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A panel data analysis of the impact of energy democracy on renewable energy adoption in The Netherlands

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Summary

Energy communities may play a critical part in the government's goal of transitioning to renewable energy. The Netherlands is taking a long time to integrate localized energy transition strategies. Additionally, the country's reliance on non-renewable energy remains significant. In order to fasten the Dutch transition to renewables, it is crucial to figure out what factors influence the role of community-based participation in the adoption of decentralized renewable energy.

Thus, this thesis investigated the adoption of renewable energy and the role of energy democracy in The Netherlands's energy transition. In particular, the goal of the research is to investigate quantitatively the explanatory power of the socio-economic conditions and institutional factors in the adoption of renewable energy with a focus on the role of energy democracy in terms of community renewable energy systems.

With this aim, the research started as a study of the energy democracy in The Netherlands; more insight was achieved into the drivers and barriers in adopting renewable energy and the role of socio-economic and institutional factors. This research has been designed as desk research and longitudinal design in the form of the panel study. The key methods used were collecting secondary data from official statistics. Data was analysed using a fixed-effects model and the findings further supplemented by collecting primary data with semi-structured interviews. The differences across provinces and regions have been explained with the selected predictors and control variables.

The main findings where that socio-economic condition of households measured with the share of income spent on energy is negatively associated with the role of energy democracy. Furthermore, the selected institutional factor, the financial incentive for stimulating the adoption of renewable energy SDE+ (incentive scheme for sustainable energy production) has demonstrated a significant positive impact in The Netherlands energy democracy and energy transition. This finding was further supported with the expert's opinions from the interviews.

From the analysis we show and conclude that socio-economic conditions and institutional factors such as financial incentives are associated with the innovation-decision process which is an important element behind the participation in the energy transition in The Netherlands. There appears to be an economic gap that differentiates early adopters from late adopters, although this only explains partly according to the presented model.

Keywords

Energy democracy, energy transition, socio-economic conditions, institutional factor, adoption of renewable energy.

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Abbreviations

CBS	Centraal Bureau voor de Statistiek/ Central Bureau of Statistics
CREs	Community Renewable Energy Systems
CRESNO	Number of cooperative projects
DG	Distributed generation
EU	European Union
IHS	Institute for Housing and Urban Development Studies
R&D	Research and Development
RES	Regionale Energie Strategie/ Regional Energy Strategy
RET	Renewable Energy Technology
SDE+	Stimulering Duurzame Energieproductie en Klimaattransitie /Stimulation of sustainable energy production and climate transition (SDE+)
SISE	Share of Income Spend on energy
SRE	Share of renewable energy
TCM	The Climate Monitor
TLEM	The Local Energy Monitor

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Chapter 1: Introduction

1.1. Background information

While renewable energy policies have changed the prospects for electricity utilities in the European Union (EU), the impact of distributed generation (DG) through renewable energy technology (RET) seems to have an important effect on the market configuration and has proven to be a tough competitor to the centralized generation (Groot, 2014). According to (Wood Johnny, 2018), it is at the local level that the decarbonization of the energy sector can be addressed more effectively. The local and decentralized character of renewable energy development generates benefits for the economy and communities over the extractive processes of fossil fuels; moreover, most renewable energy sources produce little or no pollution (Ren21, 2019). In this thesis, the relation between energy democracy and adoption of renewable energy is investigated.

The concept of energy democracy focuses on community participation, ownership, and a decentralized model of energy transition and has recently received much interest. (Szulecki & Overland, 2020; Stephens et al., 2018). A fascinating debate has progressively raised the statement that local and decentralized systems are the only tangible form of energy democracy, while current public centralized energy services are often non-democratic (Chavez, 2015). However, in the European context, where people already have access to quality public services, it could seem pointless to dismantle what exists and works (Chavez, 2015). Furthermore, it can be misinterpreted as a threat if the movement is inclined to energy populism (Szulecki & Overland, 2020). Meanwhile, the EU has recognized the role that local energy communities might play in the framework laid out in the updated Clean Energy Package (Frieden, et al., 2020). It encourages community renewable systems adoption either at the local or regional level (Frieden, et al., 2020). Despite the interest of the EU in these systems, local initiatives are far from achieving their true potential (De Graaf, 2018).

The existing technological regulation regime and the slow adoption of a decentralized renewable energy system have characterized the centralized Dutch energy industry, with large-scale fossil fueled power plants and a typical division of producers, network operators and supplier functions (Akerboom & van Tulder, 2019). Furthermore, it has been found that the economy is systematically trapped by fossil-fuels due to the relations between government and industry at various stages, such as the production and exploitation, transport, storage, and refining, thus positioning The Netherlands a trading center for oil and carbon. (Oxenaar & Bosman, 2019). As a result, the country is highly dependent on fossil fuels, accounting for 90% of total primary energy supply (IEA, 2020; CBS, 2021).

However, owing to the impending shutdown of coal power facilities, the potential for fossil fuel-based energy extraction is anticipated to decline (Akerboom & van Tulder, 2019). Furthermore, in early 2018 the government decided to terminate natural gas production by 2030. In addition, although it has been agreed that greenhouse gas emissions should decrease even so according to a report by Netherlands Environmental Assessment Agency, The Netherlands is not on track to meet the 2030 target of a 49% reduction in emissions (IEA, 2020).

Even though the EU agreed that The Netherlands' share of renewable energy should be 14% by 2020, renewable energy accounted for only 11.1% of total energy consumption in The Netherlands in 2020 (CBS, 2021). Given this situation, some authors regard energy democracy as an alternative and inclusive model of decentralized energy transition that has grown in importance and focuses on the development of new options for collective control of energy, universal access, and social justice (Burke, 2018; Stephens et al.,2018). Furthermore, because of the transformative character of DG with renewable energy it contradicts the typical centralized forms of energy (Burke, 2018).

According to Kooij et al. (2018), locally-based renewable energy systems started as a local initiatives in The Netherlands and can be seen as grassroots initiatives. These initiatives are open and dynamic actions aimed at bringing changes contradicting established routes of transition which are self-organized and transformative (Kooij et al., 2018). Community renewable energy systems (CREs) often incorporate peer-to-peer sharing of energy for enhanced cost, autonomy, and profits. For instance, they defined as projects to serve a group of people in a specific geographic location like cities, with a set of shared interests and consisting of an autonomous local energy supply system that distributes locally produced energy utilizing renewable energy resources. (Narayanan & Nardelli, 2021). Historically, community-led energy projects were born out of an anti-nuclear or anti-natural gas campaign, such as the Groningen gas extraction, and were motivated by social and environmental concerns rather than commercial ones (Rasch & Köhne, 2018).

The niche technologies such as DG with renewable energy emerge and propose a viable front for the Dutch fossil fuel regime. As of 2018, 498 energy cooperatives[1] were active in The Netherlands, 85 more than in 2017. One or more cooperatives have been established in two-thirds of all municipalities, and 70,000 citizens are members of a cooperative, amounting to about 20% of Dutch households. By 2020, there were 623 energy cooperatives and more than 200 projects in the pipeline (Hieropgewekt, 2021). However, given the current adoption of decentralized renewable energy in The Netherlands can be characterized as a slow adopter because the Dutch government has placed a more significant emphasis on energy efficiency (Vondrackova, 2021; Dóci & Gotchev, 2016; Oxenaar & Bosman, 2020).

The low Dutch share of renewable energy is not for lack of efforts. The Regional Energy Strategies (RES) is a key component of the Dutch Climate Agreement as an effort to localize the management of the energy transition since they were created in early 2019. The objective of these strategies is to integrate national goals into regional programs and projects, with a concentration on the topics of built environment and a renewable energy generation goal of 35 TWh (Deloitte, 2021). Significantly, research conducted in the Flevoland strategic region demonstrates the effect of community renewable energy systems in achieving energy democracy goals such as fossil fuel resistance practices and in site renewable energy generation towards renewable energy transition (Rasch & Köhne, 2018). However, the institutional design of the Dutch energy sector is market-oriented, which has a significant impact on available space for community initiative development (Dóci & Gotchev, 2016; Magnusson, Sperling, Veenman, & Oteman, 2021).

1.2 Problem statement

As stated above, progress toward renewable energy has become increasingly significant, and CREs may play an essential part in the energy transition, which is an important government goal. Furthermore, research on renewable energy identifies that energy democracy is considered a driving force of energy transition by empowering communities in decision-

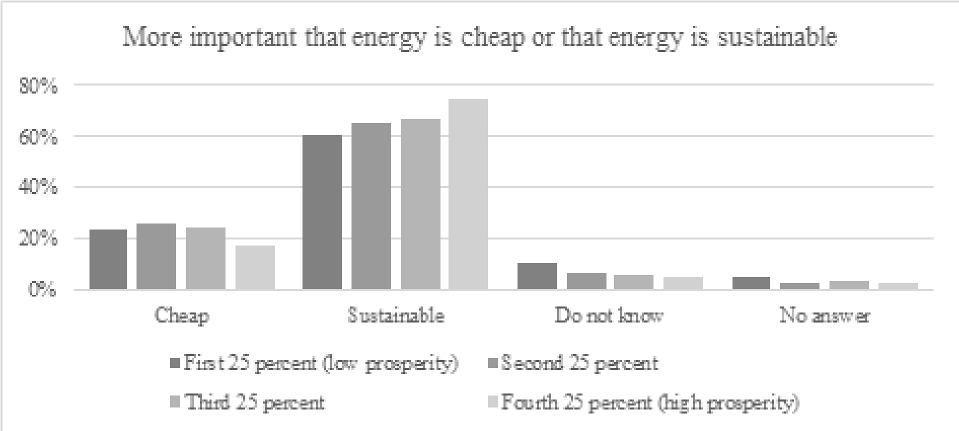
[1] Energy cooperatives and community renewable energy systems (CREs) are used as synonyms in this study.

making and the transformative power that opens a path towards the energy transition via citizen participation (Szulecki & Overland, 2020). Hence, CREs for the sustainable energy transition have gained attention in the last two decades (Wierling et al., 2018); there is a need to further understand how community renewable energy systems make their place in a centralized energy regime, thus influencing the diffusion of the RET. Some governmental institutional instruments like feed-in tariff, net metering, soft loans, and tax incentives help eliminate renewable energy's financial and economic barriers (Dóci & Gotchev, 2016). Feed-in tariffs is often regarded as a relevant instrument for improving the financial performance for households investing in a RET, hence providing a strong encouragement for disseminating RET (Vasseur & Kemp, 2015; Londo et al., 2020). However, research has demonstrated that legislative ambiguity and declining financial support hinder the foundation of new energy cooperatives as well as the continuing viability of current energy cooperatives (Dóci & Gotchev, 2016; Wierling et al., 2018).

The collectives are using three institutional schemes to make production profitable: netting, postcode rose, and the incentive scheme for sustainable energy production (SDE+). Indeed, 64% use the postcode rose scheme, 25% SDE+, and 10% net metering of all collective solar projects (Local energy monitor, 2020). Besides, studies have analyzed the effects on the rentability of the systems and the cost-benefit of net metering and feed-in tariffs (Londo et al., 2020 and Abdulateb, 2020). In unison, other studies have conducted a cross-country evaluation of the limitations that energy cooperatives face, concluding that instruments designed and expected to reduce specific types of risk do not consistently achieve that goal in practice, which is reflected in investor's perceptions (Dóci & Gotchev, 2016). Further learning from the effect of these instruments will be significant for all the stakeholders; therefore, it is critical to investigate how this institutional factor is associated with energy democracy and the adoption of RET in The Netherlands.

Even though environmental concerns are the main driver for adopting RET, the practice has limitations (Ajaz, 2019, Londo et al., 2020). Saridianou (2013) discovered that when socio-economic parameters increase, so does the likelihood of using renewable energy. For instance, a 2020 perceptions survey about energy transition and climate change presented in Graps. 1 showed that 35% of the lower income Dutch households countered that energy should be cheap rather than sustainable; this belief changes as we move into higher-income households (Akkerman et al., 2021). See Graph 1. In contrast, most respondents do not plan to adopt renewable energy in the next two years, while the most mentioned answer is still associated with investment cost; thus, financial, not environmental beliefs, is driving the adoption (Hicks & Ison, 2018; Fleiß, Hatzl, Seebauer, & Posch, 2017). It has also been stated that cooperatives are attempting to include low-income individuals as members or at the very least to participate in the decision-making process, going to point out that energy cooperatives have observed that participation in the transition varies depending on the socioeconomic condition of the households (The Local Energy Monitor, 2020). Therefore, this thesis aims to understand why the role of energy democracy through decentralization projects has not diffuse more. It does so by explaining if the institutional incentive as predictor has supported the growth of renewable energy on a local level thus far, and whether there is an influence of household socioeconomic conditions for participating in the energy transition.

Graph 1. Results of the perception survey 2020.



Elaborated by: Author. Source Akkerman et al. (2021)

1.3. Research Objectives

The research objective of this thesis is to explain how socio-economic and institutional factors affect the role of energy democracy in the energy transition of The Netherlands. More in particular, the specific objectives are:

1. To investigate the relation between institutional factors, particularly the financial incentive SDE+ for renewable energy, and energy democracy as reflected as participation in the energy transition (i.e., measured as the number of cooperative projects).
2. To investigate the relation between the socioeconomic factors, particularly between income and the share of income spent on energy and energy democracy particularly as reflected as participation in the energy transition (i.e., measured as the number of cooperative projects).
3. To investigate the impact of energy democracy influence on the Dutch energy transition as reflected as the share of local renewable energy.

1.4. Main research question and research sub-questions

The main research question is as follows:

"To what extent do financial incentives and socioeconomic conditions foster energy democracy to enable The Netherlands' energy transition?

In this research question 'energy democracy' is measured by community-based participation in renewable energy cooperatives. Sub questions, with a focus on the energy transition in strategic energy regions and provinces in The Netherlands, are the following:

1. How do financial incentives influence energy democracy?
2. How do socio-economic factors affect energy democracy?
3. How does energy democracy, stimulated the adoption of renewable energy?

1.5. Relevance of the research topic

The determinants of democracy are among the most extensively researched subjects in political science (Barnett & Low, 2009). Likewise, energy has been seen as indispensable, even the driving force behind evolution and economic progress (Szolucha, 2018). Therefore, researching energy democracy and how it is discussed and practiced in various regions and periods contributes shape new social equitable and political reconfiguration towards the energy transition. While distributed generation may provide access to clean energy and, because energy democracy is a novel idea connected with environmental justice, there is a need to understand how certain conditions might be explaining the level of adoption of RET. Ultimately, this research might assist in establishing whether socio-economic predictors for participation and whether they restrict affordable access to sustainable energy.

Finally, regarding the academic relevance, there are just a few cases on cross-regional comparison addressing the impact of the financial incentives, the socioeconomic factors and energy cooperatives in the Netherlands. Much of them are addressed either as a single region case study or a macro level, as the work done in several pieces of research comparing the deployment and maturity of this business model among European countries such as Germany, Sweden, and France (Kooij et al., 2018; Vernay & Sebi, 2020). Moreover, this study addresses a gap in the regional energy transition literature concerning to The Netherlands by analysing niche-level adoption with local renewable energy systems from a transition theory perspective (Hoppe & Miedema, 2020). This research then positions itself within this gap, analysing financial incentives such as feed-in tariff (SDE+). Furthermore, it tackles the research on energy transitions in The Netherlands by quantitatively assessing socioeconomic variables. In addition, it will serve as a basis for future decision-making processes concerning financial incentives research on decentralized systems and energy technology adoption, bringing a unique contribution to the field using panel data analysis and energy transition indicators.

1.6. Scope and limitations

This research is limited to information from The Climate Monitor (TCM) portal and Statistics Netherlands (Centraal Bureau voor de Statistiek in Dutch) and the Survey Perceptions 2020. Regarding energy democracy variable, the projects will consider sun and wind CREs. Subsequent, under institutional factors, the SDE+ financial incentive was investigated. In terms of socioeconomic status, the average annual income as well as the share of income was analyzed.

Chapter 2: Literature Review/Theory

This chapter will review the academic literature of the three complementary theoretical frameworks. First, the multilevel perspective and analysis of socio-technical systems will shed light on community-based efforts as "niches" in influencing the existing "regime" and facilitating the energy transition to renewable energy technologies adoption. Second, the diffusion of innovations framework provides insights into ecosystem actors' role, in this case, the community initiatives as "early adopters" in stimulating the adoption of renewable energy technology. Thirdly, a review on the concept of energy democracy will provide insight into local community initiative's participation, political and decision-making aspects from the niche level in the energy transition. The chapter will finalize with the proposed conceptual framework that will lead the research and conclude by listing four hypotheses that will guide this research.

2.1. Multi-level perspective and sociotechnical systems – role of niches

Society's current dependence on fossil fuels and climate change as the main externality can be framed as a consequence of a market failure (Geels, Sovacool, Schwanen, & Sorrell, 2017). However, it is deep-rooted enough in our systems to be described as a wicked problem (Geels, 2020). First, because it can be regarded as a symptom of another problem, second, it can have multiple solutions or approaches, and finally, there are many stakeholders with different interests and points of view (Waddok, 2013). The energy transition is a technology social and political topic, and until everyone is convinced that they will benefit from the energy transition, there will be disagreement and resistance (Menegaki, 2021).

