers to energy cooperative and informs about subsidy loan/scheme.	Various forms of communication tools, both digital and physical to reach as many people as possible. Residents are involved with an online campaign and questionnaire or in a game with a participation touch.
Economic	Postode rose scheme			Revolving fund to pre-finance costs for tenants and homeowners
	Subsidize solar project	Depending on support from the national government		Guarantees for municipalities and social organizations Incentive scheme for: Local renewable energy projects, non-profit energy cooperatives, association of owners
	Subsidize training program	Financial guarantee solar project		Subsidy for owners with large roofs: project 'Verzilver uw dak'
Economic and physical	Government subsidy. Energy saving campaign with the regional energy desk and ZutphenEnergie Home owners and tenants can request an energy scan or energy coach and buy energy-saving products in the energy store by means of energy vouchers.	Government subsidy. Energy saving campaign with the regional energy desk and 'Ede neutraal' Home owners and tenants can request an energy scan or energy coach and buy energy-saving products in the energy store by means of energy vouchers		Professional network with energy counters and energy cooperatives and action perspective for home owners. Incentive scheme: 'Future - proof living', Collective finance 'Transform',
Physical	Collaboration with local energy cooperatives to, for example, combat energy poverty among tenants		REIJE and Lijn 2030 (Stop 203) door-to-door service for advice on energy-saving measures, investments or initiatives Combat energy poverty in collaboration with the Energybank and social neighborhood teams CampaignAAN has 'AANjagers' and Climate Active Neighbourhoods. It helps to set up initiatives in neighborhoods and districts	Collaboration with social initiatives

Table 10, overview of instruments which are related to activities of energy poverty, accessibility of LEC and activities of LEC (Langenberg, 2021)

4.1.5 Underlying conditions to gain access in local energy cooperatives and local renewable energy projects

Condition of membership

From the articles of association (Notariskantoor Rouweler, 2016) under the heading: Members, Article 5, a distinction is made in member categories of ZutphenEnergy. Consisting of natural persons, associations and foundations, and companies and (government) institutions. Of *"... who are natural or legal persons who must have free power of management and disposal over their assets..."*(p. 2). For this research we speak of a natural person. Conditions for a natural person to join (as described in Article 6b) is the request to provide name, address, place of residence and date of birth to the board. The rules of procedure (Coöperative vereniging Zutphense Energietransitie U.A. , 2016) adds that natural persons must have a place of residence in the municipality of Zutphen and are registered in the municipal basic administration. Article 6f states that membership can only be approved by the board. When looked at the heading of: member capital, Article 9. It is mentioned that the member's capital consists of shares, each of which have a value of €10,-. Each member is obliged when joining to have *"... at least one share in the member's capital and to pay it up."* (p. 3). Article 8 of the rules of procedure states that when members purchase energy, no contribution is payable. Via the website it is communicated that the annual contribution is €27,50,- , except when participating in an energy park or decrease energy from the LEC (ZutphenEnergie, 2021). If one is a member, one has one right to vote in the general members meeting and the services of the association such as energy coaches can be used.

The following conditions apply to become a member of VE. The articles of association (ValleiEnergie, 2017) under the heading: membership and register of members, Article 4, which provides that members may be members of natural and legal persons. The application must be submitted in writing with the required information to the board. In the rules of procedure (Coöperatie ValleiEnergie U.A., 2015) under the heading of members, Article 2a, membership: No further requirements are imposed on membership. Article 2b, 'contribution' (i): counts as a condition that each member is obliged *"... to pay the annual contribution determined by the General Members' Meeting, on a proposal from the Board."* (n.p.). The fixed amount for 2021 is €35,- per year with a direct debit of €30,- (Valley Energy, 2021). Article 2b, contribution (ii): states that there may also be a form other than money to pay for membership. The agreements of this are recorded in writing. Article 2c participations, (i): states that members can also invest in the developments of the cooperative. These conditions are defined in the participation regulations. Article 2c, participations (ii) and (iii): *"Members may invest in the development of specifically named projects. The conditions for these investments are determined per project. ii. Non-members cannot invest in the development of projects or the cooperative."* (n.p.). The participation regulations state that only members can participate. A distinction has been made in Article 15, type a: Participations that strengthen the development of the cooperative. These are forms of money, labelled as the member's capital. This is not without risks for the member. Article 16, type b participation: participations in concrete projects. This makes it possible to generate energy together. This form of participation is also not without risk for the member, because projects are based on business cases with assumptions, there may be disappointing results. As a result, the monthly benefit will be put under pressure.

As conditions to be member of REIJE the articles of association say (Crol-Kole, 2012) under the heading: Members, membership: Article 3. Members may be natural and legal persons and partners of a company. Article 4, accession as a member, makes a written application to the cooperative's board. The board decides on the physical knowledge of accession. Article 8, rights and obligations of the members, excluded liability: Members pay a fixed member's capital determined by the

general meeting of members. Article 23, Rules of Procedure: the general meeting may adopt one or more regulations and may amend or cancel them. Additionally, are the domestic regulations (Ledenvergadering Coöperatie Rijn en Ijssel Energie, 2019). Article 5, financial matters states the financial regulations (Rijn en Ijssel Energie Coöperaties, 2018). Members can never again be held liable for the amount they have invested in the cooperative. This is characterized as a Cooperative UA (Excluded Liability). A contribution is requested from each member in the capital so that it can invest its own funds in energy generation projects and energy transition projects. Members are deemed to pay a contribution determined by the general members meeting. Unless the member is active as a volunteer, a customer of an energy supplier with whom the cooperative has agreed a compensation arrangement or a participant. Members were required to pay an amount of €100,- in 2019, without an annual contribution of €24,-. This goes to the member capital account which is part of the equity to invest in projects and is therefore also risk-bearing. Project participation funds are independent of the general profit and risk. They are contractually entitled to the benefits of the projects in which they participate. To spread risks, separate project BV (private company) is set up for large investment projects, so that it is not part of the ordinary business operations. The risk then lies with the participants who have made investments. It gets a market-based return for this. The member capital is used in the development phase of new projects, and the cooperative itself. The cooperative aims for a dividend of 5% on the balances of the member capital account and the general reserve account. This can only be paid out insofar as the credit at the general members' meeting of each member is there.

Conditions of project participation

Conditions for participating in an energy project as described on the websites of ZE First, a collective sun on roof. This can arise from a solar panel action for all residents (for which you do not have to be a member), in cooperation with the municipality. A quotation is drawn up for this purpose. The conditions for participating then depend on the possibility to pay for the quotation. Another form is the PS. Members of another cooperative in collaboration with ZE realize solar panels on a roof of a school. The investment per solar panel was set at €310,-. The investment would have been recouped in 10 years. On top of that, five 'profit' years and a 15-years benefit on the energy tax are accredited to participants.

Collective sun in a solar park can be done by investing yourself. Approximately €300,- per solar panel and €50,- to cover the preparation costs must be paid. You can also participate without investing. Then the costs are paid with a loan from the municipality. As a result, participants do not have a share in the solar panels, but they do generate locale sustainable energy. For this, based on the current rates, participants will receive approximately 5 cents per kWh on the electricity price. Each park has its own cooperative and its members decide on the policy together. As an example for the non-investors, ZE has developed Solar parc 'Zonnestroom'. This is for people with a small budget. With an average annual consumption of 2400 kWh, households would generate €120,- per year, on the energy bill. This has been made possible by funding from the province of Gelderland and the municipality of Zutphen.

Collective wind as an example which is an Ijsselwind project. A project between three energycooperatives: ZutphenEnergy, LochemEnergy and BrummenEnergy. The conditions for participating are by purchasing a share. A share is a loan from €250,-. The advantage is that it generates an interest rate of 3 to 4% per year, depending on the power to be delivered of wind energy.

Conditions to participate in an energy project as described on the website of ValleiEnergy (ValleiEnergie, 2021), collective sun on roof, is delivered with the example solar roof 'GroeneWaarden'. Conditions are to buy a Valley Energy Part, or a solar panel of €120,-. With an

investment participants automatically and free of charge become a member of the VE cooperative. The return can be up to 4 to 5% per year with a payback period of 9 to 10 years. participants also do not pay energy tax on the Valley Energy Parts in which investments have been made for fifteen years.

Collective sun in a solar park with as example solar park Meikade, made possible by the SDE+++ subsidy. This can be done by investing individually. Participation is possible by paying a fee of €100,- which delivers a return of 4% per year and a payback period of 11-12 years. You can also participate without investing. For this purpose, the 'op-Rozen model' has been developed by the municipality of Ede. It provides an annual discount of €60 – €100 on your energy bill. The condition is that only, single or households are allowed to participate with a maximum annual income of €40.024 and you shift to VE for a minimum of 3 years. There is no collective wind at VE yet.

Conditions to participate in an energy project as described on the website of REIJE. Collective sun on roof, with the example of 'Sportpark Schuytgraaf' (Sports park Schuytgraaf). 240 solar panels will be placed. Participation per solar panel costs €312,- with a return of approximately 5% payback period is unknown. With the example of 'Gelredome' 3000 solar panels will be placed. Participation per solar panel costs €250,- with 4% to 5% payback period is unknown.. With the example of 'Kindercentrum Oosterbeek' (Childcare center Oosterbeek) 374 solar panels will be placed, which is a PS project. Participation is allowed in the areas with certain zip codes. Participation per solar panel costs €300,-.

Collective sun on a field as an example 'Zonneveld De Bocht' 3380 solar panels will be placed. Participation for a solar panel costs €250,- with 3% to 5% payback period is unknown..

Collective wind with the example of 'Windpark Koningspleij' (Windfarm Koningspleij). Underlying conditions are (Rijn en Ijssel Energie Coöperatie, 2020) that the Koningspleij wind shares are suitable for investors who are not designated on dividends in the early years and who can deal with varying returns over the years. The Koningspleij wind shares are not suitable for designated investors who are looking for rapid availability of their invested capital or on regular dividend payments. Participation is possible from one wind share. The cost per wind share is €250,-. The term of the Koningspleij wind shares is 20 years. The expected return rate per year is 6% payback period is unknown.

At all of the three LECs it is possible to make use of the energy coaches for energy saving consultancies. There are no conditions for making use of the energy coaches, it is for free. This is because of the RRE subsidy a subsidy made available by the national government. Furthermore, energy saving activities are mainly based on own initiative. Products and further information are available at the energy counters.

4.2 Survey

As aforementioned the survey was spread amongst 2000 participants and after a period of three weeks we decided to add to it the snowball method to increase the respond rate. 246 participants started the survey in Qualtrics from which N=218 finished the survey. This is a completion rate of 88,61%. However, it is not a representative number. With a population sample of 2000 and confidence interval of 95% and 5% error margin a required response of 322 was needed (Kruisman, 2021). The survey consisted of 47 questions which need to be distinguished between control variables and theoretical concepts. The theoretical concepts consist of Capabilities, Government incentives and Social Capital (see §3.2.2 and logbook, which can be requested). The mean and standard deviation are presented as (4.61 ± .885)

4.2.1 Frequencies and Descriptive statistics

First the analysis of Frequencies has been executed to identify missing data. Other than that, not every question applied to every respondent and providing different answers to the question, there is no missing data and cleaning up the data was not necessary.