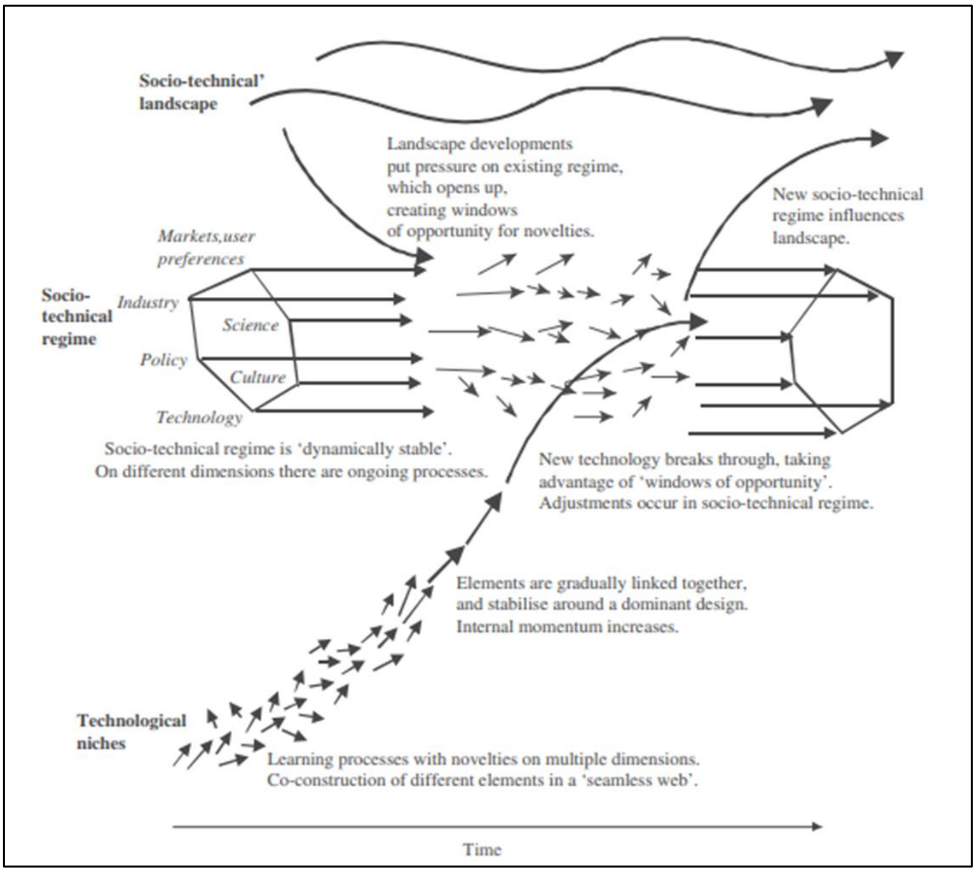
The complexity of the energy systems then lies in the fact that it is a socio-technical system. "Social systems are defined as systems of organization and work involving human cooperation and interrelations" (Stapleton, 2014, p.130). Likewise, technology fulfils functions as energy supply and water supply only in association with human agency, social structures, and organizations such as energy supply and water supply. Therefore, socio-technical systems are the cluster of activities, components, and regulations to fulfil societal functions. The socio-technical transition approach is based on a co-evolutionary view of technology and society and a multilevel perspective (Geels, 2007). Socio-technical change is a process of shifting a set of associations and rearrangement of elements so that any change in a system element might trigger configurations in other components. (Geels, 2002)

Meanwhile, energy transition is defined by the Dictionary of energy as a change in the primary form of energy consumption of a given society (Cleveland & Morris 2014). Also, it is defined as the move from a given energy provision pattern to the new state of an energy system through a new the structure of the primary energy source (Mazzone, 2020). The timeframe of socio-technical transitions has arisen as an important topic and whether they must be long and arduous or can occur fast. (Roberts & Geels, 2019).

The Dutch literature on transitions is concerned with underlying shifts in functional systems of consumption and supply, and it includes contributions from innovation researchers (Geels, 2002) and transition management studies (Vasseur & Kemp, 2015). However, the most comprehensive approach to analyzing a socio-technical transition on how centralized energy systems like CREs fit into a centralized network regime is the Multilevel Perspective (MLP) theory (Ajaz, 2019; Oxenaar & Bosman, 2019). The MLP, therefore, is one theory that understands transitions as the result of alignments between processes at different levels (Geels and School, 2007). Geels and Scot developed a typology of transitions based on combinations of the dimension of timing and character of multilevel interactions (2007). This model theory is illustrated in figure 1 and was created to get a far-reaching picture understanding of conditions for political acceleration where different levels of governance interact (niche-level, meso-level, and macro-level) and where the transitions are meant to happen and allow to visualize and analyse the different restraining forces or driving forces (Geels, 2002). Geels & School (2007) develop propositions about four different transition pathways:

1. Technological substitution based on landscape pressures triggers the emergence of disruptive niche innovations.
2. Transformation, reorientations by regime actors create pressure on the regime leading to moderate landscape changes.
3. Reconfiguration, based on regime actors adopt component-innovations, developed by new suppliers although there is competition between old and new suppliers.
4. De-alignment and re-alignment, in which the new regime grows out of the old regime, is signalled by a decline in R&D (Research and Development) investments.

Figure 1. Multilevel perspective framework



Source: Taken from: Geels (2002, p.1263)

The relationship between these levels is highly dynamic; niches often exert pressure on the regime, which in turn is affected by the development of the landscape (Geels & Schot, 2007). CREs are a grassroot innovation gaining traction due to price and performance improvements and landscape pressures. When the right set of circumstances is achieved, pressure from niche markets may cause the system to incorporate niche technologies into its present configuration, or to replace the system with new institutional settings and its own rules and regulations (Geels, 2011). Although these dynamics fluctuate, and different stages of a single transition may display distinct niche institutional dynamics, the struggle between niches and institutions is especially instructive when studying the setting of the Dutch energy transition due to the regime's strength (Geels, 2007).

Geels (2019) claimed that “innovation in existing systems and regimes is mostly incremental and path-dependent because of various lock-in mechanisms” (p. 189), such as techno-economic lock-in, social, cognitive, institutional, and political mechanisms. Within the institutional and political blocking mechanism they can be described as the regulations, standards and existing policy networks that favour traditional operators and create an unequal playing field hampering radical innovations (Geels, 2019).

In places where landscape influences have caused enough noise in the incumbent centralized regime, the resulting opportunity has brought the manufacture of CREs or even resistance practices to the fore, paving the way for a change from centralized to DG systems (Ajaz, 2019).The financial incentives programs such as the (SDE+) and the postal code, are the windows of opportunity in the sociotechnical regime which have been used by the energy cooperatives, this is called by Otteman et. al (2017, p.19) as a “discourse fit”. SDE+, a revised version of the subsidy system, is launched in 2011. The key differences in the new SDE+ scheme are the adoption limited budge. Almost 600 projects for green gas and renewable power can be achieved within an annual budget available around €1.5 billion. (Blokhuis, Advokaat, & Schaefer, 2012)

Finally, transitions become complicated due to the multiplicity of people involved and necessitate a tremendous deal of pressure to occur (Oxenaar & Bosman, 2020. When addressing the backdrop of The Netherlands and the strict regimen to the fossil fuel drum, this multi-actor nature becomes critical; It is not enough to rely on the government to manage transitions; citizen initiatives such as CREs and pressure groups seek change and play a vital role in putting pressure on the regime (Oxenaar & Bosman, 2020) . In particular, niche efforts and subnational management have shown to be crucial in creating space on the government agenda and inspiring them to take a stricter stance towards the decline in fuel use (Oxenaar & Bosman, 2020; Rasch & Köhne 2018)

This brief review has emphasized that energy systems are socio-technical systems, not merely technical or economic, and therefore it should be underlined that the energy transition is not a linear process as it is drawn in figure 1. Besides, this theory allows us to understand the driving forces happening at diverse levels in the Dutch context that affect the development and adoption of renewable energy, such as institutional conditions and macro-level factors such as fuel prices or geopolitical conditions (Geels, 2003). Furthermore, it helps us understand the role of niche initiatives, to the extent that they will use existing instruments and even demand to be heard by the regime. Therefore, we formulate our first hypothesis as follows:

> *H1: Regions with more subsidized renewable energy projects are more likely to demonstrate community-based participation in the energy transition.*

2.2 Diffusion of innovations – role of early adopters

Diffusion of innovations[2] is a theory that attempts to explain how, why, and at how quickly new ideas and technology spread (Rogers, 2003). "Diffusion is the process in which an innovation is communicated through certain channels over time among members of a social system" (Rogers, 2003, p.5). Thus, it is a specific form of communication where the communications are about fresh ideas. Furthermore, communication is a process in which participants create and share information in order to achieve mutual understanding; thus, this definition implies that communication is a process of merging (or difference) as two individuals exchange information to move each other closer or further apart in the meanings that they assign to specific events (Rogers, 2003). Table 1 summarizes the essential components of an innovation's diffusion, breaking down the stated definition.

Table 1. Components of the diffusion of innovation process

Components	Definition
Innovation	An individual or other adoption unit sees an idea, activity, or initiative as a novel. Thus, even if an innovation has been around for a long time, it can still be deemed innovative if others perceive it as new.
Communication channels	A channel is how a message gets from the source to the receiver, such as ass media and interpersonal communication.
Time	The indefinite and continuous progress of the adoption of innovations considered as a whole.
The social system	Is a set of interrelated units engaged in joint problem solving to accomplish a common goal" (p. 23) It is where the diffusion of innovations happens and will be affected by the structure of it.

Source: Own elaboration with information from Rogers (2003)

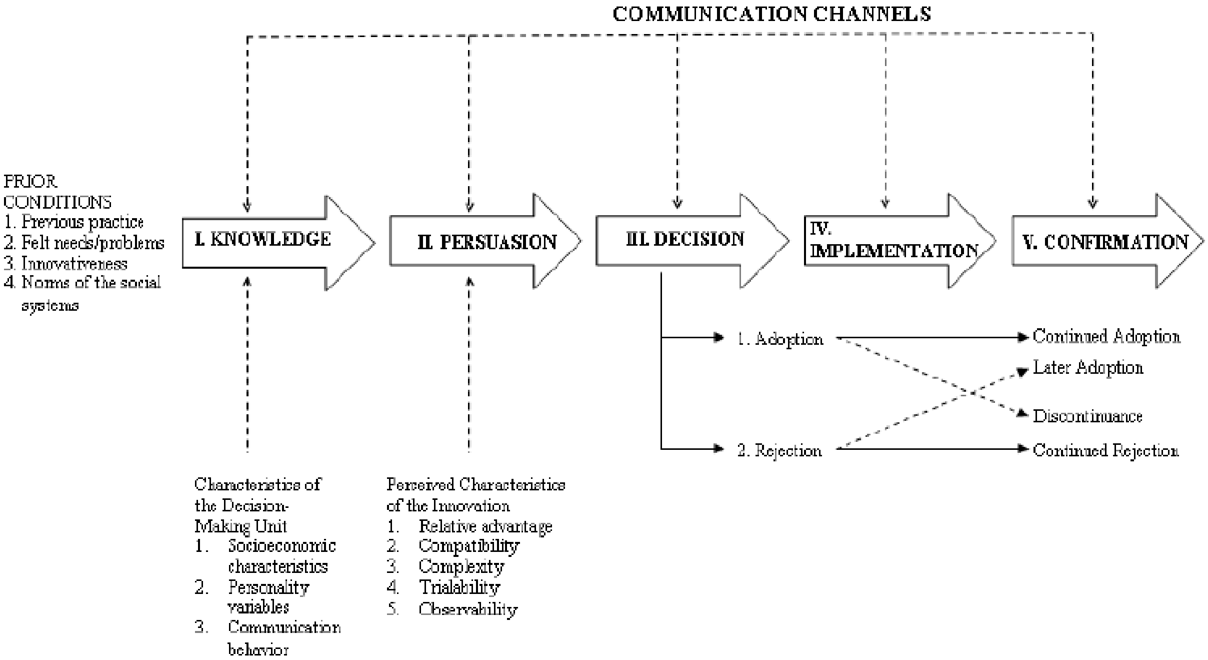
Adoption in a social system varies depending on the setting in which the innovation is tested. Then the nature of the social system may threaten or drive innovativeness. Moreover, for instance, when transferring and propagating a technology, five communication channels engage with households: government, business, developers, peers, and media. At the individual level, the head of the family influences the intention to act; how he perceives risk in the decision while general attitudes can also be extended to the financial and technical components of the technology. (Alipour, Salim, Stewart, & Sahin, 2020).

The innovation-decision process

According to Rogers (2003), the innovation-decision process is an information-processing activity in which an individual is motivated to reduce ambiguity regarding the benefits and drawbacks of an innovation. The innovation-decision process consists of five steps described in picture 2. The innovation-decision process is how an individual goes from the first knowledge stage of an innovation to the decision to adopt or not adopt and further proceed to the confirmation stage. This research is focused on the knowledge state of the diffusion process.

[2] Rogers (2003) usually used the word "technology" and "innovation" as synonyms. In this research the innovation is reflected as RET.

Figure 2. Rogers model of stages in the innovation-decision process



Source: (Rogers, 2003, p. 165)

The composition of socio-demographic indicators represents contextual conditions and whether a household can adopt the innovation. The predictors of the behaviours reveal attitudinal characteristics on how the prejudiced and non-prejudiced individuals perceive the technology (Alipour et al., 2020).

Overall, the selected predictor (socio-economic condition) and individuals' environment will first influence the stage of the innovation decision-making process. (Rogers 2003, Alipour et al., 2020). For example, income and financial knowledge are predictors typically used and significant in renewable energy adoption (Alipour 2020). However, this financial knowledge will depend on both the communication channels and the perception of the technology. For instance, Rogers (2003) and Alipour et al., (2020), people with wealth will be more likely to adopt renewable energy.

Technology adoption is driven by decisions made by potential adopters depending on the benefits they receive. Different electric rates, for example, result in varying profitability of various power generation systems. If promising technologies are accepted, they spread through the market in response to changes in the cost structure and technological costs[3] over time (Fleiter & Plötz, 2013). Many factors influence the diffusion rate and saturation level, which are grouped into four categories: the characteristics of the invention, the qualities of the adopter, the information routes, and the contextual circumstances (Rogers, 2003). Rogers proposes that there are several characteristics that a user might take into consideration during the decision-making process for adopting certain technology summarized in Table 2.

[3] In this research we refer and use as synonim cost of the technology and investment

Table 2. Attributes of the innovations and definitions.

Attributes	Definition
Relative advantage	The degree to which an innovation is perceived as better than the idea or technology it supersedes by a particular group of users, measured in terms that matter to those users, like an economic advantage, social prestige, convenience, or satisfaction
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences, and the needs of potential adopters
Complexity	The perceived difficulty to understand and use innovation
Trialability	The degree to which the adoption of an innovation is experienced without making long-term commitments or incurring significant costs
Observability	The degree to which the results of an innovation are visible to others

Source: (Rogers, 2003 in Vasseur & Kemp, 2015)

When containing a physical object, the uptake and use of technological innovation usually entail some infrastructure and prerequisites (Rogers, 2003; Alipour, Salim, Stewart, & Sahin, 2020). However, when it comes to implementing renewable technology, users must deal with two forms of underlying knowledge, financial and technical, obtained via information channels. As a result, knowledge on innovation and technological attributes comes from sources other than the media (Alipour et al., 2020)

Vasseur & Kemp (2015) have used this theory to analyze adoption factors for renewable technology in The Netherlands from the user perspective. They have used the perceived components introduced by Rogers such as the perceived relative advantage of technology, the complexity, social influence and knowledge of grants and cost as predictors for the adoption at household levels. In addition, in their approach they found out that while for adopter the prices are affordable for the non-adopters is the other way around, stating that the adoption depends on attribute perceptions (Vasseur & Kemp, 2015).

A household's attitude toward the adoption of renewable technology will be established by knowledge acquired through information channels and social features, which are subsequently moderated by the presence of perceived risks and personality traits. Information channels are a source of knowledge and social influence, which influences the observed qualities, e.g., having information can lower the consumer's risks (Alipour e. al., 2020).

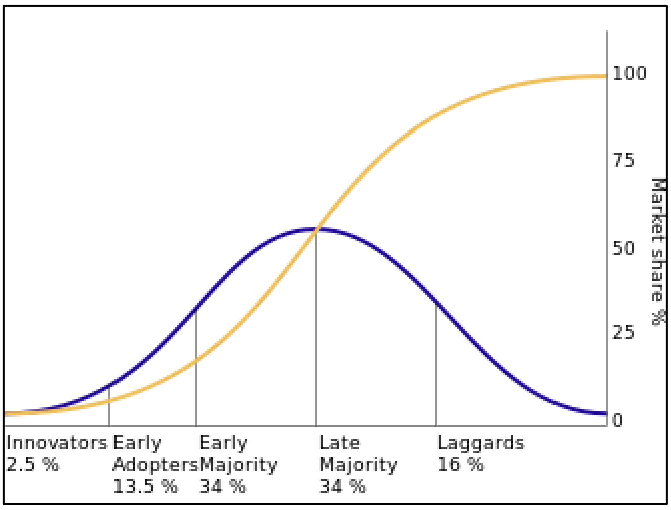
Adopter categories

The theory, besides, categorizes the adopters of innovation into five groups: innovators, early adopters, early majority, late majority, and laggards. These groups are differentiated based on the characteristics of the innovation itself, communication channels, time, and the nature of the social system (Ajaz, 2019, Rogers, 2020)

Rogers (2003) raises the following question in this classification: "Do innovators innovate because they are richer or are they richer because they innovate?"(p.251). Even though cross-sectional data cannot be used to answer this question, there are reasonable reasons for understanding the variation across adopters. Early adopters, therefore, are more likely to have a more formal education, a higher social position, or even a greater degree of upward social mobility, implying that they may be adopting innovation as one means of getting there.

As the innovators try out the innovation and the benefits are further transmitted to the other groups, the adoption rate among the participants in a social system gradually increases. He claims that the first 2.5 percent of our population is an innovator. Early adopters make up the next 13.5 percent of the population. The early majority is 34%, the late majority is 34%, and the laggards are 16%. In figure 2, it is possible to observe different types of adopters. (Rogers, 2003), the yellow line is representing the adoption rate of an innovation.

Figure 3. Diffusion of innovations S-Curve adoption



Source: Rogers (2003, p.243)

In addition to these five categories, He further clusters into two main groups: early adopters and late adopters, identifying the differences between these two groups in terms of socio-economic status, personality variables, and communication behaviors, which usually are positively related to innovativeness. For Rogers (2003), e.g., innovators and early adopters are willing to experience new ideas, and they should be prepared to cope with unprofitable and unsuccessful innovations and a certain level of uncertainty about the innovation. He also claimed that obtaining a diffusion rate of 15-18% would result in a tipping point of mass-market adoption/acceptance (Roger, 2003).

The energy cooperatives initiators are appointed under this framework as early adopters. Some of the reasons innovators and early adopters invest in CREs is that they want to achieve specific grid security and independence, as well as avoid price fluctuations. (Rasch & Khone, 2018). In addition, this adoption rate will be affected by several other factors, as explained earlier with the adoption theory of Geels (2003) by socio-technical regimes which will affect the perception and awareness of risk around the adoption. Although by landscape pressures conditions such as prices of energy and directives from the EU.

Last, Rogers' theory (2003) allows to render a behavioural decision-making model by specific categories and user conditions at the niche level that affect the adoption of RET, such as socioeconomic status, personal values, and communication behavior. Socioeconomic status is indicated under this work the variable income, and wealth (Rogers, 2003)

Alipour et.al (2020) argues in a recent piece of research, even though the socio-economic position is the only social attribute of the decision-making component to outline knowledge stage. He also states that additional factors influence the adoption process, such as culture, education, income, race, and class, which are used to quantify affordability and wealth more thoroughly. In his research, he discovered that family structure characteristics are also popular in empirical studies. At the same time, socio-economic factors as predictors are approaches to income factors related that consider how much disposable income a family has and that has been widely used in renewable energy adoption (Alipour, et al, 2020).

Even though The Netherlands is a highly egalitarian state in terms of income, the distribution of wealth is unequal and growing. The welfare state paradox explains why low-income households have none or negative assets. Low-income households do not save money as they do not need to save money for emergencies. (De Mulder et al., 2018). The spatial distribution of income may reflect some aspects of local and regional economic dynamics. Indeed, Randstad Holland has a greater income than the rest of The Netherlands, whereas low household incomes are more common in northern provinces and along the German border (De Mulder et al., 2018).

This brief review revealed that adopting RET requires more than interpreting its technical attributes; the technology must also be compatible with the aspirations of the possible adopters. Therefore, our second hypothesis is formulated as follows:

> *H2: Regions with larger share of income spent on energy are less likely to demonstrate community-based participation in the energy transition.*

The next section discusses energy democracy and the role of local communities as a driver and means of energy transition and how controversy can emerge despite the existence of collaboration, hindering or motivating a democratic transition.

2.3. Energy democracy – role of local community initiatives

Once this theoretical context is specified, rendering on the MLP theory, Burke & Sthephens (2018) stated that “energy democracy movement represents an representation of a de-alignment/re-alignment transition pathway, an ideal type of energy transition that emerges in response to serious contextual pressures” (Burke & Sthepens, 2017, p.35). Energy democracy can be position itself as a grassroot initiative level force that generates new forms of manufacturing within the regime, acting from the bottom up (Rasch & Köhne, 2018).

Meanwhile, in the Dutch context, the arising movement of energy democracy was described by Rasch & Köhne (2018) as a feasible way of organizing social action to address the transitions in renewable energy, offering an approach towards promoting renewable energy or transformative potential. Rasch & Konhe (2018) paid attention to the ways in which energy democracy can emerge through local energy practices. They show how the residents of Noordospolder municipality in The Netherlands have taken social action to address concerns about the future of energy. They have tracked the exercise of energy democracy since the 80s with the opposition to a nuclear plant development in the area and recently, with the support of grassroot organizations in the dissemination of information, and further motivating the commitment of people to resist the extraction of natural gas in the region between 2013 and 2018, and even creating the Tengengas association, whose role was to embrace community participation in deciding what is best for citizens, thus illustrating the power of protest and the educational role of local activist history. Furthermore with adoption of renewable energy production since the early 1990s is another energy practice in building energy democracy from below that is shaping imaginaries political and social of The Netherlands. Overall, this chapter elaborates that, more than ideas of sustainability, these experiences and practices are the driving forces behind energy democracy in The Netherlands (Rasch & Kohne, 2018).

Burke (2018), for his part, discusses the paths of energy transition from a broader perspective in the context of sociotechnical systems. He elaborates from the relationship that exists between concentration or distribution of political power as well as the means of governance and its relevance for energy democracy and energy transition. He argues that centralized energy technologies based on oil resources generate a concentration of power and economics, while decentralized means through renewables can more easily motivate a distribution of political and economic power. However, this author explains that although the energy transition to renewable energy is important, it exemplifies that the centralized model of renewable energy is not always the fairest, or that the accumulation of power and capital is only inherent of fossil fuels which means that the use of renewable resources does not necessarily imply a different social and political order. Using as a contrast the example that he presents on the impacts that hydroelectric development also has. Arguing that this also follow a typical centralized management. He further argues that solar and wind resources allow a broader distribution of power and that for energy democracy two paths of renewable energy development are recognized. The centralized one, where well-known megaprojects of wind farms, giant solar arrays in remote places are developed, pointing to a re-alignment pathway of the old regime (Geels, 2007; Burke, 2018). While the decentralized then seeks a local development that includes new economic and environmental relationship as well as retaining the benefits locally. Although, these differences may also be generative of social and institutional innovations which could challenge the currently dominant and resistant forms of centralized energy governance. (Burke, 2018)

One statement that is useful to measure the degree of an energy system's democratization is the one given by Szulecky (2018):

> "The energy democracy is associated with an increase in the role of individual prosumers, energy cooperatives, or municipal control of specific functions that were previously fulfilled by energy companies" (p. 24)

This contradicts the idea of re-alignment, where the new regime grows over the old one, is being pushed out. While radical democracy theories are often associated with demands that decision-making, political participation, and ownership must be decentralized at the subnational level in regions and cities (Szulecky & Overland, 2020). However, with its many ambitious energy megaprojects and authoritarian governance, China demonstrates that democracy is not required to accelerate RET adoption and tackle climate change. (Szulecky & Overland, 2020). This momentum in localization of energy power generation assumes that subnational governance scales are more democratic in their proximity to day-to-day concerns (Szulecky & Overland, 2020).

Meanwhile, the concept of energy democracy could also be approached as a goal and ideal for communities to aspire to (Szulecki & Overland, 2020). Since that energy democracy is viewed as an ideal, or even a utopia, complete democratization of energy generation and supply controlled and owned by citizen groups is unlikely to happen soon (Hewitt et al., 2019; Szulecki & Overland, 2020). This does not undermine the movement; in fact, one may argue that it is effective since it considers an alternative to neoliberal and centralized approach, acknowledging the essential nature of energy transitions and their scalar diversity. (Hewitt et al., 2019; Paul, 2018; Szulecki & Overland, 2020). Therefore, changes in how energy systems are organized, with a gradual shift to low-carbon and renewable sources, should lead to a "creative reconfiguration of social relations" and act as a catalyst for social innovation; according to this viewpoint, the technological transition comes first, allowing for political and social change. (Kooij et al., 2018; Sovacool, Martiskainen, Hook, & Baker, 2020). Energy democracy is then defined as a political, economic, social, and cultural concept that seeks to reintroduce renewable energy to cities and empower communities to resist, restructure the market and produce energy locally (Burke & Stephens, 2017).

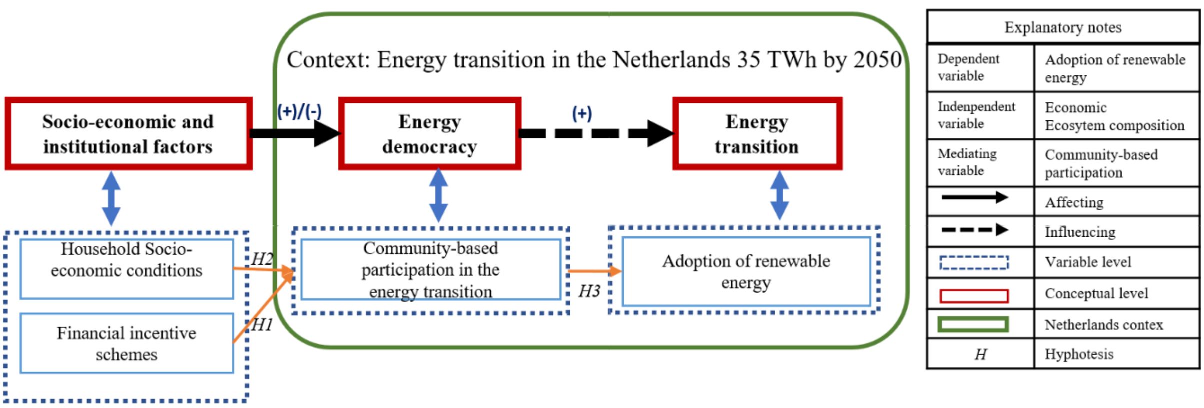
Finally, the transition from fossil-fuel-dominated energy systems to more renewable-based energy systems provide a prospect for transforming social and political dynamics through democratic re-alignment of the socio-technical system (Burke & Sthepens, 2017). Energy democracy offers a set of goals and policy instruments called in this research as institutional factors for opposing the dominant energy regime while reclaiming and democratically restructuring the energy sector and the institutions. Therefore, this concept will further be used as vehicle and intermediate variable in our conceptual model and the hypotheses is formulated as it follows:

> *H3: Regions with more energy democracy are most likely to have a higher rate of adoption of renewable energy.*

2.4 Conceptual framework

The conceptual framework consists of three parts. Firstly, it draws the hypothesis that socioeconomic factors and institutional factors (financial incentives) of the socio-technical system could influence energy democracy exercise (Londo et al., 2020; Alipour et al., 2020). Thus, the first layer outlines the elements that are likely to influence the level of community-based participation which is the mean for operationalizing energy democracy. The second layer comprises one mediating variable, energy democracy, that links the second independent variable (socio-economic and institutional) and the dependent variable (adoption of renewable energy) and whose existence explains the relationship between these two variables. Finally, the last layer outlines the energy transition and that it is achieved through or seeks to adopt renewable energy and that will be affected by the level of energy democracy (Buke, 2018; Rasch & Konhe, 2018) social factors (Rogers, 2003; Alipour et al., 2020) and financial incentives.

Figure 4: Conceptual framework



Source: Author (2021)

Chapter 3: Research Methodology

This chapter will present the research design and methodology, including overall details about method of data collection, sampling, and method of data analysis. Furthermore, it will cover the operationalization of the main concepts and how the validity and reliability of the research was maximized.

3.1. Research design and methods

This study focuses on the adoption of RET in the Dutch context and relies on the explanatory power of key factors behind the adoption of RET introduced by Rogers (2003), Londo et al. (2020), and Fischer et, al., (2020) to better forecast the adoption rate of RET. Hence, the goal is to analyse how the independent variables impact the dependent variable across individuals (provinces/regions) and aims to generalize the findings for The Netherlands. Therefore, quantitative research will be conducted, which entails a deductive approach to the relationship between theory and research, in which the focus is placed on the testing theories (Bell, Bryman, & Harley, 2019; Bryman, 2012). This approach is complemented with a limited qualitative analysis based on interviews with key players in the energy transition, to validate and further understand the outcomes of the quantitative analysis.

Among the quantitative methods for data collection, Bell, et al., (2019) and Thiel (2014) propose two designs that might fit for this purpose, a social survey, or desk research using secondary data when the aim of the research is explaining, testing, or evaluating. The strategy of the survey allows the researcher to collect a considerable body of data on many subjects, which makes it a highly efficient approach to research (Thiel, 2014). However, considering the size of the population of The Netherlands (17,474,677 million inhabitants), a margin of error of 5% and a confidence level of 95%, resulted in a minimum of 385 responses for a statistically significant and representative sampling. In addition, responses must be available from all provinces or strategic energy regions. This condition might hinder the response rate and might be time consuming. On the other hand, desk research withing a longitudinal panel study design using secondary data (contained in existing databases) is suitable for describing developments over time or exploring a particular research problem (Bryman, 2012). Nonetheless secondary data might be official statists or data that other researchers have previously obtained or analysed, but that lends itself to further research. Given this context and given the limitations in terms of time and resources, a desk research strategy and longitudinal panel study based on analysing a data matrix withing existing databases was chosen for this research design.

The main advantage of desk research based on secondary data is that there is general information accessible, making this research method very efficient and cost-effective. Hence, the comparison among provinces or regions can be made without the requirement for travel. Furthermore, the researcher can operate autonomously without the support of others (Thiel, 2014).

Panel data analysis was chosen as the analysis method for this research. Panel data is "the pooling of observations on a cross-section of households, countries, provinces, etc., over several periods" (Baltagi, 2021, p.1). Panel data is widely applied in development, and micro- as well as macroeconomics labour and urban studies (Baltagi, 2021). Likewise this approach enabled the researcher to explore the dynamics of change using brief time series by observing enough cross-sections observations repeatedly in ways that would be impossible to do with simply one of these two dimensions (Baltagi, 2021).

3.2. Sampling and data collection

3.2.1 Panel data

The national government provides quantitative data on energy transition through portals such as CBS and RVO. TCM, commissioned by the Ministry of Economic Affairs, presents trends in the energy transition across municipalities, provinces, and the recent integration of the RES to track their progress towards the established goals so while policies effects can be reviewed. This portal, apart for energy transition indicators, also provides information about socioeconomic indicators, such as income, wealth distribution, number of households, emissions, distribution of energy consumption among others.

Therefore, TCM was the main source for data collection. The sample size for this research is non-probabilistic hence the units of study are composed by the 12 provinces and 30 strategic regions covering the period from 2011 to 2019. While energy regions were recently defined, aiming for more individuals (cross-regions) to be analysed. Moreover, the selection of the data was made according to the availability of data, this means that more recent years (2020-2021) were miss considered because the data was not completed, similarly with year below 2011, not enough data was available regarding our variables of interest.

The Local Energy Monitor (TLEM), a knowledge platform that works closely with energy cooperatives collecting information about CREs and projects that have been formed or are in the process of being developed, so this database was also a reliable source of data.

Finally, it was created an integrated dataset containing 4,320 observations (collected values) using these two portals and cross-checked with the CBS data portal, but when structured as a panel dataset, we end up with 270 observations since this are repeated observations of our study variables in different times. In other words, individuals (province/region) had repeated observation across 9 years.

3.2.2. Interviews

The choice of respondents for the interviews followed a purposive sampling approach that would assist in confirming or rejecting our hypotheses and for reflecting on different perspectives on the community-based participation and the adoption of renewable energy. Nevertheless, respondents had to comply with one or more of the following characteristics or profiles.

(i) Non-governmental organizations that work closely with CREs initiatives,
(ii) Energy cooperatives members (early adopters),
(iii) Energy cooperatives initiators (innovators),

To do so, the researcher contacted over 30 different energy cooperatives as well as two different organizations energy supply organizations. However, due to the previously mentioned sampling constraints, it was decided to conduct interviews using a convenience sampling approach, which implied that the researcher interviewed the people who responded to the calls and emails. According to Bryman (2012) and Etikan, Musa, & Alkassim, (2016), convenience sampling is a valid method because it is drawn from a source that is easily accessible to the researcher and allowed for connections to be made with existing outcomes in a topic. In the end three semi-structured interviews were conducted. The structure of the interviews aimed to cover the variables of study, the formulated hypotheses and the conceptual framework of section 2.4 while allowing the respondents to share openly information and assessments. The interview guide is presented in Annex 1. A summary of the respondents' profile is presented in Table 3. For protecting the identity of our respondents instead of using their names, we label them as respondent 1, 2 and 3. The interviews were recorded to aid in the analysis and a comprehensive consent form was also sent to all respondents prior to the interviews to ensure their full and informed permission.

Table 3. List of respondents for data collection

Label	Province / RES Region	Criteria for selecting	Name of the organization	Duration
(R1)	Utrech /	(i) and (ii)	HIER opgewekt Position: Project manager	30 min
(R2)	Gelderland / Fruit de la Riviereland	(i) and (ii)	Energie Samen Position: Director of business Office	26:37 min
(R3)	Leiden/Rotterdam	(iii)	Cooperatie Energiek Leiden / Duurzame Energie Merenwijk. Position: Initiator of a cooperative project	18:33 min

Source: Author (2021)

3.3. Operationalization: variables, indicators

In Table 4, is presented find a summary of how the level of conceptualization has gone from the concepts to indicator level linking within main sources of data collection and type of expected data. The variables we want to regulate to isolate the effects caused by our independent variable are known as control variables. We present the *price of energy* (POE) and the *number of households* (NH), both of which have an impact on the adoption of renewable energy. By including them into regression models, we can truly assess the effects of social and financial incentives on the energy democracy. Besides, this operationalization also guided the interview guide as noted in Annex 1.

Table 4. Operationalization table

Concept	Definition	Variable	Indicator	Data type	Data Source
Energy democracy ***(Independent variable)***	The role of individual prosumers, energy cooperatives, or municipal control of specific functions that were previously fulfilled by energy companies	Community-based participation in the energy transition	The number of cooperative projects added in the region (No.) Number of households with RET Spatial distribution of energy cooperatives and cooperative projects. Spatial data for the location of energy cooperatives and projects	Quantitative	The climate monitor (Klimaatmonitor in Dutch) Energy Samen The Local Energy Monitor.
Energy transition ***(Dependent variable)***	Adoption of renewable energy	Renewable energy capacity	Share of renewable energy in a region (%) Renewable energy installed capacity (kW) Total know renewable energy (TJ)	Quantitative	The Climate Monitor
Socioeconomic conditions. (Rogers, 2003) ***(Independent variable)***	Income	Household income	Average household income (€/year)	Quantitative	Statistics Netherland (CBS)
	Financial capacity	Share of income spent on energy	Share of energy spent on energy in (%)	Quantitative	The Climate Monitor.
Institutional factors ***(independent variable)***	Production subsidies.	Feed in tariffs. (SDE+)	The number of subsidized projects The subsidized amount of energy (MW)	Quantitative	The climate monitor. Local energy monitor. Netherlands' Enterprise Agency
Control variable		Price of energy	Price of energy in €/kWh	Quantitative	The Climate Monitor
Control variable		Number of Households	Number of households per region	Quantitative	The Climate Monitor

Source: Author, 2021

3.4. Data analysis

For the initial data matrix preparation, Microsoft Office Excel® was employed (data inspection). Thiel (2014) advised that descriptive statistical techniques such as mean, median, and standard deviation could have been used to examine and identify errors in the dataset. STATA® was utilized to perform further inferential analysis once the dataset was sorted. QGIS® and Atlas.ti® were utilized in moderation for analysing the collected data.