Amongst the respondents 63,3% (N=138) is male, 36,2% (N=79) is female and .5 (N=1) is 'different'. Most of the respondents are higher educated. The highest responds came from HBO (University of Applied Science) with 49,8% (N=106) and 28,2% (N=60) from academic university. There is a low response of the lower educated people (primary school, LBO/MAVO/VMBO and MBO) together they have a cumulative response of 16,9% (N=36) against a cumulative of 78% (N=166) of high education (HBO and academic university).

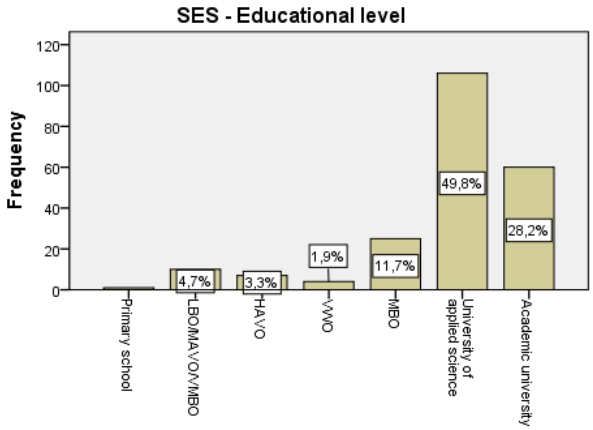


Figure 5, spread of educational level amongst respondents

Amongst the respondents most, 87,6% (N=189), are homeowners. 7,2% (N=17) live in a rental house from a housing corporation and 5,3% (N=12) lives in a private rental house. In total 189 people (86,7%) have respondent on a value of their home and 29 (13,3%) on the rental price. The value of living between 450.000 and more has the highest respondents of 20.1% (N=43). The value price between 250.001 – 300.000 is following closely with 19.6% (n=41). Finally, 29 respondents with a total of 13.3% live in rental houses. Most of them 6.9% (N=15) pay a rental price between 600-650. 6 respondents (2.8%) above 901 euro.

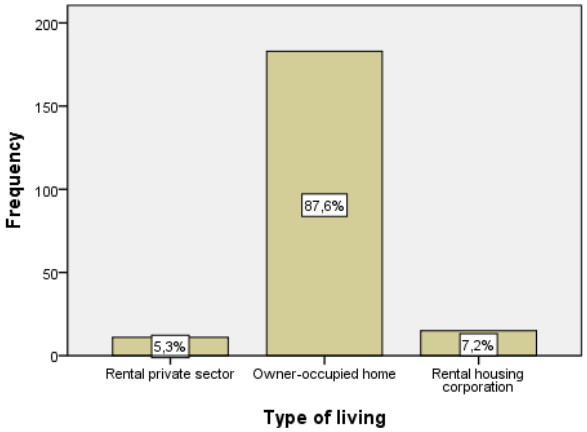


Figure 6, spread of the type of living

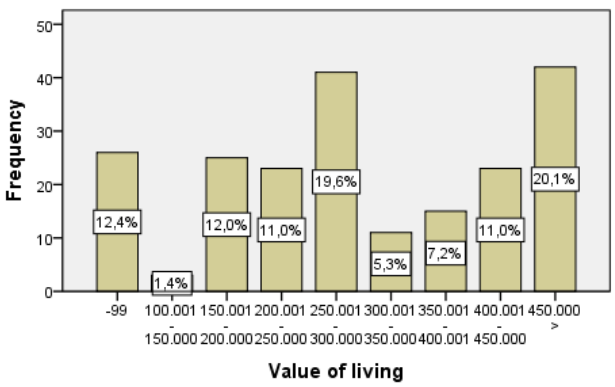


Figure 7, spread of the value of living

Furthermore, as expected the capabilities of households appear to be positive about their income situation related to their daily necessities, health, state of the house and help for administrative affairs and loneliness. This is expected since there is a high respond rate of a high education level (78%) and people who value their house highly with a cumulative of 63,2% above 250.001 out of N=189 (86,7%). Although, still 20,2% (N=44) respondents out of 218 answered that someone in the family suffered from illness or condition for 6 months or longer. However, 16,5% (N=36) did not seem to be limited in activities like doing groceries, walking and cycling. Therefore, it does not seem to be to significant. When looking at other indicators respondents with a cumulative of 93,9% (1.28 ± .756, 1, Totally agree – 5, Totally disagree) have sufficient income to cover their daily necessities.

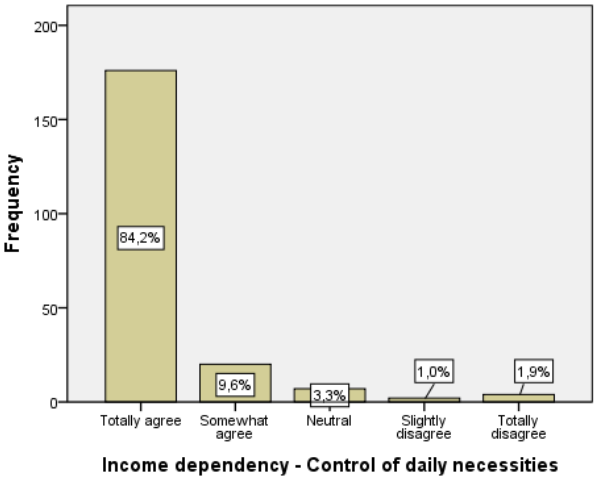


Figure 10, spread of the control on daily necessities

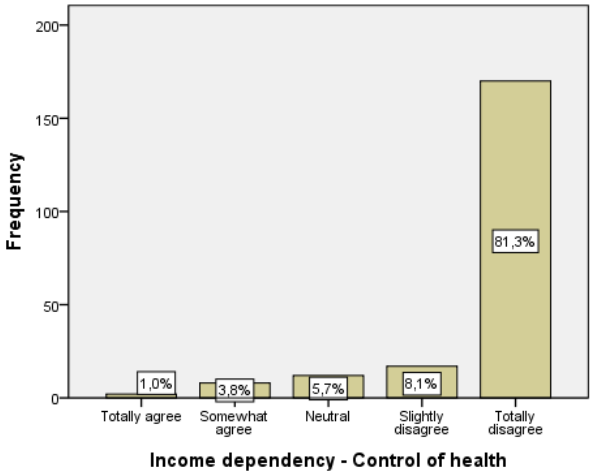


Figure 8, spread of the control on health

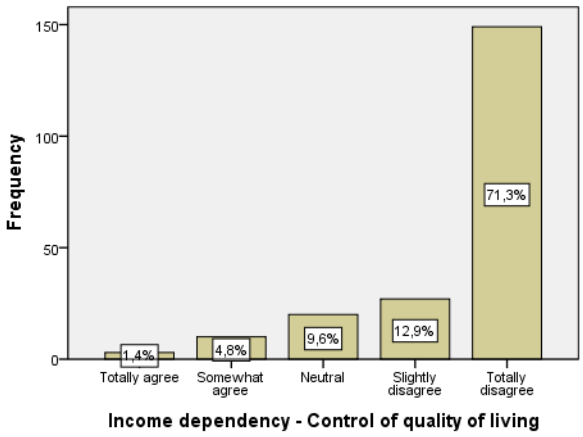


Figure 9, spread of the control on the quality of the livings

With a cumulative percentage of 89,4% (4.61 ± .885, 1, Totally agree – 5, Totally disagree) respondents have sufficient income to have control over their health (4.44 ± .983). With a cumulative percentage of 84,2% (4.44 ± .983) have sufficient income to control the quality of their living. Moreover, it seems not to be significant that 89% (4.56 ± 1.051) of the respondents need someone outside of the family take care of affairs such as allowances, taxes, paying the bills or

groceries. Also living a withdrawn life, which makes peoples live to life lonely seems not to be of any significant value. 92.8% (4.66 ± .794) does not live a lonely life.

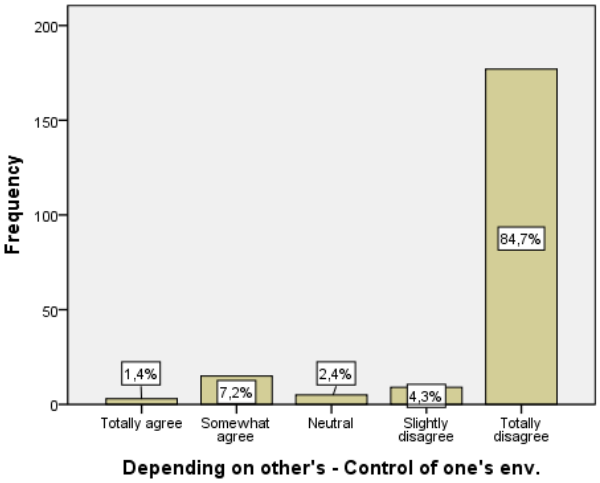


Figure 12, spread on the control of one's one environment

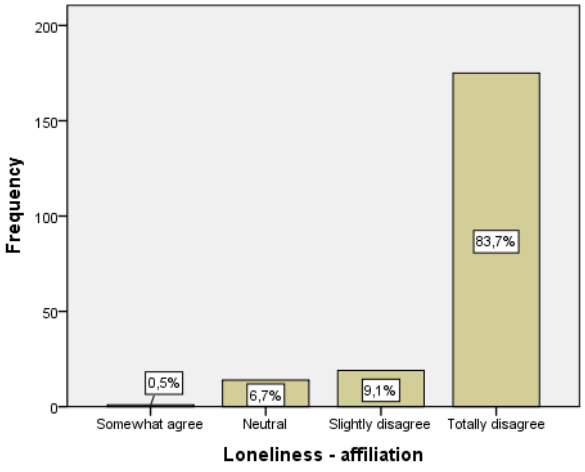


Figure 11, spread on the perception of feeling lonely

When looked at how respondents perceive the accessibility of government interventions one can state that accessibility and availability of information towards sustainability of their home is positive, with a cumulative of 70.9% (N=148, 2.11 ± 1.200). 14,8% (N=31) are neutral where to receive information from and 14,3% (N=32) do not know where to go. Second, for the subsidies available for sustainable energy 57,4% (N=120) know where to apply for subsidies and 17.2 % (N=36) are neutral and with a cumulative percentage of 25.3% do not where to apply for the subsidies. With a mean number of 2.50 ± 1.328 they know where to go for subsidies. When asked about if respondents think that municipality is listening to them, 54,5%(N=114) are neutral. Followed with a cumulative of 21,1% (N=46) of the respondents which feel that they contribute and 24,4% (N=54) do not feel to contribute to the plans of the municipality. With a mean number of 3.09 ± 1.019 the respondents are doubtful if the municipality is listening to them.