The study estimated three main panel data fixed-effects regression model, for helping to solve each research sub-question. Also, the qualitative data were originally coded using the operationalization indicators (see section 3.2), and then recoded as patterns and relations emerged through numerous reads and analysis using a deductive approach, this means that they were scrutinised under the predetermined conceptual framework of the section 2.4 to test the formulated hypothesis. Further explanation of the data analysis procedure is stated in Table 5.

Table 5. Steps for data analysis

Steps to be follow for the data collection and analysis		
#	**Step**	**Description**
1	Data collection	Selection, collection, and arrangement of the dataset
2	Data inspection	Overall data overview to identify blank spaces.
3	Imputation of missing data	The dataset was completed using The Local Energy Monitor. Additionally using excel forecast function was useful to fill the missing data and for avoiding the deletion of years or individuals.
4	Run primary analysis (independent versus mediating variable)	The socioeconomic variable against energy democracy will be plotted for each region or province. On the axis "x" the year, on the axis "y" left energy democracy (energy cooperatives), and on the axis "y" right the socioeconomic variable (income). This will be repeated for each of the selected regions to verify that there is a trend or correlation.
5	Graphic and descriptive statistics	The energy democracy variable against energy transition was plotted for each region or province. On the axis "x" the year, on the axis "y" left energy democracy (energy cooperatives), and on the axis "y" right the energy transition variable (share of RE per region). This was repeated for each of the selected regions to verify that there is a trend or correlation.
6	Discussion	The expected trend was found and is aligned with the proposed theoretical framework for renewable energy adoption.
7	Regression analysis	For the collected database, was plotted to obtain the state regression analysis. The significance level was verified; when the p-value is less than 0.05, there would be a significant correlation.
9	Selection of the model	Fixed effects model was the selected model, therefore different combinations with different regressors and indicator were carried out.
10	Hypothesis test	Validate the hypothesis: If socioeconomic factor and SDE are associated with energy democracy. Test was carried out to determine the significance of the predictors.
11	Test for panel data assumptions	Test for verifying multicollinearity and cross-sectional dependence were carried out moreover Prais-regression model was used as suggested in the literature for panel data (Baltagi, 2021).
12	Qualitative data analysis	The interviews were analyzed using a deductive approach, this means that they were scrutinized under the predetermined conceptual framework of the section 2.4 to assess the formulated hypothesis.

Source: Author (2021)

As mentioned earlier we used fixed effects panel regression model because it wipes out the individual effects therefore the suggested model is as follows:

$$Y_{it} = a_{it} + \beta_1 X_{it} + u_{it}$$

Hence our first model seeker to associate the development of projects (energy democracy) with the income, share of income spend on energy and the financial incentive SDE+.

$$Energy\ democracy\ _{it} = B_0 + \beta_2 Share\ of\ income\ spend\ on\ energy_{it} + \beta_3 Subsidized\ energy_{it} + \beta X_{it} + u_{it}$$

Finally, the global model for the conceptual frameworks is as follows

$$Energy\ transition_{\ it} = B_0 + \beta_1 Number\ of\ cooperative\ projects_{it} + \beta_2 Share\ of\ income\ spend\ on\ energy_{it} + \ \beta_3 Subsidized\ energy_{it} + \beta X_{it} + u_{it}$$

Where $\beta\chi_{it}$, represents the control variables used from 12 provinces and 30 strategic energy regions over a ten-year period from 2011 to 2019. Testing for the assumptions of panel data, we did not find evidence of multicollinearity.[4] Even though the gathered dataset is relatively small, cross-sectional dependence was found out.[5]

There are two fundamental conditions for employing fixed effects approaches. First, the dependent variable must be assessed at least twice for each region/province. Those measurements must be equivalent, with the same meter (Allison, 2009). Second, the predictor variables have a significant change in value throughout those several occurrences. Fixed effects estimates may have significantly greater standard errors than random effects estimate in many circumstances. Fixed effects estimates, on the other hand, employ solely within-individual differences, basically ignoring any information regarding individual differences (Allison, 2009). As a result, this model is better suited to the goal of this research because there is limited variance across individuals with some outliers, because the interest is primarily in analysing the impact of variables over time and we are looking for a model that will allow us to generalize the findings.

3.5. Challenges and limitations

The main challenge was getting empty or zero tabular values; because it was hard to determine what happened. This was addressed by the imputation of missing (See chapter 4). Additionally, for instance the aim was obtaining statistics on the percentage of households that spent more than 8% of their income in energy cost, but were only available for one year; therefore, it was decided to use the average regional share of income spent on energy on which more longitudinal data was available.

It is recognized that there might be other alternatives for measuring energy democracy. In this regard, energy democracy legislations or the local ecosystem of the provinces and RES historically promoting the adoption of RET can be considered as a good indicator for energy democracy. However, since our aim here is to assess the extent of energy democracy and not citizen support for energy democracy.

Also, given the broad scope of the research, national and regional level, a primary data collection would be rather cost-inefficient. Therefore, we are limited to just relying on secondary data and a deductive approach for the collected primary data. The researcher is also aware that there might be a selection bias regarding the interviews and that this might undermine the validity of this research and might be hard to generalize to a certain extent the results of this research.

[4] Testing for multicolinearity was performed with STATA

[5] Cross-sectional dependence was tested with STATA using using Breusch-Pagan LM test of independence

3.6. Validity and reliability

A database appropriate for the project's scope and limitations was chosen. A comprehensive literature review was conducted to identify a deep and integrated set of indicators that helped achieving internal validity. Thiel (2014) stated that using different data sets in whole or part to enhance the internal validity. Additionally, the one challenge was to achieve external validity is during the operationalization process because the current indicators were not explicitly created to measure some of the study's variables (Thiel, 2014), however they were supported by the definitions found in the literature review. Furthermore, generalization and causality are two significant concerns in quantitative research (Bryman, 2012). Ultimately, because this study was conducted at the country level, the findings can be generalized and replicated. Likewise, the literature review, inferential model, and expert statements might indicate a causal relationship between institutional factor and energy democracy. Moreover, data collection from trustworthy sources was used, thus the reliability is ensured since the official statistics usually followed strict validity and reliability requirements during the data collection processes.

We also recognize that conducting explanatory research with only secondary data and without addressing causality may be complicated. As a result, interviews were conducted as part of data triangulation strategy to strengthen the model’s robustness and hypotheses' answers, so increased the internal validity of this research. According to Thiel (2014), reliability and validity can be enhanced by applying triangulation, which means the collection of information from two or more data sources is combined but is most recommended for case of studies because of the low internal and external reliability.

The fundamental principles of ethics guided this research and avoided cannibalize the collected data. To achieve this, Thiel (2014) claims that the researcher must be cautious with managing secondary data, not creating arguments *post hoc ergo propter hoc* or causality in correlation (p.119). Furthermore, because it is an open database, the researcher did not compromise anyone's confidentiality. Besides, this data can be used with the same research design to either replicate the research to assess it or for further advanced statistical analysis, strengthening internal and external validity.

Chapter 4. Presentation of data and analysis

This chapter presents the research results based on statistical analysis for the 12 provinces and 30 strategic energy regions in The Netherlands. We will first discuss the processing and composition of the collected data, especially the dependent, independent variables and the control variables. Then, the second part looked into the descriptive and inferential analysis. Finally, this chapter closes with further analysis and the summary of the interview's findings as a basis for answering the research questions in the chapter 5.

4.1. Data collection, processing, and imputation of missing data

Given the desire to provide a recent overview while also increasing the number of analyzed individuals with existing data, 2011 was chosen as a starting point. Moreover, this year corresponds to the date when the financial incentive *SDE+* was updated (Blokhius, 2012), and data such as household income, the share of income spent on energy, and the percentage of renewable energy was available until 2019. However, there was insufficient information in the database regarding community projects, income, and share of income spent on energy, so data imputation was attempted using a single input and case deletion approaches. (Nardo et al., 2008) states that the deletion of the missing data ignores systematic variances among the data and typically increases the sample's standard deviation. While replacing the missing data with a single value e.g., mean, media reduces the sample's standard deviation. Both methods are viable, but they must consider the unique characteristics of the dataset in question and be evaluated to check if they change the measured information. In 2019, the average household income, energy consumption, and share of income spent on energy were mainly absent. Therefore, interpolations were used to fill in the tabular empty spaces in our dataset aiming for a significant statistical analysis and a balanced dataset. The confidence interval to determine the prediction accuracy was set up at 95%, which means that the approximate interval at each prediction was forecasted where 95% of the future points are expected to be included based on a normal distribution. Similarly, our dependent variable for the first part of the conceptual framework, the community projects' data, was only available since 2015. Therefore, The Local Energy Monitor database was used to collect and cross-checked from 2011 to 2014.

The database has also provided geographical information data at the province and strategic energy region levels in The Netherlands from 2011 to 2019. However, the spatial information of the strategic regions could not be acquired because the program is still in its early stages. As a result, there are no geographical information systems of such territorial division, and they could not be evaluated further in detail. Nevertheless, we use a top-down, province-region approach with the data to determine whether the *average household income* (*AHI*), the *share of income spent on energy* (*SISE*), and the *financial incentive (SDE+)* to explain the energy democracy, and what the trend of this relationship is.

4.2. Descriptive statistical analysis and graph analysis

The purpose of this section was to present graphs and charts meant to highlight visual correlations between data and showcase the data in an easy-to-understand way and style. Using descriptive statistics, we looked at the trends of our independent and dependent variables in greater detail.

The dataset consists of information on 12 provinces of The Netherlands and the 30 strategic energy regions regarding socio-economic and energy transition indicators from 2011 to 2019.

In the energy transition dataset, the average household income varies from 42,000 € to the highest 65,000 €. The dataset also contains information per province of population, *number of CREs* projects, *total known renewable energy* (TKRE), *total known renewable energy per citizen (TKREI)*, and *energy price (POE)*. Descriptive statistics are summarized in Table 6. In this table, we can look at descriptive statistics of the panel dataset with our main variables of interest. For instance, the mean and variation of the CREs projects is affected by the number of years without projects or zero values in early 2011. This does not happen with *SDE+* incentives since the incentive was available before 2011 and for other energy projects like biomass, CHP (Combined Heat and Power) engines, or carbon capture technologies more recently (RVO, 2021). The price of energy is constant mainly, and as stated in chapter 3, we used it as control variables as well as the number of households. In Annex 2, we can see the description and code for the variables. Meanwhile, as we can identify from Graphs 2 and 3, is that on average, the adoption of renewable energy has been slow when looking at the mean growth (red line) as stated in the problem statement and that there are individuals (provinces/regions) who perform better in terms that they present more cooperative projects. These individuals could be considered outliers such as Noord-Holland-Zuid, Noord-Holland-Nord, and Friesland, which are slightly above the average number of projects. This insight is consistent with the information stated in The Local Energy Monitor report 2020.

Table 6. Summary of descriptive statistics

Variable		Mean	Std. Dev.	Min	Max	Observations
Total number of cooperatives projects	overall	7	12.79	-	117.00	N = 270
	between		6.46	0.11	31.67	n = 30
	within		11.10	- 23.98	92.02	T = 9
Total energy cooperatives installed power	overall	3,638	9,902.15	-	92,763.00	N = 270
	between		6,296.49	11.67	30,035.67	n = 30
	within		7,719.19	- 26,382.23	66,365.77	T = 9
Total known renewable energy	overall	3,434	3,129.46	183.00	16,218.00	N = 270
	between		2,964.54	250.44	10,770.56	n = 30
	within		1,125.34	- 500.90	8,881.10	T = 9
Share of renewable energy	overall	0	0.04	0.01	0.32	N = 270
	between		0.04	0.02	0.22	n = 30
	within		0.02	- 0.04	0.16	T = 9
Average household income	overall	54,100	5,413.52	39,800.00	67,819.32	N = 270
	between		4,307.70	42,836.15	62,224.37	n = 30
	within		3,361.81	47,757.17	61,980.42	T = 9
Share of income spent on energy	overall	0	0.01	0.02	0.05	N = 270
	between		0.00	0.03	0.04	n = 30
	within		0.00	0.02	0.04	T = 9
Price of energy	overall	0	0.01	0.20	0.23	N = 270
	between		-	0.22	0.22	n = 30
	within		0.01	0.20	0.23	T = 9
Number of households	overall	255,845	236,860.60	19,675.00	1,125,445.00	N = 270
	between		240,341.20	20,220.00	1,091,247.00	n = 30
	within		7,544.44	216,825.10	294,980.10	T = 9
SDE number of projects	overall	435	303.37	28.00	1,575.00	N = 270
	between		273.61	39.44	1,057.89	n = 30
	within		139.26	81.71	986.71	T = 9
SDE capacity	overall	133	209.67	-	1,320.00	N = 270
	between		144.75	4.22	506.78	n = 30
	within		153.73	- 363.86	964.91	T = 9

Source: Author, (2021)

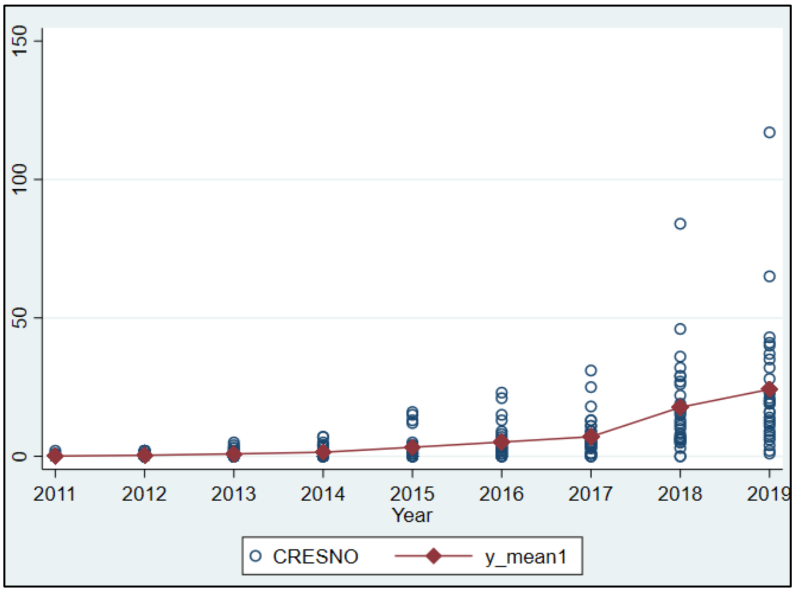
For independent variables, the Pearson correlation test was run to determine which variables were weighted and aggregated to compose the predictor model for the adoption of renewable energy and the role of energy democracy. This method determines the degree to which two variables are adjusted or have a linear relationship. Therefore, this test was essential to determine whether the data can be simplified with a first-degree equation where the slopes would indicate the weights attributed by each indicator. In Table 7, a correlation analysis is presented for ease of viewing. Likewise, this test considers that values greater than 0.5 or less than -0.5 symbolize a strong correlation, between 0.3 and 0.5 or -0.5 and -0.3 a weak correlation, between -0.3 and -0.1 or 0.1 and 0.3 a low correlation, and from -0.1 to 0.1 absence of it (Smith, 2015). Following this analysis, it was found that *AHI* and *SISE* were highly correlated, and therefore both would compete to explain the dependent variable *CREs*. On the other hand, good correlation coefficients were found between the socio-economic variable's income and population with our dependent variable, and as was expected within the financial incentive.

Table 7. Correlation table

	AHÍ	*SISE*	*CRESNO*	*CRESPW*	*TKRE*	*SRE*	*POE*	*NH*	*POP*	*SDEQ*	*SDEP*
AHÍ	100%	-84%	48%	21%	30%	0%	5%	40%	42%	51%	27%
SISE	-84%	100%	-58%	-45%	-37%	-5%	4%	-46%	-46%	-56%	-31%
CREs	48%	-58%	100%	54%	59%	-12%	22%	52%	51%	82%	46%
CRESP	21%	-45%	54%	100%	30%	-27%	12%	28%	27%	35%	30%
TKRE	30%	-37%	59%	30%	100%	3%	11%	79%	80%	83%	82%
SRE	0%	-5%	-12%	-27%	3%	100%	6%	-40%	-40%	-19%	27%
POE	5%	4%	22%	12%	11%	6%	100%	0%	0%	15%	17%
NH	40%	-46%	52%	28%	79%	-40%	0%	100%	100%	81%	44%
POP	42%	-46%	51%	27%	80%	-40%	0%	100%	100%	81%	44%
SDEQ	51%	-56%	82%	35%	83%	-19%	15%	81%	81%	100%	58%
SDEP	27%	-31%	46%	30%	82%	27%	17%	44%	44%	58%	100%

Source: Author (2021)

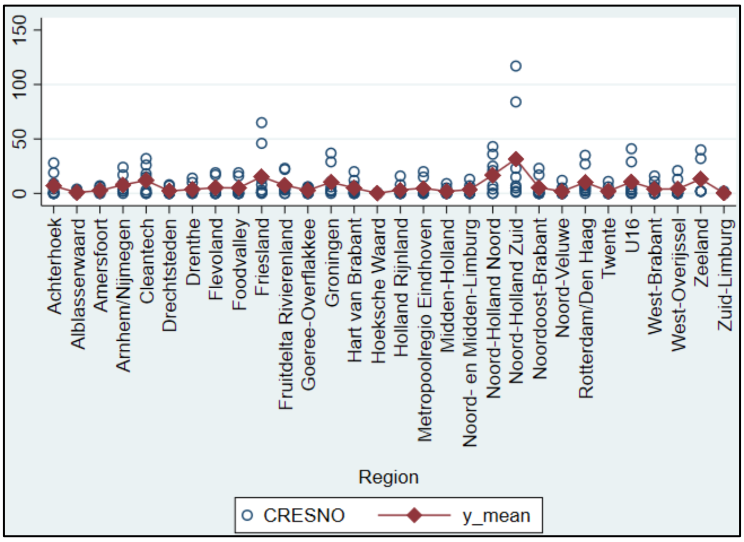
Graph 2. Number of cooperatives projects across time



Source: Author (2021)

In the graph 2 a minor increase is envisaged in 2018, which could be explained in part by the recognition that the CRES gained as part of the transition act in early 2018 (Kocsis & Hof, 2016)

Graph 3. Average number of cooperatives projects across individuals



Source: Author (2021)

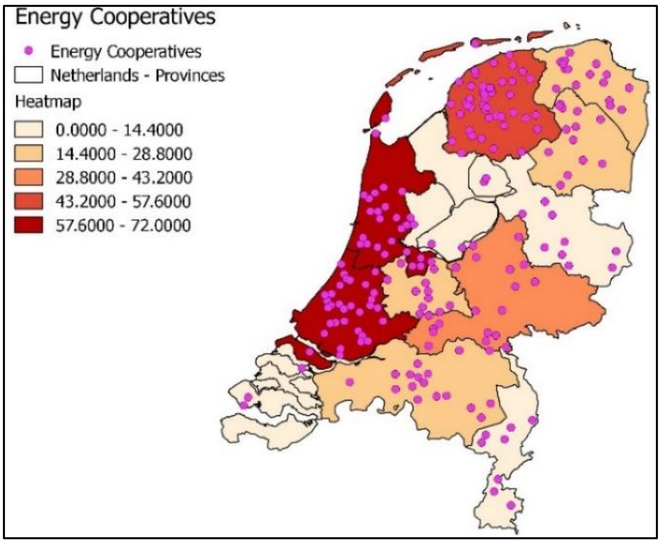
The heat maps in figures 4, 5, and 6 show the spatial distribution of the share of income at the province level in the year 2018. The difference is presented in different colors, with red being the highest and light red/white the lowest. One can note an inversely proportional trend. In other words, a concentration of energy cooperatives in regions with a low proportion of income spent in energy can be observed. Although the Pearson correlation was carried out using the spatial data resulting in -49%, which indicates a moderate negative correlation according to (Smith, 2015) as sown in Table 8.