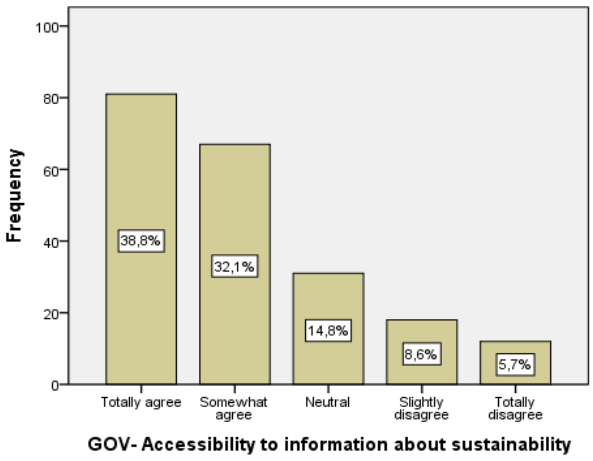


Figure 14, perception of having access towards information about sustainability provided by government

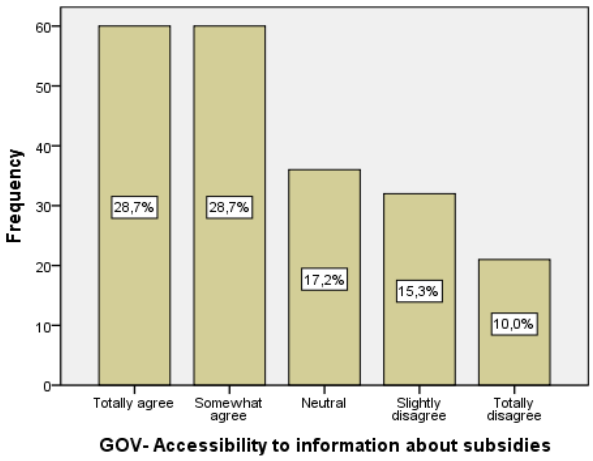


Figure 13, perception of having access to information about subsidies

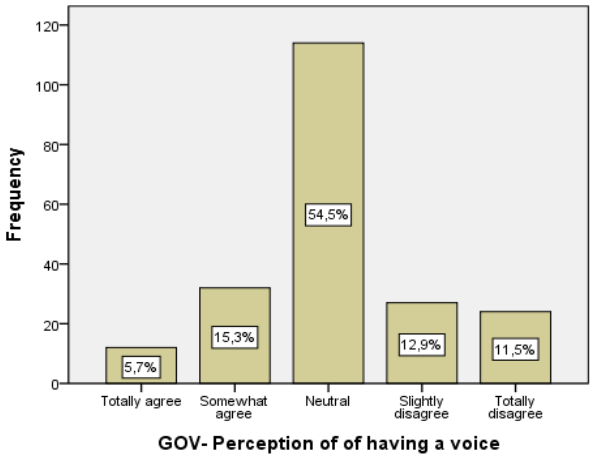


Figure 15, perception of having a voice in decision-making processes

Moreover, indicators on Social Capital have been examined. Indicators are related to how respondents perceive trust and equality under socio-demographic factors like income situation, education level and culture backgrounds and if there is trust in formal institutions like the government. Overall there is a positive attitude towards the Social Capital indicators. First, trust against families from another income situation is slightly positive with a total cumulative of 64,1% (N=140, 2.17 ± .937) have trust. Followed by 29,2% (N= 63) who are neutral and a cumulative of 6.7% (N=15) who do not agree to trust families from another income situation. They do see households with another level of income as equal to themselves with a cumulative of 71,8% (N=185, 1.81 ± .993.) and 20,6% (N= 44) are neutral. A total of 7,7% (N=16) do not see themselves as equal to the other.

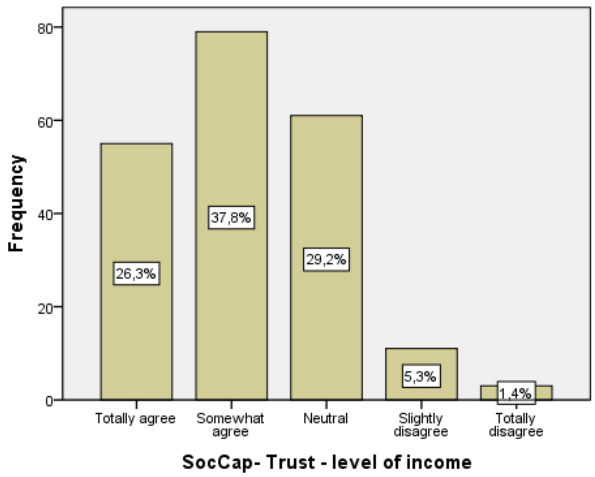


Figure 17, spread of having trust in households with another level of income

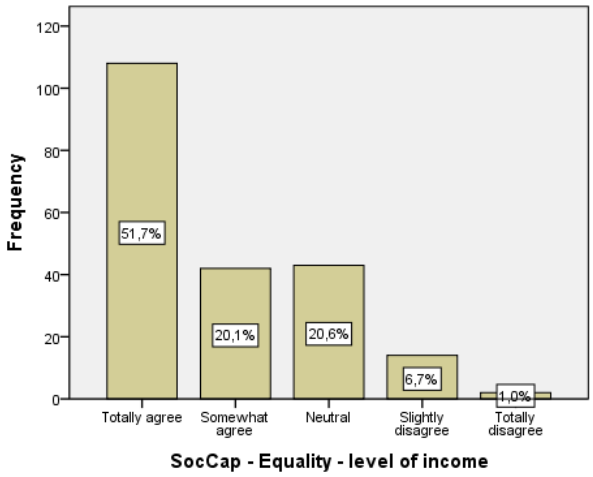


Figure 16, spread of seeing households with another level of income as equal, as themselves

Second, trust against families with different education levels is positive with a cumulative of 69,6% (N=154) do have trust in families with another educational level and 24,8% (N=54) are neutral. A total of 4,6% (N=10) has no trust. Respondents also see households with another education level as equal to themselves, with a cumulative of 76,1% (N=152) and 19,1% (N=41) neutral. A total of 4,8% (N=10) does not sees other as equal in education level. The mean is 1.73 ± .938.

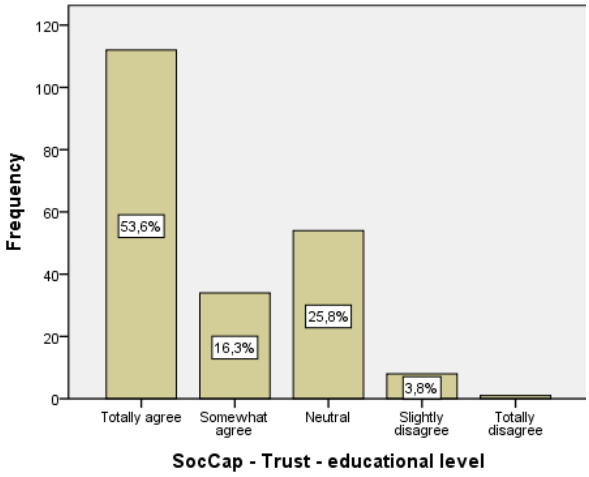


Figure 18, spread of having trust in households wit another educational level

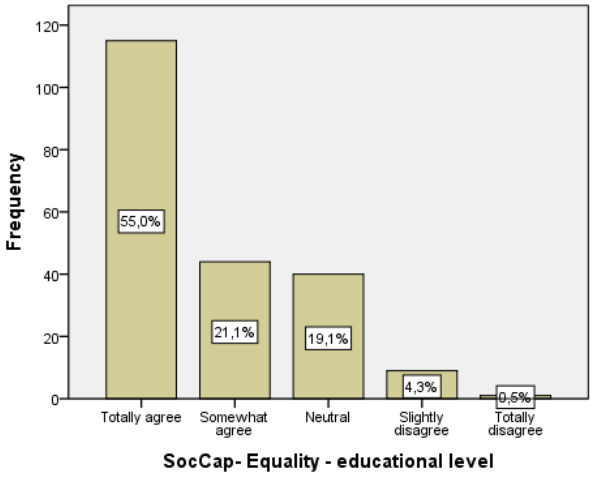


Figure 19, spread of seeing households with another educational level as equal, as themselves

Third, do respondents trust families with other cultural background? The mean number is 1.91 ± 1.028. A cumulative of 69,1% (N=152) are positive and do have trust, 24,9% (N=52) are neutral. A total of 6,2% (N=14) does not trust other cultural backgrounds. Do they also see them as equal to each other? Yes, a cumulative of 73,2% (N=160) sees themselves as equal to each other, 20,6 (N=44) are neutral. A total of 6,4% (N=14) do not see themselves as equal to other cultural backgrounds. Finally, do respondents trust local government. This is the least positive indicator with a mean of 2.53 ± 1.065. With a cumulative of 57,3% (N =125) they have trust and 22,9% (N= 50) is neutral. A total of 19,7% (N=43) has no trust in the local government.

Finally, the DV, 30.6% (N=64) of respondents were aware of LECs and 69,4% (N=145) were not aware of the LEC.