Table 8. Correlation test: Distribution of share of income spent on energy and energy cooperatives

	SISE	CRESNO	Share of households with SISE =>8%
SISE	1		
CRESNO	-0.4948	1	
Share of households SISE =>8%	0.876	-0.280009	1

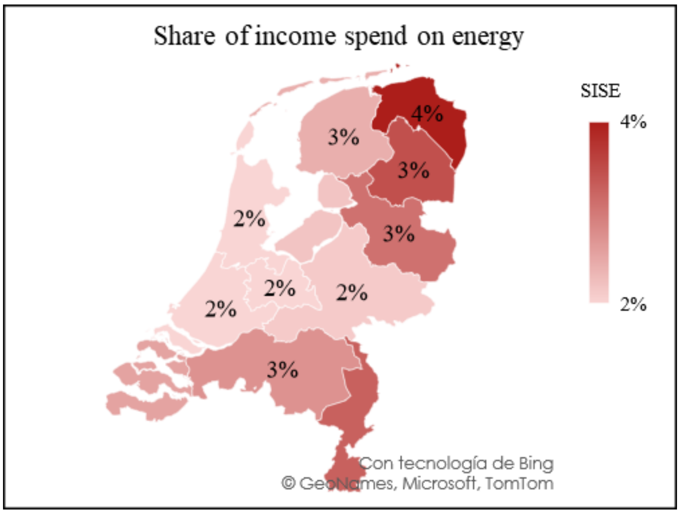
Source: Author (2021)

Figure 5. Heat map CREs



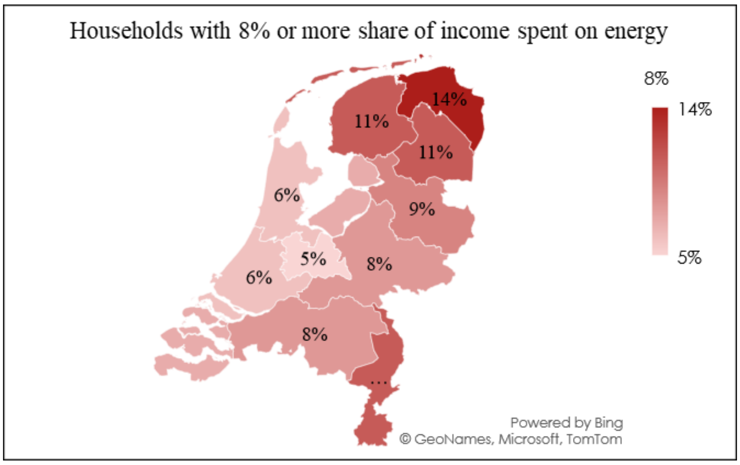
Source: Author (2021)

Figure 6 Heat map SISE



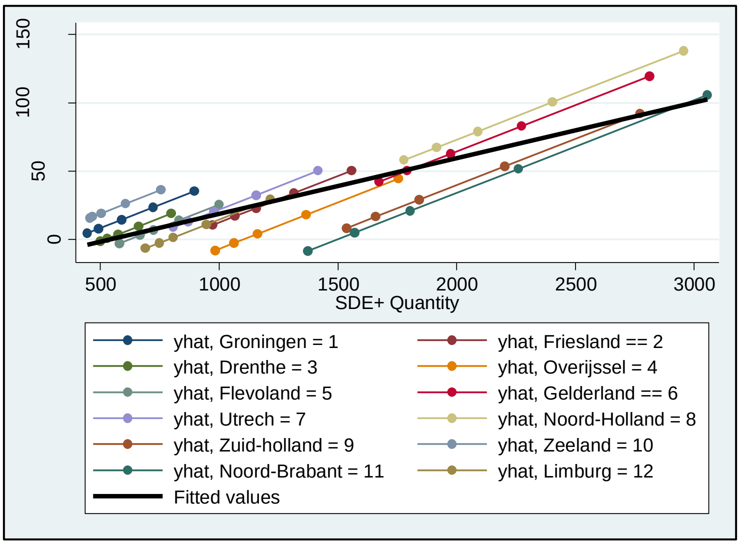
Source: Author (2021)

Figure 7. Heat maps of the share of households with 8% or more SISE.



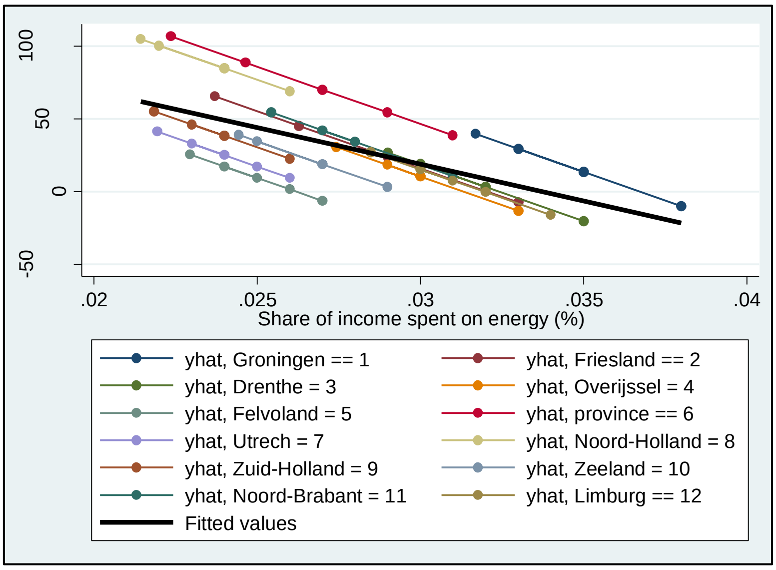
Source: Author (2021)

Graph 4. Number of cooperatives and financial incentive



Source: Author, 2021

Graph 5. Number of cooperative projects and *SISE*



Source: Author (2021)

The first part of the conceptual framework aims to explain the relationship between socioeconomic and institutional factors on energy democracy. Therefore, under this approach we used the number of subsidized projects and the share of income spent on energy as independent variables and the number of community renewable energy projects as dependent variable, as can be noted from graphs 4 and 5, the *financial incentive (SDEQ)* and *SISE* have a positive (see graph 4) and negative (see graph 5) association respectively.

4.3. Inferential analysis and empirical model

After a cursory descriptive examination of the dataset, it was presented an overview of the trends and impacts of our variables of interest. Therefore, this section aims to present the different models employed to test the various hypotheses presented in chapter 2 using the chosen fixed-effects regression model and assessing the relationships of our variables.

The result of the fixed effects models of the adoption of renewable energy is shown in summary tables. The model's outputs cover from 2011 to 2019 when the SDE+ was rearranged (Blokhuis, Advokaat, & Schaefer, 2012) and when most data was available. The tactic taken for the inferential analysis was aligned with the conceptual framework in section 2.4. Hence, three models were tested to understand the influence of socio-economic conditions and financial incentives on cooperative projects. The second test was carried out with the *share of renewable energy (SRE)* and *the number of cooperative projects (CRESNO).*

Table 9. Summary of regressions energy democracy with financial incentives and SISE

	OLS	OLS	FE1	FE2
Dependent variable:	CRESNO	CRESNO	CRESNO	CRESNO
SISE	-1009.6***	-753.0***	-749.7***	-863.9***
	(126.8)	(97.22)	(96.80)	(106.0)
SDEQ		0.0254***	0.0279***	0.0280***
		(0.00178)	(0.00222)	(0.00220)
NH			-0.00000518	-0.00000549*
			(0.00000281)	(0.00000279)
POE				118.9*
				(47.10)
_cons	37.17***	18.37***	18.51***	-3.756
	(3.891)	(3.214)	(3.200)	(9.372)
N	270	270	270	270
R-sq	0.191	0.542	0.548	0.559
adj. R-sq	0.188	0.539	0.543	0.552

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Source: Author (2021)

Several points can be drawn from the regression output of table 9. First, the regressor variables, the *share of income spent on energy (SISE)*, and the *number of incentives (SDEQ)* displayed a 95% and 99% significance. Second, increasing the number of regressors in the analysis has considerably changed the slope while the Pearson correlation coefficient remains positive. Besides, the adjusted r-square and r-square are larger; therefore, it appears that there is an upwards omitted variable bias if the financial incentive *(SDEQ)* variable is not included in the model.

This model, besides, explains that if all other variables were held constant, any percentage change in the share of income spent on energy makes new community energy projects less likely to be developed. As a result, the *financial incentive SDE+* regressor's positively impacts the model; hence, additional community energy projects are more likely to be developed for each supported project by keeping other variables constant. Finally, the adjusted r-square states that this model explains 54% of the variation, and the remainder is explained by random effects and other predictors not comprised in this model.

This is consistent with the established assumption that feed in tariff as financial incentives schemes is meant to encourage the adoption of renewable energy. The model includes the control variables *number of households (NH)* and *energy price (POE)*, which do not compete with our variables of interest.

Table 10. Summary of regressions, dependent variable: share of renewable energy

	OLS	FE1	FE2	FE3	FE4
Dependent variable:	SRE	SRE	SRE	SRE	SRE
CRESPW	0.000000385	0.000000276*	0.000000276*	0.000000258*	0.000000191
	(0.000000248)	(0.000000134)	(0.000000134)	(0.000000129)	(0.000000131)
SISE	-0.336	-2.151***	-2.151***	-2.836***	-2.541***
	(0.442)	(0.261)	(0.261)	(0.296)	(0.321)
SDEPW	0.000104***	0.0000412***	0.0000412***	0.0000357***	0.0000749***
	(0.0000118)	(0.00000752)	(0.00000752)	(0.00000736)	(0.0000189)
POE				0.384***	0.385***
				(0.0874)	(0.0866)
SDEPW2					-3.37e-08*
					(1.49e-08)
_cons	0.0542***	0.118***	0.118***	0.0561***	0.0441*
	(0.0142)	(0.00858)	(0.00858)	(0.0163)	(0.0170)
N	270	270	270	270	270
R-sq	0.284	0.535	0.535	0.570	0.580
adj. R-sq	0.276	0.473	0.473	0.510	0.519

Source: Author (2021)

From the regression output presented in table 10, we can note that the socio-economic condition of households, operationalized through the *SISE*, has a significant impact on the adoption of renewable energy, with a 1% increase in the share of income spent on energy leading to 0.02% decrease in the share of renewable energy and hence the adoption of RET decreases. This is consistent with the research done by Fischer et al. 2020, where they explain that among the factors that affect social behaviour towards the adoption of renewable technology, financial capacity is a factor influencing the adoption. However, it is really through the information channels that a decision is made based on the perception of financial profitability and the complexity of the technology (Rogers, 2003, Fischer et al., 2020).

The results show that the energy democracy, operationalized by the number of cooperative projects, has a slight but significant impact on the adoption of renewable energy, with the increase of 0.01 kW leading to a 0.0003% increase in the share of renewable energy hence the adoption of RET. This is consistent with literature results indicating that personal traits are a factor affecting the behavioural reasoning and will attract a person or household to participate in cooperative projects or directly adopt renewable energy, as explained by Fischer et al. (2020), who states that "financial participation" is further driven by household income, individual financial literacy, trust, patience, and expectations regarding the returns of investments" (Fischer et al., 2020, p.24).

The results show that the incentive SDE+ has a significant impact on the adoption of renewable energy, with an increase of subsidized MW of renewable energy directly leading to a decrease in the share of renewable energy. The results are consistent with the research of Londo et al. (2020) and Abdelmotteleb et al. (2020); they made adoption models of renewable technology under the effect of the policies of net meting and feed-in tariff (SDE+). In both cases, the policies encourage the development of new renewable energy projects, impacting the projects' profitability and making them less financially risky. In contrast, the absence of these institutional instruments might undermine the adoption of renewable energy technology.

The control variable fulfils a twofold role. First, the significant correlation improves the model. Second, by adding this variable in the regression, and because of the resulting correlation between other variables, they are not fighting to explain our dependent variable. The r-square in model 4 indicates that this model explains 57% of the variation. The remaining 43% of the variation is explained by random effects and other factors not considered in this model.

Table 11. Summary of regressions. Dependent variable total known renewable energy

Dependent variable	OLS TKRE	FE TKRE	FE2 TKRE	FE3 TKRE	FE1 TKRE
CRESNO	44.50*** (10.34)	27.17*** (4.339)	27.17*** (4.339)	25.21*** (4.448)	23.14*** (4.489)
SISE	110450.3*** (21769.9)	-30972.5** (10601.7)	-30972.5** (10601.7)	-44480.0*** (12852.1)	-33142.8* (13585.6)
SDEPW	11.48*** (0.591)	4.367*** (0.312)	4.367*** (0.312)	4.322*** (0.311)	6.000*** (0.769)
POE				6673.1 (3626.9)	7059.6 (3595.1)
SDEPW2					-0.00142* (0.000596)
Const	-1724.5* (701.3)	3606.7*** (348.7)	3606.7*** (348.7)	2589.2*** (652.8)	2041.3** (686.1)
N	270	270	270	270	270
R-sq	0.683	0.755	0.755	0.758	0.764
adj. R-sq	0.679	0.722	0.722	0.725	0.730

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Source: Author (2021)

A third regression model was carried out for checking our last assumed relation in our conceptual framework. In this regression, we changed the indicator of adoption of renewable energy using now the *total known renewable energy (SRE)*. From the presented output in table 11, several things can be highlighted. First, our main interest variables are yet significant at 0.01, 0.05, and 0.001, respectively. Another interesting point is that we squared the *SDEPW* and the output show that both *SDEPW* and squared *SDEPW2* are significantly influencing the regression model. Therefore, this indicates that there is an tipping point at which our regressor variable might take negative values. The explanation for this phenomenon might be because the SDE+ incentive has a limited annual budget, so new applications will be left out of this incentive, and it will be less likely that renewable energy will continue to be adopted. According to Dóci & Gotchev (2016), this is a risk condition given that new adopters will not benefit if the budget for the year is already over, ending up with more risk and uncertainty in the investment of renewable energy.

Although is worth to note that indications of cross-sectional dependence while testing the panel data assumptions were found. This might hinder the efficiency and reliability of the predictors; however, this is a concern for larger databases (Baltagi, 2021). Still, for the purpose of comparison, we present the results of Prais-Winsten regression model, and the summarized output is presented in table 12. It is worth noting that both models are consistent for the counted data.

Table 12. Fixed effects model and Prais-white regression summary

Dependent variable:	FE TKRE	Prais TKRE	FE(R) TKRE	Prais(R) TKRE
CRESNO	13.18*	27.22***	13.18	27.22***
	(5.092)	(5.330)	(7.936)	(5.704)
SISE	-42221.1***	-27516.2*	-42221.1**	-27516.2
	(12395.4)	(13130.9)	(14949.7)	(16767.5)
SDEPW	3.904***	2.596***	3.904**	2.596*
	(0.315)	(0.386)	(1.379)	(1.001)
POE	9515.9**	9495.9***	9515.9***	9495.9***
	(3554.9)	(2635.1)	(2505.2)	(2233.0)
NH	0.0327***	0.00933***	0.0327	0.00933***
	(0.00748)	(0.00245)	(0.0178)	(0.00249)
_cons	-6334.4**	-799.5	-6334.4	-799.5
	(2134.1)	(1043.1)	(4683.2)	(859.2)
N	270	270	270	270
R-sq	0.777	0.250	0.777	0.250
adj. R-sq	0.744	0.236	0.772	0.236

Standard errors in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Source: Author (2021)

Furthermore, the coefficients of our variables are in similar values and with equal signs. However, the fixed effects model shows a better fit indicated with a larger r-square lower standard errors.

It should be noted that the coefficients may be inefficient and require a logarithmic adjustment or the usage of more realistic units. On the other hand, it is necessary to state that the possibility of maintaining other variables constant and with zero values is improbable This is why values are not discussed in depth.

4.2. Further analysis and validation with qualitative data

This research strategy aimed to investigate the trajectory of renewable energy adoption, addressing the impact of the socio-economic predictor's *income* and *share of income* and the impact of the financial incentive SDE+ in the context of energy democracy in The Netherlands. It does so by looking into a long-term trajectory and within multiple individuals (provinces and regions), in this case, provinces and regions clusters. In this further analysis, we present the central insights of the interviews with experts that endorsed the presented hypothesis.