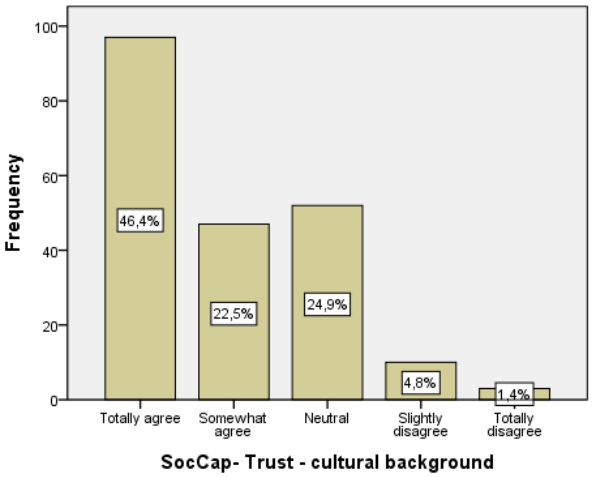


Figure 21, spread of having trust in households with a different cultural background

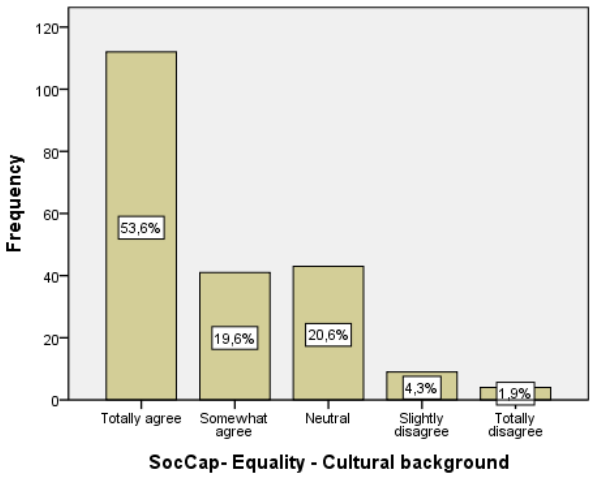


Figure 20, spread of seeing households with a different cultural background as equal, as themselves

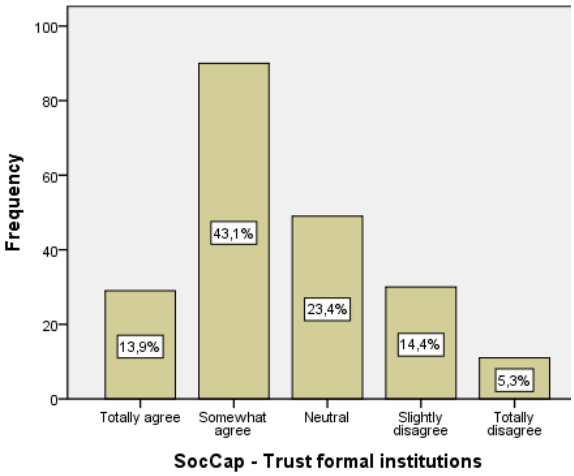


Figure 23, spread of having trust in formal institution, like the local government

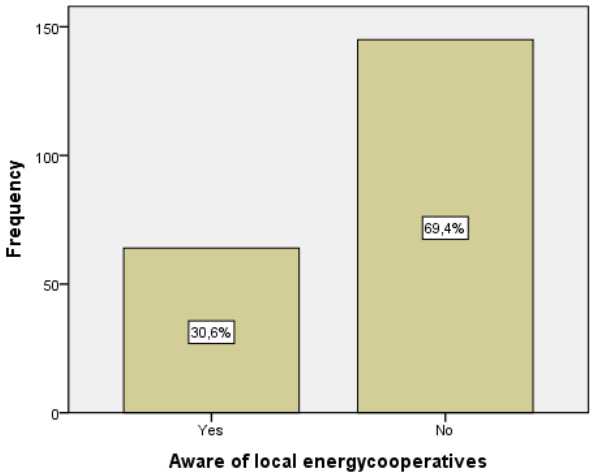


Figure 22, spread of knowing local energy cooperatives

4.2.2 Internal consistency

To identify if the survey questions measure the theoretical construct as explained in §3.2.2 a Cronbach Alpha test is executed. First, the DV is established on one survey question: Q35_1 - Perception towards collective investment. This question predicts the current situation of collective or no collective investments in LECs. Second, the new variables will be tested based on Cronbach Alpha (CrA) test (see Appendix C3). To be more specific the IV will be separated in: Capabilities: Control of one's environment, bodily health and affiliation; Government Incentives; Social Capital: Trust and equality.

New IV: CAP- Control of one's environment. Consisting of Q13, Q14 and Q15 with an acceptable value of the CrA of .712.

New IV: GOV- Access to government incentives. Consisting of Q25 and Q26 with an acceptable value of the CrA of .805.

SocCap – Trust and Equality Consisting of Q37 till Q43 an acceptable level of .896.

4.2.3 Multicollinearity and multivariate outliers

To avoid biased estimations of the coefficients between two or more predictor variables a multicollinearity test is executed. We can speak of a satisfactory in the multicollinearity test with the highest VIF of 1.11 (see table 10) and the condition index is 21.94, below the threshold value of 30. The condition index with the variance proportions are rejected since there are not two or more variance proportions higher than the set value of 0.8 and higher than 30 (see Appendix C4). Finally, we check the data on outliers in the multivariate data with the Mahalanobis distance test. In our dataset seven outliers were identified and deleted to let de analysis not be biased, N=209.

Variables	Tolerance	VIF
Depending on other's - Control of one's environment	.984	1.016
Loneliness - affiliation	.939	1.065
GOV_Perception of of having a voice	.872	1.147
CAP_incomedependency_control	.884	1.131
GOV_Accessible incentives	.906	1.103
SocCap_Trust_Equality	.926	1.080
a. Dependent variable: Aware of local energy cooperatives		

Table 10, Variance Inflation Factors (VIF)(Langenberg, 2021)

4.2.4 Logistic regression analysis

The logistic regression consists of 7 models of which it is tested against the binary DV, aware of LECs. Model 1 consists of the control variables, then in model 2 one IV (educational level) is added that indicates the level of the SES. In model 3, two IV are added. This is measuring the accessibility to government incentives. In model 4 one IV has been added, of which the trust and equity measures the social capital theory. In model 5, three IVs have been added that measures control of one's environment, bodily health and affiliation of the Capabilities theory. The moderation variable was then added in models 6 and 7. In model 6, this is the moderation variable of capabilities and the perception of accessibility to government incentives. In model 7, this is the moderation variable of capabilities, equity and trust of social capital theory. Finally, the models will be compared. An overview of the models with the regression coefficients and odds-ratio can be found in table 11.

Model 1 is the basic model including only variables related to sociodemographic characteristics. Age_Dummy (1) is significant and contribute to explain the accessibility to LECs of respondents. Respondents with the age between <25 – 45 are three times (3.213) more likely to have positive relation to the accessibility of LECs then the age between 45 – 65. This result is robust and stable since it stays significant from model 1 till model 7 when additional variables are included. Age_Dummy (2) with the age between 66 – 76 > would have 17,5% (1.175) of a higher change to then the age between 45 -65. However, this relationship is not significant and cannot be confirmed. Type of living_Dummy (1) is not significant but respondents from the rental private sector would have been three times more (3.054) likely then owners with an occupied home to positively have access to LECs. Type of living_Dummy (2) is not significant. However, they would have been 21.1% less likely to have positively access to LECs.

Model 2 includes an additional variable measuring SES. There is no significance level of the educational level. However, if significant it would be 71% (1.711) more likely and with a university level it would have been 3.9% (0.961) less likely to have positively relation to the accessibility to LECs then respondents with an HBO educational level.

Model 3 includes additional variables measuring accessibility of government incentives. The perception of respondents towards access to information about available government incentives is significant and 67% (1.670) more likely to have positively access to LECs. This stays robust and stable till model 5. When starting to include moderate variables the log odd (Exp (β)) increases, however

it is not significant anymore. According to the perception of having a voice, it has no significance. It would, however, have 30.1% (1.301) of a higher chance of having access to LECs.

Model 4 includes an additional variable measuring social capital. There is no significance level of the values about having trust in different sociodemographic and see them as equal based on the characteristics: income situation, cultural background and educational level. Nevertheless, if significant, it is 21.1% (.789) less likely that respondents have positively access to LECs.

Model 5 includes an additional variable measuring capabilities. There is however no significant level of the values about income dependencies, depending on others and loneliness. If significant, respondents depending on income dependencies 50.4% (.496) and bodily health would have been 13.3% (.867) less likely to positively have access to LECs. Loneliness, if significant, would have been 23.6% more likely to positively have access to LECs.

Model 6 includes the moderate variable. A moderate variable between Capabilities and the perception towards access of information about available government resources which has no significant relationship. If significant it would have been 23.4% (.763) less likely to positively have access towards LECs.

Model 7 Includes the second moderate variables. A moderate variable between capabilities, trust and equality in different sociodemographic groups based on the characteristic's income situation, cultural background and educational level which has no significant relationship. If significant it would have been 33.7% (.663) less likely to positively have access towards LECs.

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	β	Exp (β)	β	Exp (β)	β	Exp (β)	β	Exp (β)	β	Exp (β)	β	Exp (β)	β	Exp (β)
Constant	0,432	1,541	0,318	1,375	-1,584*	0,205	-1,268	0,281	0,881	2,412	-1,270	0,281	-3,507	0,030
Age_Dummy														
Age_Dummy(1)	1,167**	3,213	1,239**	3,450	1,226*	3,406	1,231*	3,425	1,311*	3,711	1,323*	3,756	1,334*	3,796
Age_Dummy(2)	0,161	1,175	0,209	1,232	0,321	1,378	0,327	1,387	0,375	1,455	0,374	1,454	0,378	1,460
Type of living_Dummy														
Type of living_Dummy(1)	1,117	3,054	1,090	2,975	0,447	1,563	0,336	1,399	0,220	1,246	0,131	1,140	0,107	1,113
Type of living_Dummy(2)	-0,238	0,789	-0,521	0,594	-1,006	0,366	-0,872	0,418	-1,125	0,325	-1,195	0,303	-1,289	0,276
Educational level_Dummy														
Educational level_Dummy(1)			0,537	1,711	0,480	1,616	0,471	1,602	0,443	1,557	0,446	1,562	0,463	1,589
Educational level_Dummy(2)			-0,040	0,961	0,136	1,145	0,137	1,146	0,150	1,162	0,165	1,179	0,165	1,180
GOV_perception of of having a voice					0,263	1,301	0,295	1,343	0,257	1,293	0,256	1,292	0,256	1,291
GOV_Accessibility of information					0,513*	1,670	0,538*	1,713	0,532*	1,702	1,497	4,467	1,134	3,107
SocCap_Trust_Equality							-0,237	0,789	-0,200	0,818	-0,218	0,804	1,251	3,493
CAP_incomedependency_control									-0,702	0,496	-0,116	0,891	0,466	1,593
CAP_Depending on other's - Control of one's environemtn									-0,142	0,867	-0,143	0,867	-0,142	0,867
CAP_Loneliness - affiliation									0,212	1,236	0,231	1,259	0,267	1,306
CAP_GOV_Perceptionofaccessibility											-0,270	0,763	-0,171	0,843
CAP_SocCap_Trust_Equality													-0,411	0,663
	Significance levels:		*P< 0.05	** P< 0.01	***P<0.001									

Table 11, overview of the hierarchical implemented variables in different models with the regression coefficients, log odds and significance (Langenberg, 2021)

Model characteristics.

If we look at goodness-of-fit statistics (table 12) one can say that all models are significant, meaning that the model performs better than the model before. Models 3, 4 and 7 have the highest percentage of correctness (74.6%) and with model 7 with a value of Nagelkerke is .219. Which means that this model explains 21.9% of the forming of accessibility in LECs. However, there are slight differences in the value of Nagelkerke. This make model 3, 4 and 7 quite even and since they have large differences in the explanation of the forming of accessibility in LECs.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Omnibus test (Signif. lev.)	.011	.021	.000	.000	.001	.001	.001
-2 Log likelihood	244.462	242.584	227.961	226.777	223.108	222.770	222.280
Cox and Snell pseudo R-squared	.061	.069	.132	.137	.152	.153	.155
Nagelkerke pseudo R-squared	.085	.097	.186	.193	.214	.216	.219
Hosmer-Lemeshow test (Signif. lev.)	.971	.822	.418	.032	.273	.191	.370
Percentage correct	69.4	68.9	74.6	74.6	73.7	74.2	74.6

Table 12, overview of the goodness-of-fit of the models. The significance, deviance, Chi-squared and percentage correct predicted of the model can be read (Langenberg, 2021)

5. Discussion

A qualitative and quantitative research method was used for this research. For the qualitative method, the documents were used to examine the facts and, through interviews, the different perceptions of the government and the LEC and, through the quantitative method, the perception of households to study the LEC's accessibility.