4.2.1. Institutional factors and energy democracy

The second component explaining the energy democracy level is the financial incentives, the so-called SDE+, which is reflected as an institutional factor (Londo et al. 2020; Dóci & Gotchev, 2016). or as an information dimension under the taxonomy of predictors of Alipour et al. (2020). We show that it had constantly grown, implying that new projects had relied on this incentive.

Implied H0=0 (i.e., there is no effect of the institutional factor on energy democracy).

Response to H2: On average, the regression outputs indicate that provinces and regions with more incentives regionally are more likely to participate in the energy transition based on community-based projects

We further evaluate this relationship across individuals (provinces and regions) with the fixed effects panel regression. This means that the null hypothesis is rejected in favour of the statement that the *SDE+* financial incentive is positively associated with the adoption of renewable energy; as a result, favouring the energy democracy goal of local power generation in the energy transition. Also, the results show that the categories, in this case, regions and provinces are collectively statistically significant at a 0.05 significance level. Thus, according to the results, the presence of this incentive motivates renewable energy adoption. This is also consistent with the findings of the Local Energy Report 2020, where they claimed that at least 35% had used this financial incentive. Moreover, a scale was designed for addressing this hypothesis and the strength of this relationship is summarized in table 13.

Table 13. Level of influence of the financial incentive.

Level	Influence on the DV	Description
0	No effect	Without the financial incentive the value would be almost the same. (There is no statistical significance)
1	Weak	The application of the financial incentive influences the rate of adoption. (There is statistical significance.
2	Strong	The application of the financial incentive influences the dependent variable and there is a turning point for a negative effect.

Source: Author (2021)

Furthermore, the citizens would need to assume all the financial burden from the absence of financial incentives; from the survey in this report, we can note the following.

> "*This means that if you want to work without a subsidy, you must have your own income"* (The Local Energy Monitor Report, 2020, p.33). Translated from Dutch

From the interviews with experts, we shed light on the importance of financial incentive SDE+. Furthermore, they all stated that, while this incentive has been used in various projects, it is not best suited for a cooperative energy situation because they are not aiming for profit but rather energy transition or environmental concerns. The following quotes i.e., back up this assertion.

> *"The SDE+ is applicable for all types of projects not only for energy cooperatives, and this subsidy seems to be designed for a really profitable project, and sometimes cooperative projects are not…; they are aiming differ rent goals. However, recently there has been a new incentive in The Netherlands, especially for the cooperatives. The SDE+ seems to fit more for a profile of a big investor with an idea of a project on a cheap piece of land with no building in the surroundings. However, also people seem to reject these big projects while energy cooperatives look for smaller projects. They normally are in the urban environment, and normally they demand more effort and engagement, and as a cooperative, it is hard to aspire to those big projects (R1,15:45)"*

> *"SDE+ was good for large scale projects, however, now there are incentives more focused on the energy cooperatives." (R2, 14:45)"*

Furthermore, the responses are consistent with the regression model and previous tests, confirming the inverted u-shape we obtained when we squared the variable *SDE+*, to the extent that as the budget of the incentive is reached, projects will be left out of the program. Thus, most likely, RET adoption will drop as well.

> *"If we submit our application for any subsidies and don't get it, the project wouldn't go further, or most likely, the project will be stopped. This is because most people are not willing to invest and take the risk without government subsidies." (R3, 10:15).*

4.2.2. Socio-economic conditions and energy democracy

A variety of variables influences the adoption of RET. The first selected component is income and financial capacity, which are discussed as socio-economic factors (Alipour et al., 2020; Rogers, 2003; Fischer et al., 2020). Even though the difference in this variable is constantly increasing and decreasing, respectively, the share of income spent on energy influence was substantial, implying that changes in the proportion of income are associated with fewer possibilities on community base participate in energy projects.

Implied H0=0 (i.e., there is no effect of socio-economic conditions on energy democracy)

> *Response to H1: Generally, the regression outputs indicate that provinces and regions with lower income or greater energy-related expenditures are less likely to participate in the energy transition on community-based projects.*

Based on the inferential analysis, there is a relationship between the selected socio-economic factors and the context of energy democracy. This means that the null hypothesis is rejected in favour of the statement that the SISE is negatively correlated with the slow adoption of renewable energy; thus, it hinders the energy democracy goal of local power generation in the energy transition.

Additionally, perhaps, the most insightful finding was that our respondent mentioned by herself the term energy poverty as a constraining factor. Although the selected variable *SISE* in this research was operationalized under the socio-economic condition in the dimension of financial capacity. Nevertheless, besides, this indicator is also used for measuring energy poverty, and beneath EU directives, energy poverty is a condition where the share of income represents 8% or above; in this regard, respondent three said:

> *"We have a diverse community, and I am aware that some people live in an energy poverty situation, so participating in the energy transition is not even crossing their minds." (R3, 13:40).*

Further reflect on these results using Rogers (2003) theory indicates that the persuasion stage is the part of the decision-making process that involves the individual with the innovation more sensitively than the knowledge stage. Subjective evaluations of the innovation by close peers that reduce uncertainty about the outcome are usually more credible to the individual and lead to more positive attitudes towards the product. In this regard, R1 claimed:

> *"In the end also, the late adopters will feel the effect of the energy transition because of the projects are happening basically in their backyard… (R1, 25:00)"*

Innovators and early adopters serve as leaders, whether as initiators (innovators) influencing late adopters who may adopt the innovation due to peer pressure and feel safer when adopting. While for the laggards, besides being the most localized social group, they may be was well sceptical of the innovation but also restrained by socioeconomic condition.

4.2.3 Energy democracy and energy transition

Lastly, a third hypothesis was formulated for energy democracy which is reflected as community-based participation in the energy transition through CREs, and that might be influencing the level of adoption of renewable energy.

Implied H0=0 (i.e., there is no effect of energy democracy on the adoption of renewable energy)

> *Response to H3: On average, the regression outputs indicate that energy democracy is influencing the energy transition in The Netherlands*

This was addressed by rendering on a straightforward relation, testing the correlation between cooperative energy projects and the energy transition itself and further adding more regressors to the model.

This hypothesis is mainly solved with the fixed-effect model, on which the effect of both of this variable is different from zero and statistically significant, meaning that we failed to reject the null hypothesis. Even though, all the respondents agreed on this relationship, they all note the importance of first being able to fulfil basic needs with the available income first and secondly the importance of effective financial incentives.

The results showed a statistically significant relationship as expected logically. However, insight from the interviews also strengthens this statement. First, our respondents were exposed to the definition of energy democracy, and they all agree that overall, there is a moderate impact since, apparently, these initiatives are in an early stage. Besides, they all said that the cooperatives are first making the place at the energy market, influencing the regime to the extent that they are demanding more and better suit financial incentives. Second, this growing movement has demonstrated force since now the cooperatives had a voice and representation in the political agenda of The Netherlands, with specific targets for local renewable energy ownership. Finally, privates and banks are starting to pay attention to the market the cooperatives will represent in the future. For instance, the Commercial Director of Energie Sammen said:

> *"[…] definitely, these initiatives have a great impact to the extent that banks and privates are starting to pay more attention because they recently valued the potential market around energy cooperatives in 25 billion euros in the next ten years; therefore, they are generating disruption in the way that the market is evolving […]" (R2, 22:00).*

Similarly, the Local Energy Monitor expert raised the statement that energy democracy is generating more engagement, even for the late adopters. This is in line with the indicators of energy democracy goals, as they aim to produce energy locally and restructure the existing market

> *"When we look at the number, maybe the energy cooperatives do not have a significant share. However, half a million households in The Netherlands have solar panels, for example, which adds to energy transition even though there are not participating in energy cooperatives. They are making their own house sustainable. I think a big part of what the energy cooperatives do is showing people that these*

projects can also be realized in a better way than a lot of utility companies do […]" (R1, 15:30)

"We have much contact with energy companies and think that in the last five years they have changed the dynamic and they are adapting and learning the way energy cooperatives work so they are starting even to work together […]" (R1, 15:30)

"Also, the cooperatives have impacted the politics because in the Climate Agreement it was stated the role of energy cooperatives and it was targeted 50% level of ownership, and they did this by themselves and is helping the energy transition of Netherlands." (R1,24:18)

I do not think the energy cooperatives would take the throne of energy companies in The Netherlands because the government is private-oriented mainly" (R1,15:30)

An intriguing finding from our respondents is that they all noted the new incentive SCE as instrument better suit for CREs, which replaced the old "postcoderoos" and was renovated in April 2021. However, the website by now mentions that the number of applications is so massive that they have already exceeded the annual budget, highlighting once again that without incentives, the adoption rate and development of new projects will struggle.

Chapter 5. Conclusions and Discussion

This study has researched a contemporary topic concerning niche initiatives reflected as CREs with local energy democracy concept and the role of early adopters on renewable energy adoption and whose motivations follow a pattern of engagement in the energy transition. The research goal was to explain how the selected institutional and socio-economic factors are associated with the role of energy democracy and determine the relation of energy democracy's role with community participation in the energy transition in The Netherlands. Within this objective, the main research question was as follows - *To what extent do financial incentives and socio-economic conditions impact the energy democracy in The Netherlands' energy transition?* The answer to this question is trifold.

First, the selected institutional factors have impacted the development of CREs to a moderate-strong extent, stimulating local energy democracy. Second, socio-economic conditions were found to have a significant influence on participation in energy democracy. In other words, when the region's income increases, it would often follow that their involvement in energy democracy also increases. Third, energy democracy as a niche initiative has had a moderate influence within the energy transition due, they are in an early phase. Three hypotheses were further identified that helped answer the research sub-questions that will be re-stated and further discussed and reflected in the following sections.

5.1. Institutional factors and energy democracy

How do financial incentives influence energy democracy?

Theorizing with the constructed framework in section 2.1 with the MLP, we rendered a broad perspective of the Dutch ecosystem and the current energy regime, focusing on the opportunity created by institutional factors, precisely the financial incentive SDE+ that cooperatives have been making the most out it.

The results portray that regions with higher regional incentives are more likely to participate in the energy transition on a local level. However, as presented in the results, the trend and overall effect has been unhurried. This result is comparable with Kocsis and Bert's (2016) findings covering the years from 2011 to 2014, who concluded that production subsidies were partially effective but that the Dutch government was seeking enhanced efficacy by reviewing the design of production subsidies as it happens in the last year with the creation of new incentive focused (SCE) from CREs. In addition, the financial incentive can be a driver when present but a barrier when absent.

From Rogers (2003) perspective this might be, and improvement of the innovation attributes discussed in the literature review, they might use SDE subsidies to increase the rentability’s project (Blohuis et al., 2012). Thus, increasing the rate of adoption. However, in practice it has demonstrated ineffectiveness compared to other European countries (Blohuis et al., 2012; Dóci & Gotchev, 2016).

Even though motives for participating can be heterogeneous as discussed by Bauwens (2014) referring to institutional factors, he also mentioned it will depend on how exactly the adopter weight of the market conditions and rentability withing the CREs initiatives. Rogers (2003) further support that it will be context-dependent, explicitly of the communications channels and the information they receive and understand from the business case.

5.2. Socio-economic conditions and energy democracy

How do socio-economic factors affect energy democracy?

Generally, provinces and regions with lower income or greater energy-related expenditures are less likely to community base participate in the energy transition. The socio-economic conditions and personalities of adopters influence the likelihood that an RET will be adopted. Rogers (2003) claims that there are various classifications of innovators, early adopters, early majority, and laggards. The less educated and less wealthy are generally the last to adopt an innovation. When reflecting on these statements, it was found the existence of households experiencing energy poverty spend over 8% percent of their income on energy bills. In contrast, as the results of the collected dataset suggest, the average household is only between 2% and 4%. Besides, whatever is above even 4% will drive the energy democracy and adoption rate to be negative. The results suggest that for non-adopters, the socio-economic condition of households will influence the decision-making process in joining energy cooperatives and hence the adoption of renewable technology. Thus, even if the quota is minimal or includes voluntary work, the energy transition will not be part of their priorities. This is also supported and comparable with the research done by Fischer et al., 2020. He found that income is positively related to the probability of stating a high willingness to participate in energy cooperatives. While he also claimed that membership seems to be particularly attractive to male, middle-aged, and well-educated people with comfortable incomes.

The theoretical contribution in this area was the introduction of the indicator of the share of income spent on energy, thereby complementing Rogers (2006) and bringing the theoretical evaluation approach into practice by investigating adoption of RET. One critique of this outcome might be the relationship's direction. Even though the hypothesis was solved in favour of the influence of the aforementioned socio-economic conditions, the influence may be the other way around, as addressed in Madrid-Vargas, Bruce & Watt (2018). They argued that the creation of energy cooperatives has the potential to alleviate energy poverty. As a result, this is a component that has not been totally explained.

5.3. Energy democracy and energy transition

How does energy democracy, stimulated the adoption of renewable energy?

Third, the role of energy democracy was demonstrated with the fixed effects model, the interviews. On average, the regression outputs indicate that energy democracy is influencing the energy transition in the Netherlands. We can further conclude that innovators are the risktakers and bring the innovation in from outside of the system as claimed by Rogers (2020).

Moreover, MLP theory posits that when a niche innovation at the niche level becomes promising enough to be able to compete with the incumbent regime might result in a transition in the socio-technical regime. Besides, these initiatives are creating new transition futures Burke (2018). Moreover, the panel study analysis results are direct as more community projects understandably contribute to the energy transition.

This research has shown that these initiatives impact the energy transition to the point that a new market is emerging around them, which has finally piqued the interest of banking and private organizations. This are comparable results with pieces of research done that postulate energy cooperatives as way to facilitate the diffusion of RET and low-carbon technology (Bauwens, 2014). Following so the Noordoostpolder case where the community participation had influence energy choice and means or energy production in The Netherlands creating new transition futures. And finally, with Rogers' (2003) framework in the sense that energy cooperative initiators are playing a central role in the innovation-decision process. Consequently, diffusing innovative ideas forward altering the existing market, and positioning itself in the political narrative as supported by Rogers (2003) and Akerbom & van Tulder (2019).

5.4. Reflection on research method

The uniqueness of our research was due to our methodological contribution, which employed energy transition panel data to explore the ex-post impact of major predictive variables on energy democracy. This illustrates that future policy evaluations will be significantly reliant on available data to track the performance of a stimulus strategy. Similarly, it will aid an ex-ante study in predicting the impact of these institutional factors.

We also want to point out the weaknesses of this research. One of the shortcomings of the fixed effects is predictor bias; however, this was addressed by comparing with other regression models. All presented models showed that the unexplained factor adds to the different rates of effect on local energy democracy as well as renewable energy adoption. This means that more unexplained factors are associated with the adoption of renewable energy locally in the Netherlands; therefore, these results are not a complete representation of all possible factors influencing the energy transition. Another study's limitations are related to primary data collection. As a result, it is essential to emphasize that the process used to pick our respondents may be biased, resulting in a weak representation of the population; however, it is advantageous in cases when randomization is impractical, such as when the population is substantial. Therefore, the direction influence of the socio-economic conditions in The Netherlands' energy democracy and energy transition is not yet fully explained unless we can sample specifically the share of households with a 4% or higher share of income spent on energy and ask them about their motivations and perspectives on energy cooperative initiatives.

5.5. Suggestions for further research and policy implications

The Dutch situation is definitively an interesting case to investigate in terms of transitions not only because of an economic lock-in with fossil fuels (Oxenar & Bosman, 2020) but for the community participation and evidence of the role of energy democracy in bringing back renewable energy has been set up in this research. However, there is much to address regarding renewable energy adoption, financing the transition, and the economic gap. Perhaps an outstanding finding in this regard was that this research directly addresses the income and the financial capacity expressed by the share of income spent on energy also associated with energy justice and energy poverty.

Consequently, the recommendations for future research will align with the scope, limitations, and results of this research. First, it would be interesting to try a comparative case of study within the strategic energy regions by using a survey to directly address economic inequality and the influence of community participation in the energy transition. Second, creating a more comprehensive dataset and adding more predictors behind the community participation in the energy transition will improve the predictors' unbiased, consistency, and efficiency in forecasting the adoption of renewable energy as suggested by Alipour et al (2020) who found more than 30 different types of predictors.

Lastly, the RES strategy is taking place in the year 2021 (RES, 2021). The portals are constantly improving and updating; hence, it would be worth generating a model before and after implementing these localizations strategies and whether the rate is positive of adoption of renewable energy is accelerating.

The adverse implications of fossil fuels have been widely discussed and identified as a global policy issue and this research began by trying to bring to light evidence of a gap in the socio-economic conditions and the Dutch policy and institutional environment in the form of incentives. These incentives represent a governmental cost. Nevertheless, evidence has been presented that the pace of adoption would be slower in the absence of these institutional instruments. While for households to participate in the transition is still dependent on their socio-economic condition. With the help of the already developed monitoring tools, it is possible to evaluate institutional instruments within the existing regime in terms of transition to the extent that they do not become ratter a bottleneck. Therefore, this policy should be further evaluated and constantly renewed.

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Annex 1. Interview Guide

Hi, I'm Byron Montero Alvarez, a Master's Degree in Urban Management and Development student. I am a Mexican and resident in Rotterdam, Netherlands. I would need 30 minutes of your time to conduct this interview.

This research is being conducted as part of the MSc Program in Urban Management and Development of IHS requirements. The primary objective of this study is to assess " To what extent do financial incentives and socioeconomic conditions foster energy democracy to enable The Netherlands' energy transition?"

Information from interviews with key experts and representatives of the locally generated renewable energy sector is vital to this research, and the data collected will be solely for academic purposes. Therefore, confidentiality will be maintained, and transcripts of interviews or interview notes, if respondents do not wish for the interview to be recorded, will be accessible only to the student researcher, Byron Montero, and his thesis supervisor, Hans Schaffers.