The qualitative research shows that affordable access can be created by making financial constructions available, but that social problems do not make it easy for the target group to get involved. This appears to require resources other than access to energy projects. The LEC is also not seen as a panacea for vulnerable households. Collaboration between different social parties seem to offer a solution to get behind the front door of the households to be able to work on both problems and a combination of instruments, programs and projects. The difference in organizational objectives also seem to have an impact on accessibility and therefore on the inclusiveness in LECs. This is in line with two of the expectations made. First, how collective regulations and financing are produced and distributed to influence the affordability and accessibility towards community initiatives and second, that different underlying values and principles between community initiatives make them less inclusive. However, we see that the expectations are not correct regarding the assumption that vulnerable households are also influenced by their own capabilities which affect their health and autonomy of investing in RE or making the decision of participating within community initiatives for RE. The quantitative data shows that there are no significant results in which the capabilities of households affect accessibility to LEC or policy instruments made available and that the perception of trust and seeing other households as equal as themselves, do not affect the fellow human beings.

This fits with two of assumptions made since different underlying values and principles influence the distribution of goods, services, activities and relationships, and thus the physical and social provisioning systems (O'Neill, Fanning, Lamb & Steinberger, 2018; Steinberger, 2020). Furthermore, it fits the literature of TNO (2020) from which highlighted that energy poverty is not only having less use of energy services in the own house. It has further social implications such as affecting the quality of life and a less inclusive society. We identified that LECs and municipalities are collaborating between societal organizations and local governments which is verified by the literature of having a social inclusive society government (Evans, 2004; Rydin & Pennington, 2010; Hayes, Gray &Edwards, 2008) and the literature on Janssen (2020) Steinberger, (2020) Middlemiss et al., (2019) that a collective approach within communities can help to solve the problem.

However, a possible explanation for the difference between the qualitative and quantitative data can be the skewed data from which, 78% was highly educated and 22% was <HBO. A second possibility may be that internal validity is limited, so that the set and variable do not measure what it is required to measure. Moreover, the data is also not representative for the population as a whole, since it did not meet the response rate of 306 (N=218) which compromised external validity for the entire population. Nonetheless, it is representative of the neighborhoods studied in this research.

Furthermore, from the qualitative data we identified a different extent of accessibility and therefore a different extent of energy justice. Zutphen and Arnhem have a relative high extent of energy justice. However, Arnhem does not specifically put emphasize on LECs. The province of Gelderland and Ede have a relatively low extent of energy justice. The province, since instruments are not useable for the target group and Ede since it is emphasizing on neighborhood initiatives and it remains unclear how they combat energy poverty. This is expected to be due to the role played

by the municipalities and LECs. In Zutphen, ZutphenEnergie seems to play a broader role by entering into various collaborations, showing initiative by going through the doors and showing initiative in research and available projects from the province. ValleiEnergie wants to, but seems to have difficulties because communication and cooperation are not yet smooth. Arnhem has set a clear goal and seems to be pushing for action with large campaigns. However, they are not looking for cooperation with the LECs but with the Energy Bank to tackle energy poverty. The province appears to be supporting where necessary and exploring other alternatives, despite the fact that the energy poverty issue is not part of the legal tasks. One possible explanation may be that there are different interests between the political parties that are governing, thus putting the use of capacity and budget on other interests.

Finally, of the four activities of the LECs, the first three are accessible and the fourth is not. First, accessibility in RE projects of LECs. Government provide financial constructions to guarantee affordable solar projects in LECs for homeowners with a low disposable income from which no investment is needed. This, however, depends on the organizational purposes of the LEC. Moreover, there appears to be not much attention from the relevant target group. Second, there are energy coaches available for energy saving consultancies. Government provide subsidies to make free use of energy coaches for energy saving consultancies for the target group. Third, the government provides incentive loans for homeowners to make homes more sustainable. However, these are not useable for our target group since sufficient income is needed. Finally, to make use of the offer of collaborating organizations between LECs and organizations from the social domain. There are collaborative structures which together try to combat energy poverty and make themselves available for residents. One possible explanation why there is no interest from our target group and why the incentive loan cannot be used is that there is not sufficient insight into the problems of homeowners with a low disposable income living in energy poverty and how policies can be focused on this. For both paragraphs, and again, this fits the assumption based on O'Neill, Fanning, Lamb & Steinberger, 2018; Steinberger (2020) as describe above.

The contribution of the research to the public debate is that the research provides new insights in the role and the relationship between the two government levels and LECs. It also provides insights in how resources are distributed among society and on what the governments need to focus on. This, subsequently, gains insight in whether resources are available for the target group, and to what extent this contributes to accessibility to LECs. This research fits the literature that alternatives on social and physical provisioning systems are needed to create efficient pathways of energy demands in satisfying the needs of humans with a low level of biophysical resource use (Raworth 2020; Fanning, et al., 2020; Wood & Roelich, 2019; Lamb & Steinberger, 2018; Brand-Correa & Steinberger, 2017). However, this implies for science that it is important to examine and compare the different roles and interests of governments and organizations (social provisioning systems) that depend on each other to serve society. This makes it possible to understand whether current collaborations and agreements between social provisioning systems still fit the current time and issues. It is important to research the relevant target group to understand their demands. Insights from this research provide inspiration to look how resources (physical provisioning systems) can be adapted to the current demand and needs of the target group. Additionally, this implies that evaluation of the current state of affairs among for instance, the capabilities and needs from homeowners with a low disposable income living in energy poverty in relation to facilities available to them, is needed.

Finally, some reflection on what went well and what went less well will be delivered. According to the former, this research is provided with a thorough literature study and a well-funded

theoretical framework that contributes to the fact that this research is viewed from multiple perspectives which increases the validity and reliability. To the latter, due to the different theories and perspectives it seems that it did not enhance answering on the research question. Possibly because of too much irrelevant data which made it difficult to specify a clear answer. However, we did manage to finish this research between the stated deadline.

6. Conclusion and recommendations

This final chapter first gives answer to the research question: *"To what extent do homeowners with a low disposable income, in the Regional Energy Strategy regions: Arnhem-Nijmegen, FoodValley and CleanTech region, have access to local renewable energy cooperatives and projects, in terms of capabilities, government incentives, affordability and social inclusion?''* followed by answering the sub question which are relevant to answer the research question. The answer of the research question is based on the findings presented in chapter 4.

The conclusion is that there three out of four activities of the LECs are accessible but it is not easy to ensure this accessibility. There is little enthusiasm from the target group. The energy bill is not the only concern of our target group since there is often an underlying social problem. Creating financial guarantees for LEC is creating financial risks for municipalities which are not desirable. Organizational objectives furthermore affect accessibility of energy projects and due to insufficient capacity and tight budgets at municipality level this obstacle is increased. Besides, the target group is not eligible for government incentives to increasing sustainability of houses and the LECs are not seen as a panacea for vulnerable groups to participate in the energy transition. A combination of projects programs and instruments are needed. The quantitative data shows a contradiction in how the access to LECs is perceived since there is no significant prove that the capabilities of homeowners with a low disposable income are influencing the access to LECs negatively. Moreover, there is no significant prove that the capabilities of homeowners with a low disposable income and there perception on the fellow citizen in trust and equality, and trust in formal institutions is influencing the access to LEC negatively. Lastly, there is also no significant prove of a connection between the capabilities of homeowners with a low disposable income and how information and resources are applicable to them to being involved in decision making process, is influencing the access to the LECs negatively. Finally, Zutphen and Arnhem have a relative high extent of energy justice. Where Zutphen is highly cooperating with the LEC. Arnhem does not specifically put emphasize on LECs. The province of Gelderland and Ede have a relatively low extent of energy justice. The province, since instruments are not useable for the target group and Ede since it is emphasizing a lot on neighborhood initiatives and it remains unclear how they combat energy poverty.

What is the role of local energy cooperatives and which type of local energy cooperatives and projects can be distinguished?

We identified two types of LECs: the first one plays a social role and is the first contact for municipalities regarding energy transition. They pursue social goals and deal with aspects such as generating energy, energy trading, consulting in energy savings, recruitment campaigns, collective purchasing actions for solar panels and actions for saving energy. Based on interviews it became clear that a broader social role is desired to make growth possible and combat social issues like energy poverty. This means for them to connect the system world (municipality) with the lived world (society). The second type, the production (management) cooperatives are concerned with the generation of energy, from one or more product installations. Often this amounts to solar on the roof. Further, there is a distinction between energy projects that can be developed and by whom. The energy projects consist of collective solar roof, collective solar farm and wind farms, from which financial participation is required. There are also energy saving activities from which no financial participation is required.

What participation conditions have been set by the Regional Energy Strategies?

Three conditions have been identified to achieve effective and broad participation and support. This consists of the modes of communication, type of financial participation and the interpretation of responsibilities and roles by LECs and municipalities. Municipalities are seen as the responsible institute to include inhabitants and to aim for local ownership. Fulfilling this role is closely related to communication with residents. All three RES regions are aware of citizens with smaller budgets. The FoodValley region wants to contribute with cheap loans for less able residents. Furthermore, the LECs are seen as an important partner to meet the condition of 50% local ownership in RE projects. The FoodValley and Arnhem-Nijmegen seem to have their communication strategy more comprehensive since they make use of citizen forums, citizen panels and tailor-made participation processes. The CleanTech region is not to specific about it the communication strategy but want to put more emphasize on it in the RES 2.0. Additionally, within the financial participation they all use the 'participatiewaaier' to benefit financially. They also do not forget the importance of less wealthy inhabitants. An interesting finding is the outcome that the social tender could offer for equal and fair participation in the RES.

How does the government and local energy cooperatives incorporate social inclusion?