Question	**Hypothesis and indicators covered**
How important is the number and size of local cooperative energy projects for achieving the energy transition goals? (Low – high)?	Number of projects / H3
Are there other factors or circumstances that contribute to, or hinder, achieving the (regional, national) energy transition goals?	Financial incentive, SISE /H1, H2
What has been the impact of local cooperative energy projects in achieving the energy transition, and what are the success or failure reasons?	Number projects /H3
What is the impact of household income on participating in local cooperative energy projects (low – high)	Income, SISE / H2
To what extent is household income explaining the success or failure of energy transition / adoption of renewable energy? = H2	Income/ SISE/ H2
What is the impact of financial incentive schemes such as SDE+ on participation in local cooperative energy projects (low – high)?	Financial incentives/H2
Are there other factors or circumstances that contribute to, or hinder, achieving the (regional, national) energy transition goals?	Financial incentives /H2
To what extent are financial incentive schemes explaining the success or failure of the energy transition / adoption of renewable energy? = H3	Number of projects /H2
Energy democracy definition: "The energy democracy is associated with an increase in the role of individual prosumers, energy cooperatives, or municipal control of specific functions that were previously fulfilled by energy companies" (p. 24) To what extent do you feel that the energy cooperatives have positively or negatively influenced the energy democracy goals in the sense that they bring back control to local communities creating a space in the national agenda and disrupting the energy market?	Wrap up question/ Energy democracy / H3

Annex 2. Descriptive and inferential statistic outputs

Variables codebook

Code	**Description**	**Type**
RES	From 1 to 30. 1= Groningen…	Categorical
Year	2015 to 2019	Continuous
CRESNO	Number of community renewable energy projects	Continuous
CRESPW	Installed capacity of community renewable energy projects in kW	Continuous
AHI	Average household income in €/year	Continuous
SISE	Share of income spend on energy	Continuous
SDEQ	Number of projects with the subsidy in province = i	Continuous
TKRE	Total know renewable energy in TJ in province= i	Continuous
SRE	Share of renewable energy consumed per region in (%)	Continuous
NH8%	Number of households with a share of income spend on energy is 8% or higher.	Continuous
POE	Price of energy	Continuous

Detailed output of the regression model with *community renewable energy systems* (energy democracy) as independent variable with robust standard errors.

```
Fixed-effects (within) regression               Number of obs     =        270
Group variable: RES                             Number of groups  =         30

R-sq:                                           Obs per group:
     within  = 0.4676                                         min =          9
     between = 0.0978                                         avg =        9.0
     overall = 0.3388                                         max =          9

                                                F(3,29)           =      16.75
corr(u_i, Xb)  = -0.2389                        Prob > F          =     0.0000

                                 (Std. Err. adjusted for 30 clusters in RES)
------------------------------------------------------------------------------
             |               Robust
      CRESNO |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        SISE |   -1234.94   209.6892    -5.89   0.000    -1663.802    -806.077
       SDEPW |   .0247504   .0075195     3.29   0.003     .0093714    .0401295
         POE |   195.9102   35.36935     5.54   0.000     123.5718    268.2487
       _cons |  -1.725368   5.086785    -0.34   0.737    -12.12901    8.678275
-------------+----------------------------------------------------------------
     sigma_u |  6.8278808
     sigma_e |  8.6259234
         rho |  .38520449   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Detailed output of the regression model with *Total known renewable energy* (energy transition) as independent variable.

```
Fixed-effects (within) regression               Number of obs      =       270
Group variable: RES                             Number of groups   =        30

R-sq:                                           Obs per group:
     within  = 0.7583                                         min =          9
     between = 0.8585                                         avg =        9.0
     overall = 0.5648                                         max =          9

                                                F(4,29)            =    181.30
corr(u_i, Xb)  = 0.5028                         Prob > F           =    0.0000

                                   (Std. Err. adjusted for 30 clusters in RES)
------------------------------------------------------------------------------
             |               Robust
        TKRE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      CRESNO |   25.20628   6.877482     3.67   0.001     11.14024    39.27231
        SISE |  -44479.96   15422.83    -2.88   0.007    -76023.18   -12936.74
       SDEPW |   4.321699   1.447072     2.99   0.006     1.362106    7.281293
         POE |   6673.054   3014.644     2.21   0.035      507.414    12838.69
       _cons |   2589.234   549.9571     4.71   0.000     1464.445    3714.022
-------------+----------------------------------------------------------------
     sigma_u |  2335.9341
     sigma_e |  590.64275
         rho |  .93990835   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Detailed output of the Prais-Winsten regression model with *Total known renewable energy* (energy transition) as independent variable.

```
Prais-Winsten AR(1) regression -- iterated estimates

      Source |       SS           df       MS      Number of obs   =       270
-------------+----------------------------------   F(5, 264)       =     17.61
       Model |  18994565.6         5  3798913.11   Prob > F        =    0.0000
    Residual |  56960157.2       264  215758.171   R-squared       =    0.2501
-------------+----------------------------------   Adj R-squared   =    0.2359
       Total |  75954722.8       269  282359.564   Root MSE        =     464.5

------------------------------------------------------------------------------
        TKRE |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      CRESNO |   27.21662   5.330298     5.11   0.000     16.72132    37.71193
        SISE |  -27516.22   13130.94    -2.10   0.037    -53370.92   -1661.525
       SDEPW |   2.596449   .3859324     6.73   0.000     1.836552    3.356346
         POE |   9495.887   2635.094     3.60   0.000     4307.412    14684.36
          NH |   .0093252   .0024467     3.81   0.000     .0045077    .0141426
       _cons |  -799.5137   1043.108    -0.77   0.444    -2853.383    1254.356
-------------+----------------------------------------------------------------
         rho |   .9897877
------------------------------------------------------------------------------
Durbin-Watson statistic (original)    0.310847
Durbin-Watson statistic (transformed) 1.912048
```

Annex 3. Created data matrix

RES	res_code	Year	AHI €	SISE	SDEQ	SDEPW (MW)	CRESNO	CRESPW (KW	TKRE (TJ)	SRE	TKREI (MJ/l)	POE (Eur/kW	NH
Achterhoek	1	2011	48100	0.042	321	2	0	0	811	0.025	446	0.218	123695
Alblasserwaard	2	2011	53600	0.031	28	0	0	0	185	0.022	15	0.218	31290
Amersfoort	3	2011	56100	0.03	115	8	0	0	598	0.026	125	0.218	121530
Arnhem/Nijmegen	4	2011	46300	0.035	554	1	0	0	3253	0.04794422	1014	0.218	329570
Cleantech	5	2011	51300	0.035	182	3	0	0	1063	0.029	291	0.218	141315
Drechtsteden	6	2011	49700	0.031	49	32	0	0	932	0.04	1586	0.218	123165
Drenthe	7	2011	47100	0.041	351	52	0	0	2209	0.043	1716	0.218	210290
Flevoland	8	2011	50800	0.033	370	18	0	0	4335	0.117	9190	0.218	159505
Foodvalley	9	2011	49900	0.0325	154	1	0	0	799	0.027	177	0.218	137440
Friesland	10	2011	43600	0.037	759	36	0	0	3863	0.06	2237	0.218	282480
Fruitdelta Rivierenland	11	2011	54200	0.035	100	0	0	0	953	0.023	1127	0.218	92530
Goeree-Overflakkee	12	2011	53300	0.033	219	10	1	290	412	0.086	6037	0.218	19675
Groningen	13	2011	39800	0.044	301	13	0	0	4994	0.058	5544	0.218	279960
Hart van Brabant	14	2011	44900	0.038	197	11	0	0	1062	0.026	257	0.218	196010
Hoeksche Waard	15	2011	57200	0.031	33	0	0	0	229	0.029	515	0.218	35110
Holland Rijnland	16	2011	53700	0.03	230	1	0	0	929	0.02417722	205	0.218	237205
Metropoolregio Eindhover	17	2011	49500	0.034	305	7	0	0	1849	0.024	39	0.218	325765
Midden-Holland	18	2011	55200	0.03	75	3	0	0	544	0.022	375	0.218	92305
Noord- en Midden-Limbur	19	2011	48300	0.039	287	9	0	0	1421	0.02	329	0.218	219965
Noord-Holland Noord	20	2011	50900	0.034	574	31	1	310	3844	0.063	3864	0.218	282905
Noord-Holland Zuid	21	2011	49400	0.029	670	29	2	265	6573	0.03483101	1372	0.218	986395
Noordoost-Brabant	22	2011	51900	0.034	277	4	0	0	1546	0.026	235	0.218	247620
Noord-Veluwe	23	2011	52000	0.035	91	0	0	0	503	0.027	165	0.218	70205
Rotterdam/Den Haag	24	2011	46900	0.029	508	10	0	0	6836	0.021	1174	0.218	1058565
Twente	25	2011	45400	0.037	263	60	0	0	3030	0.049	1691	0.218	266670
U16	26	2011	52900	0.032	515	5	0	0	1924	0.023	119	0.218	405505
West-Brabant	27	2011	50800	0.034	256	93	0	0	9045	0.08	2749	0.218	297360
West-Overijssel	28	2011	47700	0.037	419	3	0	0	1312	0.024	155	0.218	213440
Zeeland	29	2011	47400	0.034	334	33	9	7430	2599	0.016	4401	0.218	168610
Zuid-Limburg	30	2011	43500	0.038	215	1	0	0	1212	0.00850387	133	0.218	287720
Achterhoek	1	2012	48800	0.04	381	2	0	0	1055	0.033	482	0.224	124650
Alblasserwaard	2	2012	54400	0.032	29	0	0	0	183	0.022	29	0.224	31570
Amersfoort	3	2012	57100	0.031	130	8	0	0	607	0.027	133	0.224	122840
Arnhem/Nijmegen	4	2012	46900	0.037	581	23	2	163	4401	0.06597445	1741	0.224	332575
Cleantech	5	2012	51900	0.036	199	6	0	0	1221	0.033	300	0.224	142210
Drechtsteden	6	2012	50800	0.031	56	32	0	0	993	0.042	1888	0.224	123775
Drenthe	7	2012	47900	0.042	431	56	0	0	2475	0.047	1766	0.224	211240
Flevoland	8	2012	51500	0.033	428	201	0	0	5207	0.137	9347	0.224	162020
Foodvalley	9	2012	50300	0.0345	181	1	0	0	938	0.031	177	0.224	139420
Friesland	10	2012	44500	0.041	875	51	1	2	5130	0.079	2507	0.224	283605
Fruitdelta Rivierenland	11	2012	55000	0.036	117	1	0	0	1225	0.03	2237	0.224	93565
Goeree-Overflakkee	12	2012	53800	0.034	291	11	1	290	499	0.107	7290	0.224	19915
Groningen	13	2012	40400	0.046	388	46	2	4600	5804	0.067	5700	0.224	283235
Hart van Brabant	14	2012	48400	0.038	222	13	0	0	1050	0.026	389	0.224	197585
Hoeksche Waard	15	2012	58300	0.031	40	0	0	0	232	0.03	509	0.224	35200
Holland Rijnland	16	2012	54200	0.031	263	1	0	0	953	0.02522643	203	0.224	240120
Metropoolregio Eindhover	17	2012	50500	0.037	360	12	0	0	2281	0.029	234	0.224	329295
Midden-Holland	18	2012	56000	0.03	93	4	0	0	607	0.025	368	0.224	92895
Noord- en Midden-Limbur	19	2012	49100	0.04	346	56	0	0	1863	0.026	548	0.224	221880
Noord-Holland Noord	20	2012	51600	0.034	720	60	1	310	4001	0.063	4060	0.224	285255
Noord-Holland Zuid	21	2012	50400	0.031	817	34	3	288	6743	0.03634359	1465	0.224	995735
Noordoost-Brabant	22	2012	52900	0.037	317	23	0	0	1980	0.033	406	0.224	249560
Noord-Veluwe	23	2012	52700	0.036	103	1	0	0	612	0.033	298	0.224	71060
Rotterdam/Den Haag	24	2012	47500	0.032	591	41	2	250	7842	0.025	1556	0.224	1071545
Twente	25	2012	46300	0.041	333	64	0	0	4478	0.071	2010	0.224	268260
U16	26	2012	53800	0.032	569	6	0	0	1905	0.024	177	0.224	408580
West-Brabant	27	2012	51600	0.037	284	105	0	0	8944	0.08	3141	0.224	300125
West-Overijssel	28	2012	48600	0.041	536	36	0	0	2459	0.045	340	0.224	214810
Zeeland	29	2012	48200	0.035	392	69	9	7430	2845	0.019	4817	0.224	169730
Zuid-Limburg	30	2012	44100	0.041	258	1	0	0	1412	0.010622	235	0.224	290545
Achterhoek	1	2013	49000	0.039	392	6	0	0	1024	0.031	561	0.228	125525
Alblasserwaard	2	2013	55000	0.031	31	9	0	0	209	0.026	386	0.228	31760
Amersfoort	3	2013	57500	0.03	132	17	1	16	587	0.026	176	0.228	123705
Arnhem/Nijmegen	4	2013	47000	0.038	595	78	2	163	4660	0.06915957	1782	0.228	335740
Cleantech	5	2013	52000	0.036	203	7	1	52	1214	0.034	330	0.228	143470
Drechtsteden	6	2013	51100	0.031	57	32	0	0	992	0.043	1630	0.228	124135

Drenthe	7	2013	48200	0.041	451	65	0	0	2480	0.046	1805	0.228	211885
Flevoland	8	2013	51400	0.032	458	216	0	0	5943	0.162	11716	0.228	163765
Foodvalley	9	2013	50500	0.0355	187	1	0	0	911	0.03	220	0.228	141180
Friesland	10	2013	44500	0.042	899	58	1	2	4846	0.075	2538	0.228	285030
Fruitdelta Rivierenland	11	2013	55200	0.036	121	1	3	6000	1215	0.029	2179	0.228	94460
Goeree-Overflakkee	12	2013	54200	0.034	295	12	1	290	488	0.104	7172	0.228	20130
Groningen	13	2013	40000	0.045	402	48	2	4600	6000	0.066	5599	0.228	285895
Hart van Brabant	14	2013	48400	0.037	226	13	0	0	1022	0.025	397	0.228	199655
Hoeksche Waard	15	2013	58800	0.031	41	0	0	0	239	0.031	543	0.228	35295
Holland Rijnland	16	2013	54100	0.031	273	4	0	0	954	0.02500076	235	0.228	243195
Metropoolregio Eindhover	17	2013	50900	0.038	381	25	0	0	2272	0.029	270	0.228	331855
Midden-Holland	18	2013	56300	0.03	96	4	0	0	596	0.024	390	0.228	93325
Noord- en Midden-Limbur	19	2013	49400	0.04	360	80	0	0	2356	0.033	658	0.228	223900
Noord-Holland Noord	20	2013	51700	0.034	734	63	5	2889	4866	0.078	5090	0.228	286460
Noord-Holland Zuid	21	2013	50800	0.032	878	42	6	2900	6865	0.0366317	1451	0.228	1003855
Noordoost-Brabant	22	2013	53300	0.038	332	31	0	0	1905	0.032	446	0.228	251890
Noord-Veluwe	23	2013	52800	0.036	103	1	0	0	611	0.033	323	0.228	71815
Rotterdam/Den Haag	24	2013	47700	0.033	618	360	3	272	7762	0.024	1366	0.228	1076800
Twente	25	2013	46600	0.042	343	71	0	0	4427	0.064	1723	0.228	269740
U16	26	2013	54000	0.032	583	13	1	24	1973	0.025	318	0.228	412630
West-Brabant	27	2013	51800	0.038	299	144	0	0	9213	0.082	3463	0.228	302795
West-Overijssel	28	2013	48800	0.042	545	37	0	0	2289	0.047	571	0.228	216230
Zeeland	29	2013	48600	0.034	414	173	9	7430	3363	0.023	6174	0.228	170570
Zuid-Limburg	30	2013	44000	0.043	266	3	0	0	2550	0.01858884	260	0.228	292255
Achterhoek	1	2014	50100	0.037	398	7	0	0	1323	0.042	724	0.229	125305
Alblasserwaard	2	2014	56300	0.029	31	9	0	0	249	0.032	721	0.229	31805
Amersfoort	3	2014	58900	0.028	135	18	1	16	675	0.031	246	0.229	124315
Arnhem/Nijmegen	4	2014	48100	0.031	604	167	4	228	4703	0.065	1541	0.229	337040
Cleantech	5	2014	53100	0.033	207	7	3	149	1522	0.045	447	0.229	144180
Drechtsteden	6	2014	52500	0.029	59	32	0	0	1107	0.04781908	1246	0.229	124075
Drenthe	7	2014	49500	0.038	472	184	0	0	3448	0.067	2596	0.229	211450
Flevoland	8	2014	53300	0.03	486	287	0	0	6393	0.184	12972	0.229	163485
Foodvalley	9	2014	51600	0.029	196	2	0	0	1120	0.04	291	0.229	142260
Friesland	10	2014	45500	0.033	923	111	1	2	5947	0.096	3156	0.229	285300
Fruitdelta Rivierenland	11	2014	56100	0.034	127	24	4	6027	2308	0.058	1967	0.229	94850
Goeree-Overflakkee	12	2014	56500	0.031	297	12	1	290	520	0.115	7429	0.229	19910
Groningen	13	2014	41400	0.042	417	54	2	4600	8284	0.097	8688	0.229	286625
Hart van Brabant	14	2014	49500	0.035	232	143	1	9	1323	0.0328548	494	0.229	201060
Hoeksche Waard	15	2014	60400	0.029	44	0	0	0	266	0.036	635	0.229	35360
Holland Rijnland	16	2014	55800	0.029	283	11	0	0	1042	0.026	287	0.229	243960
Metropoolregio Eindhover	17	2014	52100	0.031	401	62	1	57	2611	0.035	277	0.229	334390
Midden-Holland	18	2014	56900	0.028	101	4	0	0	675	0.029	446	0.229	94075
Noord- en Midden-Limbur	19	2014	50700	0.037	372	84	0	0	2453	0.033	680	0.229	223805
Noord-Holland Noord	20	2014	52800	0.032	749	86	8	3749	4985	0.084	4941	0.229	287240
Noord-Holland Zuid	21	2014	52400	0.027	904	90	10	2966	7680	0.04419424	1308	0.229	1010975
Noordoost-Brabant	22	2014	54500	0.031	337	39	1	140	2045	0.036	463	0.229	252630
Noord-Veluwe	23	2014	54200	0.034	105	1	0	0	735	0.043	353	0.229	71550
Rotterdam/Den Haag	24	2014	49500	0.027	643	425	5	342	9256	0.03	1299	0.229	1076865
Twente	25	2014	47800	0.033	355	72	0	0	4284	0.079	2110	0.229	268620
U16	26	2014	55600	0.029	587	13	4	78	2154	0.028	386	0.229	415390
West-Brabant	27	2014	53100	0.031	315	166	0	0	9035	0.086	3624	0.229	304105
West-Overijssel	28	2014	50200	0.033	558	44	0	0	2033	0.04339923	699	0.229	215655
Zeeland	29	2014	50000	0.032	433	188	9	7430	4318	0.034	7566	0.229	170760
Zuid-Limburg	30	2014	45400	0.037	273	12	0	0	2322	0.0190923	256	0.229	292755
Achterhoek	1	2015	51400	0.034	415	31	1	47	2093	0.078	864	0.224	126105
Alblasserwaard	2	2015	58100	0.027	32	10	0	0	245	0.03	826	0.224	31910
Amersfoort	3	2015	61200	0.026	150	20	2	133	634	0.029	308	0.224	125520
Arnhem/Nijmegen	4	2015	49900	0.031	614	168	4	138	4305	0.068	1569	0.224	340615
Cleantech	5	2015	54700	0.031	215	11	12	2060	1338	0.04	557	0.224	145260
Drechtsteden	6	2015	54100	0.027	65	33	0	0	1407	0.059	1478	0.224	124870
Drenthe	7	2015	51000	0.035	500	193	1	166	3803	0.076	2978	0.224	212345
Flevoland	8	2015	55100	0.027	580	569	2	1880	7793	0.221	16555	0.224	165195
Foodvalley	9	2015	53600	0.028	214	11	2	379	1055	0.038	446	0.224	144335
Friesland	10	2015	47100	0.032	972	133	3	1187	6470	0.103	3319	0.224	286430
Fruitdelta Rivierenland	11	2015	58100	0.031	149	32	4	6024	1951	0.054	1635	0.224	95675
Goeree-Overflakkee	12	2015	58100	0.028	304	36	4	16382	565	0.124	8510	0.224	20075
Groningen	13	2015	42800	0.038	445	133	3	4607	9044	0.105	9451	0.224	289550