The municipality from Zutphen, Arnhem and Ede aim for a social cohesive society by an integral approach. Hence, a subsidy policy or financial constructions and collaborations between residents, businesses and social organizations is arranged. The municipality from Zupthen does not incorporate social inclusion formally since it is lacking capacity and budget. It however, set a goal to combat energy poverty amongst tenants, not on homeowners. To combat energy poverty amongst homeowners they have an informal approach in collaboration with ZutphenEnergy and organizations from the social domain since households in energy poverty do not only have concerns about energy. Often, they are concerned of their social implications. For instance, they arranged an inclusive solar farm for less wealthy people and organised training programs for the unemployed. The municipality from Ede act social inclusive by stimulating involvement in neighbourhood initiatives and arranged an inclusive solar farm for less wealthy people. The municipality of Arnhem has set a goal to reduce energy poverty by 2500 households. It further highlights on improved communication to make shared information understandable for every resident, with emphasize on low literacy. They want to improve the accessibility towards social neighbourhood teams and facilities. They organize district meetings with opportunities for residents to raise their voice and the municipality the possibly to understand the issues at stake. The province acts social inclusive by sharing knowledge, supporting and facilitating in social inclusion issues. This is done through programs such as village deal, liveability alliances and 'everyone participates' from the liveability program and subsidizing municipality, residents and LECs to provide perspectives for action from the climate plan program. Furthermore, they contribute to monitoring the well-being of people to gain insights in social issues at stake and policies that should be piloted.

When looking at the three LECs, ZutphenEnergy, ValleiEnergy and Rijn and Ijssel Energy, they do not have a clear approach or guideline from their own organization or from the municipality which is directing the LEC on how to go about social inclusion. In general, the three LECs fulfil a social inclusive role since they are neutral and have a collective purpose to stimulate towards sustainable energy. However, this differs per LEC to how they fulfil their role based on organizational purposes and agreements with the municipality. Despite this, it also seems to be difficult to

incorporate vulnerable households in solar projects. Often, it is difficult to understand for vulnerable groups, interests or priorities lie elsewhere.

How does government facilitate access to local energy cooperatives?

The municipality of Zutphen and Ede both provide access by communicating LEC activities through the municipal websites and financially guarantee by making a solar field project accessible to less wealthy citizens. Zutphen tries to increase financial alternatives for less wealthy residents by investing and cooperating in a research project with Transform, a program provided by the province of Gelderland. The municipality of Arnhem is not emphasizing on the LECs to combat energy poverty. Since they have set a clear goal to combat energy poverty they are emphasizing on physical instruments. Like collaboration with the Energybank, ELMG to increase awareness and ArnhemAAN to simulate neighbourhood or company initiatives. The energy counter website is the communication instrument for the municipality of Arnhem. It provides information towards the energy projects and energy saving activities and the economical and physical instruments available. It shares a subsidy scheme which is based on incentive loans. There is, however, also the option for a PS for collective energy generation. Furthermore, it has a long-term urban campaign ArnhemAAN to enthuse residents and businesses to save or generate energy within a neighbourhood of company initiative. A team with a Volkswagen van, with employees from both ELMG and LEC, is available to consult on how to organize initiatives and to make homes and living environments more sustainable. With the purpose to try to get behind the front door of households. The energy bank focuses specifically on households with a low income. The province of Gelderland contributes by making energy counters available, subsidizing LECs for RE projects and providing action perspectives with incentive loans from which the LECs need to provide them in society. The LEC is however, not seen as panacea for the energy transition. A combination of projects, programs and instruments is the solution for vulnerable groups to participate in the energy transition. However, the incentive loans are only available to people with sufficient income. Relatively a large group of households do not prefer incentive loans since they have bad experiences with it.

What are the underlying conditions to gain access in the local energy cooperatives and projects?

For all three of the membership it is possible to become member with only submitting personal data which need approval from the board. Moreover, it differs mostly in the contribution of the membership and the type of membership. To become a member of ZutphenEnergy they asks an annual contribution of €25,- and a share of €10,- for the member capital. For ValleiEnergy they ask an annual contribution of €35,- or a form other than money. REIJE distinguishes between a member who needs to pay contribution, a volunteer or a customer. The latter two do not have to pay contribution. The former pays €100,- at the start of the membership for the member capital. Project participation funds are independent and are decided on the specific project.

Furthermore, the conditions of project participation in solar on roof, field or in a wind farm is quite similar of ZutphenEnergy, ValleiEnergy and REIJE. The differences lie in the investment per solar panel or wind shares which is project dependent because these are different business cases. Prices are between €100,- and €310,-. Yet, ZutphenEnergy and ValleiEnergy also have possibilities to participate in projects without investment. In the case of ValleiEnergy only with the condition to take energy from ValleiEnergy for three years. Finally, there are energy saving consultancies and activities which are the same for all three LECs. They have no further conditions then own initiative. However, from the interviews it became clear that LECs also take on own initiatives for instance ZutphenEnergy with the ‘put it on 60’ imitative to lower energy usage of boilers in houses or to

point homeowners to energy products which can save energy. Also, the difference of having access in a project without investment relies on the organizational purposes of the LEC. REIJE sees the energy projects as financial participation projects not social participation projects.

Do the capabilities and low socioeconomic status of vulnerable household influence access to local energy cooperatives?

First, there is no significant prove that the capabilities and low SES of homeowners with a low disposable income are influencing the access to LECs negatively. There is also no significant prove that based on capabilities of homeowners with a low disposable income and their perception on the fellow citizen in trust and equality, and trust in formal institutions as in, local government and LECs is influencing the access to LECs negatively. Lastly, there is also no significant prove that based on the capabilities of homeowners with a low disposable income with the information and resources applicable to them, and being involved in decision making process is influencing the access to the LEC negatively.

Recommendations

It would be recommended to have further research in the lived experience and capabilities of homeowners with a low disposable income. Interesting is then to interview social teams, interest groups and the relevant target group. Also to have further research in the psychology of the target group questioning how they think, how they want to be involved and how they want to be approached among others. It would be recommended to the province to, first, have further evaluation (practical or research) on how effective the resources are and to what extent national government should facilitate in alternatives. Also inform the national government about the budget and the capacity that is needed for municipality to achieve goals from the climate agreement. Second, support municipalities with setting up communication strategies which the municipality can share with the LECs. Third, evaluate how LECs and municipality fulfil their role when societal aspects as energy poverty arise and an integral approach is needed. Fourth, share the best practices between LECs and municipalities. Finally, try to work on image improvement, make the LECs part of the municipality to gain trust from citizens and show society that the government is at the service of society. Also, it is recommended to search for cooperation with societal organizations like LECs, Energybank and volunteers within society to empower social issues and create capacity. Do not reinvent the wheel but learn from other successful municipalities. Recommendations towards LECs are, do not get stuck in the role of being a producer, spread the word that LECs are there to benefit the citizen. This however, is also a role of the municipality. Broaden the role of LECs, act as the spider in the web which creates a position to connect different parties which need to be involved to combat energy poverty but also to increase participation in the energy transition. Take ZutphenEnergy as an example. Finally, if it is not existing already, then meet with other LECs to share experiences and best practices.

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Appendix

A Central human Capabilities

(Nussbaum, 1999)

CENTRAL HUMAN FUNCTIONAL CAPABILITIES

1. **Life.** Being able to live to the end of a human life of normal length; not dying prematurely, or before one's life is so reduced as to be not worth living.

2. **Bodily Health.** Being able to have good health, including reproductive health;[83] to be adequately nourished; to have adequate shelter.

3. **Bodily Integrity.** Being able to move freely from place to place; having one's bodily boundaries treated as sovereign, i.e. being able to be secure against assault, including sexual assault, child sexual abuse, and domestic violence; having opportunities for sexual satisfaction and for choice in matters of reproduction.

4. **Senses, Imagination, and Thought.** Being able to use the senses, to imagine, think, and reason – and to do these things in a "truly human" way, a way informed and cultivated by an adequate education, including, but

5. **Emotions.** Being able to have attachments to things and people outside ourselves; to love those who love and care for us, to grieve at their absence; in general, to love, to grieve, to experience longing, gratitude, and justified anger. Not having one's emotional development blighted by overwhelming fear and anxiety, or by traumatic events of abuse or neglect. (Supporting this capability means supporting forms of human association that can be shown to be crucial in their development.)

6. **Practical Reason.** Being able to form a conception of the good and to engage in critical reflection about the planning of one's life. (This entails protection for the liberty of conscience.)

7. **Affiliation. A.** Being able to live with and toward others, to recognize and show concern for other human beings, to engage in various forms of social interaction; to be able to imagine the situation of another and to have compassion for that situation; to have the capability for both justice and friendship. (Protecting this capability means protecting institutions that constitute and nourish such forms of affiliation, and also protecting the freedom of assembly and political speech.)
B. Having the social bases of self-respect and non-humiliation; being able to be treated as a dignified being whose worth is equal to that of others. This entails, at a minimum, protections against discrimination on the basis of race, sex, sexual orientation, religion, caste, ethnicity, or national origin.[84] In work, being able to work as a human being, exercising practical reason and entering into meaningful relationships of mutual recognition with other workers.

8. **Other Species.** Being able to live with concern for and in relation to animals, plants, and the world of nature.[85]

9. **Play.** Being able to laugh, to play, to enjoy recreational activities.

10. **Control over One's Environment. A. Political.** Being able to participate effectively in political choices that govern one's life; having the right of political participation, protections of free speech and association.
B. Material. Being able to hold property (both land and movable goods), not just formally but in terms of real opportunity; and having property rights on an equal basis with others; having the right to seek employment on an equal basis with others; having the freedom from unwarranted search and seizure.[86]

B Qualitative data – interview questionnaire

Format vragenlijst beleidsmedewerker provincie

1. Wat is uw naam, functie en welke rol neemt u in, in de energietransitie?
2. Wat is de rol van de provincie in het vraagstuk 'energiearmoede in de energietransitie'?
3. Welke rollen kan de provincie innemen in het vraagstuk 'energiearmoede in de energietransitie?
    a. En waarom juist dan die en niet een andere?
4. Wat is de maatschappelijke rol van de lokale energiecoöperatie?
5. In hoeverre ziet u lokale energiecoöperaties als toegankelijk alternatief voor woningeigenaren in energiearmoede?
6. In hoeverre kan de provincie bijdragen aan de toegankelijkheid voor woningeigenaren in energiearmoede in lokale energiecoöperaties?
7. Waar liggen de kansen voor woningeigenaren in energiearmoede?

8. Zit er een verschil in afspraken die gemaakt worden tussen gemeenten die weinig budget en capaciteit hebben om deze vraagstukken op te pakken en gemeente die daar voldoende van hebben? Waar zitten de verschillen in?
9. Wordt het vraagstuk 'energiearmoede in de energietransitie' integraal opgepakt? Is daar een voorbeeld van en welke partijen werken samen of worden samengebracht?
10. Klopt het dat er minder haalbare subsidieringen of leningen zijn voor deze kwetsbare groepen? Waarom is dat?
11. Waar zijn de provincie en gemeente van afhankelijk wanneer het een specifieke groep als woningeigenaren met laag besteedbaar inkomen wil betrekken bij lokale energiecoöperaties?
12. In hoeverre is dit vraagstuk de verantwoordelijkheid van de provincie?

Format vragenlijst beleidsmedewerkers gemeente

1. Wat is uw naam, functie en welke rol neemt u in, in de energie transitie?
2. Wat is de relatie tussen de gemeente en de lokale energiecoöperatie?
3. Heeft de gemeente invloed op het beleid/participatiebeleid bij de lokale energiecoöperatie? Zo ja, hoe uit zich dat?
4. Worden er door de gemeente voorwaarden gesteld voor inclusie in lokale energiecoöperatie?
5. Wat is de maatschappelijke rol van de lokale energiecoöperatie?
6. Wat is de relatie tussen het regionaal energieloket en de gemeente?
7. Wat is de relatie tussen het regionaal energieloket en de lokale energiecoöperatie?
8. Welke rol neemt de gemeente in bij het ontwikkelen van duurzame energieprojecten en waarom juist die (De rollen zoals ze beschreven staan in de RES) ?
9. Welke rol neemt de gemeente in wanneer het de kwetsbare groepen bij de energietransitie wil betrekken? Hoe uit zich dat? Kun je daar voorbeelden van noemen?
10. Hoe waarborgt de gemeente inclusie in de energietransitie?
11. Wordt er lokaal maatwerk geleverd om kwetsbare groepen te betrekken bij de energietransitie en lokale energiecoöperaties? Hoe uit zich dat? Kun je daar voorbeelden van noemen?
12. Hoe worden kwetsbare groepen betrokken bij een inwonerspanel of bijeenkomst?
    a. Hoe worden kwetsbare groepen actief betrokken bij beleid?
    b. Hoe worden kwetsbare groepen actief betrokken bij lokale energiecoöperaties?
13. Waarom spreekt men in het beleid meer over de inzet op buurt- en wijkinitiatieven?

14. Hoe maakt de gemeente de lokale energiecoöperaties en projecten toegankelijk voor kwetsbare groepen?
15. Waarom kan er niet altijd gebruik gemaakt worden van bijv. een collectieve zonnepanelen actie of postcoderoosregeling en voor alle kwetsbare groepen?
16. Waar is de overheid van afhankelijk om lokale energiecoöperaties en duurzame
17. energieprojecten betaalbaar te houden?
18. Zijn er barrières en welke barrières zijn dat, die ervoor zorgen dat verschillende sociale groepen in de gemeente achterblijven in de energietransitie?
19. Wat is de rol van de provincie in het vraagstuk 'energie armoede in de energietransitie'
20. Wordt het vraagstuk 'energiearmoede in de energietransitie' integraal opgepakt? Is daar een voorbeeld van en welke partijen werken samen of worden samengebracht.
21. Waar ziet u graag dat de provincie in stimuleert, ondersteunt of faciliteert in het vraagstuk 'energie armoede in de energietransitie' ?
22. Klopt het dat er minder haalbare subsidieringen of leningen zijn voor kwetsbare groepen? Waarom is dat?
23. Er is vaak te zien dat de keuze gemaakt wordt voor projectontwikkelaars. Kunnen zij het zelfde aanbod bieden als sommige lokale energiecoöperaties en daarmee de kwetsbare groepen erbij betrekken?
24. Waarom wordt er soms ook voor een projectontwikkelaar gekozen en niet de lokale energiecoöperatie?

Format vragenlijst energiecoöperaties

1. Wat is uw naam, functie en welke rol neemt u in, in de energie coöperaties?
2. Wat is de relatie tussen de lokale energiecoöperatie en de gemeente?
3. Heeft de gemeente invloed op het beleid/participatiebeleid bij de lokale energiecoöperatie? Zo ja, hoe uit zich dat?
4. Worden er door de gemeente voorwaarden gesteld voor inclusie in lokale energiecoöperatie?
    a. Wanneer men er naar kijkt, hoe waarborgt men de inclusie? Wanneer men er niet naar kijk, hoe komt het dat er niet gestuurd wordt op inclusie?
    b. Welke voorwaarden stelt de gemeente voor 50% eigendom?
    c. Welke voorwaarden stelt de gemeente voor de toegankelijkheid van kwetsbare groepen?
5. Wat is de maatschappelijke rol van de lokale energiecoöperatie?
    a. Welke rol verwacht de gemeente dat u heeft als energiecoöperatie?

6. Wat is de relatie tussen het regionaal energieloket en de lokale energiecoöperatie?
7. Op welke bewoners richt u zich?
8. Hoe worden kwetsbare groepen betrokken of benaderd om bij lokale energiecoöperaties mee te doen of aan te sluiten?
    a. Moet je eerst lid zijn voordat je mee kunt investeren?
    b. Wat zijn de voordelen om lid te worden van een lokale energie coöperatie?
    c. Zijn er risico's aan een lidmaatschap of investering?
9. Waar is de lokale energiecoöperatie van afhankelijk om energieprojecten toegankelijk en betaalbaar te maken voor kwetsbare groepen?
10. Wat zijn haalbare projecten voor de kwetsbare groepen?
11. Wat levert financieel jaarlijks het meeste op. Zon op dak, zonnevelden of windprojecten of energiebesparingsmaatregelen?
12. Hoe worden energiebesparingsactiviteiten opgezet en georganiseerd onder de inwoners?
13. Ik heb nog niet gezien dat kwetsbare groepen kunnen meeprofiteren van windenergie. Waarom is dat?
14. Waarom verschillen de prijzen per lokale energiecoöperatie in lidmaatschap en in projecten?
15. Hoe creëert men toegankelijke energie coöperaties voor huishoudens met een verschil in sociaal economische status?
16. Zoekt de lokale energiecoöperatie naar samenwerkingsverbanden met bijvoorbeeld schuldhulpverlening wanneer er weinig aanbod is vanuit de lage SES. Neem als voorbeeld het zonnepark Zonnestroom
17. Wanneer men kijkt naar het huidige ledenbestand. In welke groepen kunt u ze indelen en kunt u daar een percentage aanhangen? Er is een keuze tussen drie groepen: laag/midden/hoog inkomensgroepen
18. Hoe creëert men onderling vertrouwen tussen de leden?
19. Wat zijn de onderwerpen die tijdens de ALV besproken worden?
20. Zijn er gevoelige onderwerpen waar meer dan de helft van de leden tegen zou stemmen zoals het betrekken van kwetsbare groepen bij de lokale energiecoöperaties?
21. Zijn er barrières en welke barrières zijn dat waardoor de kwetsbare groepen niet aansluiten bij de lokale energiecoöperaties?

C Quantitative data - survey

C1 Survey questionnaire

Voordat we beginnen met de enquête delen we de definities van de belangrijkste woorden met u zodat er geen onduidelijkheid over bestaat en begrepen wordt wat er gevraagd wordt.

- **Energietransitie:** De overgang van het bestaande energiesysteem met fossiele brandstoffen als olie, kolen en gas naar een nieuw energiesysteem met duurzame energie uit bijvoorbeeld zon, wind en biomassa

- **Duurzame energie**: Is hernieuwbare energie waardoor energiebronnen van de aarde niet uitgeput raken. Energie uit wind en zon kan niet uitgeput raken. Energie uit olie, kolen en gas wel.

- **Verduurzamen:** Kun je doen door bijvoorbeeld het huis te isoleren waardoor je langer gebruik kunt maken van warmte in je woning.

Start enquête

De enquête start eerst met algemene vragen zodat later de huishoudens verschillend van elkaar geclassificeerd kunnen worden.

1. In welke gemeente woont u en wat is uw postcode(zonder de laatste twee letters)?
    - ……..
    - ……..

2. Wat is uw geslacht?
    - Man
    - Vrouw
    - Anders

3. Wat is uw leeftijd?
    - Jonger dan 25
    - 25-35
    - 36-45
    - 46-55
    - 56-65
    - 66-75
    - 76 of ouder

4. Ik ben of heb een…….?
    - Autochtoon
    - Migratieachtergrond, westers

- Migratieachtergrond, niet westers

5. Wat is de hoogst behaalde opleidingsniveau in het gezin?
    - Geen onderwijs
    - Lagere school,
    - LBO/MAVO/VMBO
    - HAVO
    - VWO
    - MBO
    - HBO
    - Universiteit

6. Hoe is uw situatie? (meerdere antwoorden mogelijk)
    - Werkend met betaald werk – voltijd
    - Werkend met betaald werk - deeltijd
    - Vrijwilligerswerk
    - Werkzoekend
    - Arbeidsongeschikt
    - Student
    - Gepensioneerd

7. Hoe is uw gezinssamentelling?
    - Alleenstaand
    - Gezin zonder thuiswonende kinderen
    - Gezin met thuiswonende kinderen, met …… kind(eren)

8. In welke type woning woont u?
    - Koopwoning (ga naar vraag 9)
    - Huurwoning van woningcorporatie (ga naar vraag 10)
    - Huurwoning private sector (ga naar vraag 10)

9. Wat is de geschatte WOZ-waarde van uw woning?
    - 50.000 – 100.000
    - 100.001 – 150.000
    - 150.001 – 200.000
    - 250.001 – 300.000
    - 300.001 – 350.000
    - 350.001 – 400.000
    - 400.001 – 450.000
    - 450.000 of meer

10. Wat is de bruto huur van uw woning?
    - 500 – 550
    - 551 – 600
    - 601 – 650
    - 651 – 700

- 701 – 750
- 801 – 850
- 901 – 950
- 950 – 1000
- 1001 of meer

De volgende vragen worden gesteld over uw inkomen en gezondheid en welke invloed dit heeft op uw sociale leven.
De vragen worden beantwoord op een schaal van: 1 helemaal mee eens en 5 helemaal niet mee eens.

Vragen ter ondersteuning van capability approach theorie

11. Ik heb voldoende inkomen om maandelijks eten, drinken, onderdak, kleding en de rekeningen te betalen?
    - 1
    - 2
    - 3
    - 4
    - 5

12. Door onze inkomenssituatie is er onvoldoende controle over onze gezondheid
    - 1
    - 2
    - 3
    - 4
    - 5

13. Door onze inkomenssituatie is er onvoldoende controle over de staat van het huis
    - 1
    - 2
    - 3
    - 4
    - 5

14. In mijn gezin zijn er één of meerdere personen die te kampen hebben met langdurige ziektes of aandoeningen langer dan 6 maanden
    - 1
    - 2
    - 3
    - 4
    - 5

15. Vanwege mijn gezondheid ben ik 6 maanden of langer beperkt in activiteiten zoals boodschappen, wandelen en fietsen?
    - 1
    - 2
    - 3
    - 4

- 5

16. In mijn gezin ontvangen we iemand van buiten het gezin die onze zaken regelt zoals toeslagen, belastingen, betalen van de rekening of boodschappen. (niet vanwege corona)
    - 1
    - 2
    - 3
    - 4
    - 5

17. Ik leid een teruggetrokken leven met eenzaamheid.
    - 1
    - 2
    - 3
    - 4
    - 5

Vragen ter ondersteuning van Energy justice theorie

De volgende vragen worden gesteld over uw huidige situatie in het verduurzamen van uw woning of u de plannen voor verduurzamingsmaatregelen kent en of u wilt aansluiten bij deze plannen.