Hart van Brabant	14	2015	51200	0.032	247	153	2	14	1282	0.034	527	0.224	203010
Hoeksche Waard	15	2015	61900	0.026	44	0	0	0	268	0.036	716	0.224	35545
Holland Rijnland	16	2015	58400	0.026	293	12	1	72	1007	0.028	335	0.224	246770
Metropoolregio Eindhover	17	2015	54200	0.031	433	71	1	57	2837	0.03682084	463	0.224	338440
Midden-Holland	18	2015	59000	0.026	111	5	1	760	656	0.028	508	0.224	94880
Noord- en Midden-Limbur	19	2015	52600	0.034	409	100	3	2520	2557	0.03416563	863	0.224	225585
Noord-Holland Noord	20	2015	54800	0.029	828	123	16	7681	5952	0.1	5975	0.224	289050
Noord-Holland Zuid	21	2015	55600	0.025	950	273	15	12295	8376	0.046	1479	0.224	1025620
Noordoost-Brabant	22	2015	56500	0.03	356	139	0	140	2816	0.049	1188	0.224	255175
Noord-Veluwe	23	2015	55900	0.031	111	1	0	0	634	0.037	364	0.224	72670
Rotterdam/Den Haag	24	2015	51600	0.026	687	464	5	181	11017	0.034	1432	0.224	1090530
Twente	25	2015	49500	0.031	387	88	0	0	4377	0.078	2202	0.224	269825
U16	26	2015	58100	0.027	612	27	3	197	2107	0.028	534	0.224	420550
West-Brabant	27	2015	55400	0.03	338	303	0	0	9503	0.089	3937	0.224	307055
West-Overijssel	28	2015	52000	0.031	597	72	0	0	2044	0.045	925	0.224	217630
Zeeland	29	2015	51900	0.029	456	200	13	27879	4720	0.035	8540	0.224	171285
Zuid-Limburg	30	2015	47200	0.034	280	13	0	0	2146	0.01650009	368	0.224	293705
Achterhoek	1	2016	52600	0.031	427	46	4	223	2171	0.081	1044	0.196	126835
Alblasserwaard	2	2016	59200	0.025	35	10	0	0	214	0.026	867	0.196	32085
Amersfoort	3	2016	62900	0.024	162	23	3	153	690	0.032	429	0.196	126335
Arnhem/Nijmegen	4	2016	51000	0.029	652	183	9	10354	3921	0.063	1670	0.196	343425
Cleantech	5	2016	55900	0.028	231	12	15	2750	1204	0.033	600	0.196	146220
Drechtsteden	6	2016	55200	0.025	73	54	2	88	1195	0.05	1577	0.196	125400
Drenthe	7	2016	52500	0.032	529	217	2	211	3958	0.081	3284	0.196	213000
Flevoland	8	2016	56300	0.026	666	695	4	2785	8690	0.244	18770	0.196	166695
Foodvalley	9	2016	54900	0.0265	240	31	3	497	1175	0.041	699	0.196	145625
Friesland	10	2016	48400	0.031	1065	186	8	11438	6269	0.099	3383	0.196	287250
Fruitdelta Rivierenland	11	2016	59500	0.028	170	38	5	6053	1953	0.054	1735	0.196	96420
Goeree-Overflakkee	12	2016	59800	0.026	318	39	5	35630	679	0.149	11024	0.196	20195
Groningen	13	2016	43900	0.035	491	617	6	5145	8932	0.102	9600	0.196	290295
Hart van Brabant	14	2016	52500	0.029	293	163	3	170	1325	0.035	729	0.196	204435
Hoeksche Waard	15	2016	63400	0.024	49	1	0	0	255	0.034	752	0.196	35740
Holland Rijnland	16	2016	59300	0.024	310	27	1	72	1061	0.03	436	0.196	249495
Metropoolregio Eindhover	17	2016	55600	0.029	481	101	2	124	2740	0.037	618	0.196	341450
Midden-Holland	18	2016	60100	0.024	122	10	1	760	628	0.027	558	0.196	95705
Noord- en Midden-Limbur	19	2016	53500	0.031	457	115	4	2551	2770	0.041	1137	0.196	227000
Noord-Holland Noord	20	2016	56000	0.026	897	155	21	8063	5511	0.092	5411	0.196	290885
Noord-Holland Zuid	21	2016	56900	0.024	1018	288	23	12825	8424	0.046	1454	0.196	1037055
Noordoost-Brabant	22	2016	58000	0.028	418	173	2	149	2696	0.047	1364	0.196	257235
Noord-Veluwe	23	2016	57200	0.028	120	5	0	0	595	0.034	462	0.196	73305
Rotterdam/Den Haag	24	2016	52600	0.024	752	510	7	293	11298	0.035	1468	0.196	1099000
Twente	25	2016	50700	0.03	419	93	1	55	4428	0.079	2542	0.196	270715
U16	26	2016	59400	0.025	658	32	6	615	2148	0.028	573	0.196	424295
West-Brabant	27	2016	56100	0.028	379	361	3	2035	9471	0.09	4335	0.196	308385
West-Overijssel	28	2016	53200	0.029	643	87	1	65	2087	0.045	1187	0.196	219970
Zeeland	29	2016	52700	0.027	466	208	13	30654	4372	0.032	8264	0.196	171895
Zuid-Limburg	30	2016	48200	0.032	292	25	0	0	2349	0.0168075	483	0.196	294440
Achterhoek	1	2017	54900	0.029	458	59	9	746	2349	0.087	1360	0.195	127640
Alblasserwaard	2	2017	62300	0.023	42	12	1	87	236	0.028	903	0.195	32485
Amersfoort	3	2017	65000	0.023	181	24	3	153	773	0.035	500	0.195	127665
Arnhem/Nijmegen	4	2017	52500	0.028	701	200	9	10354	4524	0.069	1802	0.195	347665
Cleantech	5	2017	57600	0.027	256	16	18	3135	1317	0.036	707	0.195	147955
Drechtsteden	6	2017	56900	0.023	90	57	3	154	1406	0.054	1366	0.195	126020
Drenthe	7	2017	54100	0.03	574	235	4	316	3944	0.078	3169	0.195	215125
Flevoland	8	2017	57800	0.024	724	729	5	2826	10248	0.282	21696	0.195	168685
Foodvalley	9	2017	56900	0.024	285	39	5	656	1366	0.048	809	0.195	148305
Friesland	10	2017	49700	0.028	1155	229	13	11712	6820	0.108	3776	0.195	289335
Fruitdelta Rivierenland	11	2017	61800	0.027	198	46	6	6076	2173	0.058	1880	0.195	97685
Goeree-Overflakkee	12	2017	61900	0.024	323	39	5	35630	653	0.144	10117	0.195	20430
Groningen	13	2017	44900	0.033	590	708	11	7626	10067	0.11673224	8441	0.195	291320
Hart van Brabant	14	2017	54500	0.027	335	179	7	520	1493	0.038	925	0.195	206440
Hoeksche Waard	15	2017	66300	0.022	55	2	0	0	275	0.036	771	0.195	36160
Holland Rijnland	16	2017	61300	0.023	341	33	3	121	1214	0.03376818	531	0.195	252970
Metropoolregio Eindhover	17	2017	58100	0.027	545	132	4	217	2921	0.039	780	0.195	345495
Midden-Holland	18	2017	62400	0.022	131	46	1	760	718	0.03	606	0.195	97340
Noord- en Midden-Limbur	19	2017	55300	0.03	504	150	4	2551	3112	0.045	1318	0.195	229330
Noord-Holland Noord	20	2017	58100	0.025	975	200	25	10195	5551	0.091	5257	0.195	293620

Noord-Holland Zuid	21	2017	59400	0.021	1114	301	31	13573	9252	0.05068867	1504	0.195	1047885
Noordoost-Brabant	22	2017	60100	0.026	490	205	5	337	3195	0.055	1600	0.195	260570
Noord-Veluwe	23	2017	59300	0.027	134	9	0	0	675	0.038	627	0.195	73905
Rotterdam/Den Haag	24	2017	54700	0.023	861	568	8	419	11802	0.036	1388	0.195	1106055
Twente	25	2017	52300	0.028	463	122	1	55	4762	0.083	2609	0.195	273045
U16	26	2017	61900	0.023	740	53	11	977	2417	0.032577	631	0.195	428795
West-Brabant	27	2017	58300	0.026	435	375	6	2691	9905	0.09709569	4313	0.195	310295
West-Overijssel	28	2017	54900	0.027	698	122	1	65	2469	0.053	1455	0.195	222330
Zeeland	29	2017	54400	0.025	503	266	13	32562	4345	0.0345304	8011	0.195	172925
Zuid-Limburg	30	2017	49400	0.03	303	30	0	0	2509	0.01460976	605	0.195	296605
Achterhoek	1	2018	55600	0.02677322	491	68	19	1963	2762	0.101	1854	0.211	128220
Alblasserwaard	2	2018	61900	0.025	53	14	3	215	336	0.039	1374	0.211	32900
Amersfoort	3	2018	65800	0.02049198	228	35	6	527	1020	0.046	764	0.211	128510
Arnhem/Nijmegen	4	2018	57158.1241	0.024	788	220	17	13140	4982	0.08049895	1689	0.211	350845
Cleantech	5	2018	58000	0.0253485	299	28	26	2682	1653	0.045	937	0.211	149280
Drechtsteden	6	2018	57600	0.022	113	59	7	479	1657	0.063	1477	0.211	126335
Drenthe	7	2018	54600	0.031	661	307	10	877	4699	0.092	3929	0.211	216375
Flevoland	8	2018	58700	0.025	831	820	17	3284	11199	0.294	22629	0.211	170800
Foodvalley	9	2018	57600	0.024	353	64	16	1634	1774	0.062	997	0.211	150035
Friesland	10	2018	51108.409	0.02631879	1315	322	46	16450	7606	0.117	4345	0.211	290335
Fruitdelta Rivierenland	11	2018	62400	0.02534941	253	65	22	17241	2657	0.068	2478	0.211	98780
Goeree-Overflakkee	12	2018	62100	0.026	348	47	6	35697	809	0.173	12347	0.211	20710
Groningen	13	2018	45700	0.034	722	780	29	9240	11063	0.12845603	9213	0.211	292255
Hart van Brabant	14	2018	55100	0.027	427	208	12	8186	1940	0.049	1170	0.211	208315
Hoeksche Waard	15	2018	65900	0.024	70	4	0	0	365	0.047	1178	0.211	36470
Holland Rijnland	16	2018	61600	0.024	413	47	8	651	1611	0.04569191	783	0.211	255800
Metropoolregio Eindhover	17	2018	58300	0.027	669	209	15	7160	4275	0.055	1073	0.211	349270
Midden-Holland	18	2018	62500	0.024	163	50	5	843	973	0.041	875	0.211	98940
Noord- en Midden-Limbur	19	2018	55900	0.031	597	202	7	4393	3630	0.052	1770	0.211	230555
Noord-Holland Noord	20	2018	58500	0.023	1121	386	36	12617	5955	0.09	5135	0.211	295575
Noord-Holland Zuid	21	2018	60100	0.023	1282	344	84	21729	10669	0.05867924	1535	0.211	1056660
Noordoost-Brabant	22	2018	60800	0.027	620	252	17	2013	3824	0.065	1374	0.211	262535
Noord-Veluwe	23	2018	60300	0.02463864	154	22	5	511	891	0.05	922	0.211	74530
Rotterdam/Den Haag	24	2018	55100	0.024	1042	863	27	2278	14904	0.043	1406	0.211	1116420
Twente	25	2018	52900	0.029	553	261	6	5276	5623	0.099	2501	0.211	274570
U16	26	2018	62500	0.024	863	80	29	2702	3306	0.042	852	0.211	432520
West-Brabant	27	2018	58300	0.027	544	749	11	2891	7987	0.07974673	6220	0.211	314600
West-Overijssel	28	2018	55800	0.03	813	169	13	7551	3211	0.067	1809	0.211	224460
Zeeland	29	2018	54700	0.027	607	475	32	86403	5692	0.042	10617	0.211	173950
Zuid-Limburg	30	2018	50100	0.031	349	41	0	0	2809	0.01670367	871	0.211	297370
Achterhoek	1	2019	56763.1387	0.02455923	585	91	28	2643	3039	0.112	2158	0.223	129155
Alblasserwaard	2	2019	63692.3225	0.02204961	74	18	4	275	397	0.046	1678	0.223	33270
Amersfoort	3	2019	67361.5712	0.01922462	284	51	7	845	1441	0.066	1053	0.223	130010
Arnhem/Nijmegen	4	2019	58722.6228	0.02316445	919	258	24	13963	5123	0.078	1917	0.223	353365
Cleantech	5	2019	59114.1924	0.02374312	361	43	32	3374	2269	0.061	1260	0.223	150510
Drechtsteden	6	2019	58893.7593	0.02049668	150	75	8	635	2392	0.101	1688	0.223	126470
Drenthe	7	2019	55826.642	0.02881036	798	453	14	3897	4894	0.098	4353	0.223	217830
Flevoland	8	2019	59959.2034	0.02149616	1000	949	19	3731	12181	0.318	23445	0.223	173590
Foodvalley	9	2019	58858.1224	0.02173603	490	101	19	1907	2232	0.078	1320	0.223	151980
Friesland	10	2019	52167.9057	0.02429012	1558	395	65	19895	8250	0.128	5004	0.223	292170
Fruitdelta Rivierenland	11	2019	63720.7902	0.02374402	339	95	23	17471	2879	0.074	2864	0.223	101110
Goeree-Overflakkee	12	2019	63794.7803	0.02415917	368	99	6	35697	1092	0.228	17299	0.223	20940
Groningen	13	2019	46625.3437	0.0316923	895	1207	37	11343	12021	0.13976996	9948	0.223	293740
Hart van Brabant	14	2019	56686.3436	0.02492248	526	249	20	8865	2740	0.07	1493	0.223	210570
Hoeksche Waard	15	2019	67819.3196	0.02084828	105	31	1	105	827	0.109	6147	0.223	36825
Holland Rijnland	16	2019	62989.3804	0.02251315	547	74	16	1826	1873	0.05701157	985	0.223	258465
Metropoolregio Eindhover	17	2019	59899.495	0.02495245	942	308	20	8014	5762	0.075	1845	0.223	353340
Midden-Holland	18	2019	63837.6206	0.02121577	212	65	9	1479	1193	0.051	1100	0.223	100240
Noord- en Midden-Limbur	19	2019	57175.722	0.02911786	796	302	13	6724	3731	0.055	2204	0.223	231935
Noord-Holland Noord	20	2019	59767.4725	0.02124418	1382	640	43	13744	8707	0.129	6436	0.223	298300
Noord-Holland Zuid	21	2019	61977.2489	0.02162035	1575	428	117	25451	11432	0.06312116	1303	0.223	1064550
Noordoost-Brabant	22	2019	62219.8683	0.02542832	856	314	23	3145	4488	0.077	2049	0.223	265380
Noord-Veluwe	23	2019	61579.0144	0.02235206	208	33	12	1730	1024	0.057	1163	0.223	75025
Rotterdam/Den Haag	24	2019	56591.0175	0.02184329	1316	1320	35	3195	16218	0.047	1714	0.223	1125445
Twente	25	2019	54098.521	0.02742832	772	306	11	7171	6427	0.115	2963	0.223	276930
U16	26	2019	64084.4257	0.02194547	1042	146	41	7923	4124	0.054	1054	0.223	436765
West-Brabant	27	2019	59918.5132	0.02542832	731	1223	16	4732	10169	0.097	7005	0.223	317015
West-Overijssel	28	2019	57056.1341	0.02742832	982	248	21	8628	4000	0.085	2223	0.223	226905
Zeeland	29	2019	56191.801	0.02444061	755	584	40	92763	7388	0.073	13913	0.223	175080
Zuid-Limburg	30	2019	51168.1887	0.02848519	420	67	2	213	2732	0.01488225	1119	0.223	297775

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