18. Ik/wij hebben de afgelopen vijf jaar maatregelen genomen om te verduurzamen of gebruik te maken van duurzame energie (bijv. isolatie van de woning of de aanleg van zonnepanelen).
    - Ja
    - Nee (ga door naar vraag 23)

19. Wij hebben geïnvesteerd in: (meerdere antwoorden mogelijk)
    - Het energie zuinig maken van het huis (isoleren)
    - Zonnepanelen op het dak
    - Een warmtepomp
    - Aandelen in een zonnepark
    - Aandelen in een windpark
    - Anders, namelijk …….

20. De investering is een idee van….
    - Mijzelf
    - Buurtbewoners
    - De woningcorporatie
    - Particuliere/privé sector
    - De lokale energiecoöperatie
    - De gemeente

21. Wij hebben gebruikt gemaakt van: (meerdere antwoorden mogelijk)
    - Overheidssubsidies
    - Gemeentelijke advies
    - Kennis van de energiecoöperatie
    - Kennis van de woningcorporatie

- Anders, namelijk ……..

22. Wat is de geschatte energielabel van uw woning?
    - A- Zeer laag energieverbruik
    - B- Laag energieverbruik
    - C-Redelijk laag energieverbruik
    - D- Gemiddeld energieverbruik
    - E- Redelijk hoog energieverbruik
    - F- Hoog energieverbruik
    - G- Zeer hoog energieverbruik

23. Ik verwacht binnen nu en drie jaar over de financiële middelen te beschikken om te verduurzamen?
    - 1
    - 2
    - 3
    - 4
    - 5

24. Ik weet waar ik terecht kan voor advies om mijn woning te verduurzamen?
    - 1
    - 2
    - 3
    - 4
    - 5

25. Ik weet waar ik terecht kan om subsidies aan te vragen die beschikbaar gesteld zijn voor duurzame energie?
    - 1
    - 2
    - 3
    - 4
    - 5

26. Ik heb het gevoel dat de gemeente naar me luistert. Dit zorgt ervoor dat ik kan bijdragen aan plannen om te verduurzamen binnen de gemeente.
    - 1
    - 2
    - 3
    - 4
    - 5

27. Ik vind het belangrijk om gebruik te maken van energie dat goed is voor het milieu.
    - 1
    - 2
    - 3
    - 4

- 5

Vragen gebaseerd op Social Capital theorie

28. Ik ken buurt- en wijk plannen in de gemeente. Hierdoor kunnen we verduurzamingsmaatregelen nemen zoals bijvoorbeeld de aanleg van zonnepanelen
    - Ja
    - Nee

29. Ik vind buurt- en wijk plannen open/toegankelijk. Hierdoor kan ik makkelijk contact leggen met de betrokken buurt- en wijk bewoners.
    - 1
    - 2
    - 3
    - 4
    - 5

30. Ik ken de plannen van de gemeente. Hierdoor kunnen we verduurzamingsmaatregelen nemen. Zoals bijvoorbeeld de aanleg van zonnepanelen.
    - Ja
    - Nee

31. Ik vind de plannen van de gemeente open/toegankelijk. Hierdoor kan ik makkelijk contact leggen met de gemeente.
    - 1
    - 2
    - 3
    - 4
    - 5

32. Ik ken de lokale energiecoöperaties. Hierin kan ik investeren, bijvoorbeeld voor de aanleg van zonnepanelen, zonneparken of windparken.
    - Ja
    - Nee

33. Ik vind de lokale energiecoöperaties open/toegankelijk. Hierdoor kan ik makkelijk contact leggen met de leden.
    - 1
    - 2
    - 3
    - 4
    - 5

34. Ik vind de lokale energiecoöperaties open/toegankelijk. Hierdoor kan ik makkelijk contact leggen met de organisatie.
    - 1
    - 2
    - 3
    - 4

- 5
-

35. Ik ken buurt- en wijk plannen in de gemeente. Hierdoor kunnen we verduurzamingsmaatregelen nemen zoals bijvoorbeeld de aanleg van zonnepanelen
    - Ja
    - Nee (ga door naar vraag 35)

36. Ik vind buurt- en wijk plannen open/toegankelijk. Hierdoor kan ik makkelijk contact leggen met de betrokken buurt- en wijk bewoners.
    - 1
    - 2
    - 3
    - 4
    - 5

37. Ik ben geïnteresseerd in plannen van de....
    - Buurt- en wijk
    - Gemeente
    - Lokale energiecoöperaties
    - Buurt- en wijk, gemeente en lokale energiecoöperaties
    - Niet geïnteresseerd
    - Weet ik niet

38. Ik vertrouw gezinnen die uit een andere inkomenssituatie komen dan ik.
    - 1
    - 2
    - 3
    - 4
    - 5

39. Ik zie gezinnen uit een andere inkomenssituatie als gelijk aan mijzelf.
    - 1
    - 2
    - 3
    - 4
    - 5

40. Ik vertrouw gezinnen met een ander opleidingsniveaus
    - 1
    - 2
    - 3
    - 4
    - 5

41. Ik zie gezinnen uit een ander opleidingsniveau als gelijk aan mijzelf

- 1
- 2
- 3
- 4
- 5

42. Ik vertrouw groepen met verschillende culturele achtergronden?
    - 1
    - 2
    - 3
    - 4
    - 5
43. Ik zie gezinnen met een andere culturele achtergrond als gelijk aan mijzelf.
    - 1
    - 2
    - 3
    - 4
    - 5
44. Ik vertrouw de lokale overheid (uw gemeente)
    - 1
    - 2
    - 3
    - 4
    - 5

45. Heeft u de laatste twee keer gestemd bij de gemeentelijke verkiezingen
    - Ja
    - Nee
    - Niet van toepassing: Ik was niet stemgerechtigd

46. Heeft u laatste twee keer gestemd bij de nationale Tweede Kamer verkiezingen
    - Ja
    - Nee
    - Niet van toepassing: Ik was niet stemgerechtigd

47. Hoe wilt u door de gemeente betrokken worden bij plannen voor het gebruik van duurzame energie?
    - Ik wil niet betrokken worden
    - Ik wil geïnformeerd worden: ik vertrouw erop dat de overheid samen met andere deskundigen, de juiste keuze maakt.
    - Ik wil geraadpleegd worden: Wanneer het mij gevraagd wordt geef ik mijn mening, bijvoorbeeld door deel te nemen aan enquêtes of bewonersbijeenkomsten
    - Ik wil adviseren: ik wil mijn advies geven en meepraten bijv. in een klankbordgroep of groepsdiscussie
    - Ik wil samenwerken: ik wil samen met de gemeente plannen helpen vormgeven, bijvoorbeeld in een projectgroep

- Ik wil beleid bepalen: ik wil zelf plannen maken en uitvoeren, bijvoorbeeld met een bewonersinitiatief met mijn buurt
- Ik wil besluiten nemen: ik wil (mede)verantwoordelijk zijn voor de besluitvorming

C2 Survey invitations

Radboud Universiteit

Datum: 22-04-2021

Betreft: Een uitnodiging voor het invullen van een vragenlijst

Beste bewoner,

Voor mijn studie Planologie aan het Radboud Universiteit ben ik bezig met mijn afstudeeronderzoek. Graag wil ik u uitnodigen een vragenlijst in te vullen. De vragenlijst gaat over u. En of u kan, en wil aansluiten bij energieprojecten die goed zijn voor het milieu. De provincie Gelderland en gemeenten hebben steeds meer aandacht hoe we de inwoners kunnen laten mee beslissen en eigenaar kunnen laten zijn van energieprojecten die goed zijn voor het milieu. Deze energieprojecten worden duurzame energieprojecten genoemd. Samen met de buurt, met het gezin of alleen kan er gebruik gemaakt worden van de energieprojecten. Dit kan zijn om advies te ontvangen voor energiebesparing of om te investeren in zonnepanelen voor op je eigen dak, in een zonnepark of in een windpark in de buurt van uw gemeente. Deze investeringen leveren uiteindelijk winst op voor u. Interessant toch?

Met de resultaten van mijn onderzoek worden aanbevelingen gedaan aan de provincie en gemeenten. De aanbevelingen kunnen nuttig zijn om regels op te stellen zodat u meer betrokken kunt raken bij duurzame energieprojecten.

Ik zou het heel fijn vinden als u mij wilt helpen met mijn onderzoek!

De vragenlijst kunt u invullen op onderstaande link of scan de QR-code. De vragenlijst neemt 8-10 minuten in beslag. De einddatum voor het invullen van de vragenlijst is **23 mei, 2021.** De vragenlijst is in het Nederlands. Uw gegevens en antwoorden worden anoniem en in vertrouwen behandeld en zijn alleen bedoeld voor studiedoeleinden.

http://bit.ly/radboudvragenlijst

Hartelijk dank voor het helpen bij mijn onderzoek en succes bij het invullen van de vragenlijst!

Voor vragen kunt u mij op onderstaand e-mail bereiken.

Jaap van den Langenberg
jaap.vandenlangenberg@student.ru.nl

C3 Internal consistency

Capabilities (CAP)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,712	,714	3

Government incentives (GOV)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,806	,808	2

Social Capital (SocCap)

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,896	,898	7

C4 Multicollinearity

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	Depending on other's - Control of one's environemtn	,984	1,016
	Loneliness - affiliation	,939	1,065
	PJ - perception of of having a voice	,872	1,147
	CAP_incomedependency_control	,884	1,131
	EJ_DJ_Perceptionofaccessibility	,848	1,180
	SocCap_Perceptionofaccessibility	,906	1,103
	SocCap_Trust_Equality	,926	1,080

a. Dependent Variable: EJ-PJ- Aware of local energycooperatives

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions							
				(Constant)	Depending on other's - Control of one's environemtn	Loneliness - affiliation	PJ - perception of of having a voice	CAP_income dependency_ control	EJ_DJ_Perceptionofaccessibility	SocCap_Perceptionofaccessibility	SocCap_Trust_Equality
1	1	7,288	1,000	,00	,00	,00	,00	,00	,00	,00	,00
	2	,302	4,910	,00	,00	,00	,00	,00	,01	,79	,02
	3	,168	6,588	,00	,01	,01	,00	,00	,74	,11	,02
	4	,111	8,111	,00	,02	,01	,00	,00	,13	,07	,84
	5	,077	9,705	,00	,00	,01	,91	,01	,07	,01	,06
	6	,034	14,697	,01	,88	,09	,00	,04	,00	,01	,01
	7	,014	22,812	,01	,01	,68	,00	,49	,00	,01	,02
	8	,005	37,040	,99	,06	,22	,08	,45	,03	,01	,02

a. Dependent Variable: EJ-PJ- Aware of local energycooperatives