ENVIRONMENT AND RESOURCE MANAGEMENT
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THE SUN RISES IN EASTERN EUROPE TOO - EXPLORING ENABLING POLICIES FOR ENERGY COMMUNITIES IN HUNGARY - MASTER'S THESIS

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ABSTRACT

Climate change is happening mostly because of human actions and not because of natural processes, as previously thought. Nowadays, scientists and policy makers are aware of this problem and they have implemented measures to mitigate climate change. Some parts of civil society have taken the initiative as well to lessen moderate climate change, by installing locally operated renewable energy systems. These so-called energy communities are one important element of the energy transition towards a low-carbon economy. Focusing on Hungary, this thesis explores what governmental policies are needed to facilitate the establishment and growth of energy communities in a country where this is a new phenomenon.

The research was executed by means of a literature review and semi-structured interviews with Hungarian stakeholders. The interviews highlighted some hindering factors that do not only impede but also disable the establishment of energy communities in Hungary. The main policy suggestions amongst others are the need to implement the EU Directives in Hungary, educating the public on renewables and energy communities in general, a change of mindset that is needed from the government to render energy production more decentralized, and public awareness that makes the public become more community conscious to be able to establish energy communities. The answers given by stakeholders are relevant because, despite their diverse background, the stakeholders' policy suggestions resonate with the points that need improvement mentioned in the document of the National Energy Strategy published by the Hungarian government. This study fills the gap between government goals and current reality, and serves as the first ever Hungarian case study focusing on energy communities.

LIST OF ABBREVIATIONS AND EXPLANATIONS

Abbreviation	*Meaning*	*Explanation*
CEESEN	Central and Eastern Europe Sustainable Energy Network	Online platform created as a result of the PANEL 2050 project to facilitate communication and unite different energy actors in the regions.
HEA	Hungarian Energy and Public Utility Regulatory Authority	Regulatory body of the energy and public utility market in Hungary, supervising the national economy's sectors of strategic importance.
HMKE	Small-scale Household (Renewable) Power Plant	With this system the single electricity meter of one house has a back-and-forth annual balance billing to the extent of its own production and/or consumption.
METÁR	Renewable Energy Support System	Tender based Hungarian governmental funding system for renewable energy installers.
NES	National Energy Strategy	Policy document targeting actors and decision-makers in the Hungarian energy sector including measures to be implemented by 2030, as well as a roadmap to 2050, with the latter putting the measures proposed for 2030 in a global, longer-term perspective.
PV	Photovoltaic	Direct conversion of light into electricity at the atomic level.
SNM	Strategic Niche Management	Theoretical concept that is meant to explain how broad socio-technical transitions towards more sustainable development are taking place. It is designed to facilitate the introduction and diffusion of new sustainable technologies through protected societal experiments in fields such as renewable energy.

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1. SCRATCHING THE SURFACE

1.1. Introduction

The question of climate change and how it can be mitigated has gained increased attention in recent decades (Painter et al. 2018). Nowadays, governments work together to develop policies that, if applied synchronously, can slow and even stop carbon emissions, which are the main contributors of climate change (Wang et al. 2018). Such an example is the Paris Agreement, which was ratified by 195 nations and is a major step towards climate mitigation (IEA, 2019)[1].

Some parts of the Paris Agreement, such as Article 6, are still under debate and are a recurring issue. Article 6 emphasizes putting a price on carbon, which appears to be the ultimate solution to the climate problem, where everyone pays the price for shifting the current economy to a less carbon-intensive one (Sager, 2019). Even though this would be the ideal solution, there are countries which are hesitant to cap emissions or implement a carbon price because they fear that a sudden surge of prices would hinder their market and consumers disproportionately compared to other countries (Sager, 2019).

It seems nations need other solutions to combat climate change, while their governments are negotiating their efforts towards sustainability. They must consider other solutions, as the temperature rises every decade and mitigation has a lower cost today than in the future. That is why relying solely on governments to act on climate change is a naive idea. Furthermore, policy makers should not look at carbon price as the only option that must be implemented; policy makers have to apply more ways of climate mitigation at the same time to be effective.

Using alternative sources of energy is another way of fighting climate change, as alternative sources such as solar photovoltaic and wind energy plants have much fewer carbon emissions than fossil fuel plants (Schiermeier et al. 2008). Due to economies of scale and changes in perspective, the costs of installing renewable energy sources has plummeted in the last decades (Jäger-Waldau, 2019).

While governments are arguing which country should bear the cost of emissions, individuals have the ability to reduce their own CO_2 emissions, through engaging in sustainable energy production and consumption by setting up bottom-up initiatives. New technologies enable citizens to produce their own renewable energy.

When likeminded individuals with sustainability aspirations gather and act in alliance to achieve a larger impact on climate mitigation, they form communities. Such energy communities are formed by people who live in the same area and would like their own renewable energy source (solar photovoltaic for example) to generate energy for the community (Dóci et al. 2015). Energy communities install their own capacities on a larger-than-individual-size is driving prices even further down, providing readily available energy and with batteries this energy can be stored for later usage (Good and Mancarella, 2019).

These bottom-up initiatives are beneficial for all parties. People are willing to take action and the technology is also available to make it happen. The community benefits from clean air, reliable energy and a closer bond is formed between the members of the community (Gui and MacGill, 2018).

[1] https://www.iea.org/reports/iea-cop25

1.2. Problem definition and research gap

The Renewable Energy Directive of the European Parliament and of the European Council explains that renewable energy communities exist as legal entities and the document describes their purpose and their benefits on society. (European Parliament and European Council 2018, p.113). However, many countries still do not recognise energy communities as separate legal entities. This is the case in Hungary, a central European country and the focus of this thesis. The concept of forming energy communities is a new one in Hungary, although there have been a few successful initiatives and many failed attempts so far to bring energy communities to life. In several other European countries, however, many (even hundreds of) successful energy communities have emerged (Agora Energiewende, 2015; Boon & Dieperink, 2014; Caramizaru & Uihlein, 2020; Hicks & Ison, 2018; Jensen et al. 2018).

This thesis explores the current state of Hungary's energy transition, its dependencies, the way the country is heading and the opportunities that lie within the untapped value of energy communities. The Government of Hungary has stated in its recent new National Energy Strategy document that by 2030 each of the 174 districts in Hungary must have at least one successfully operating energy community (Ministry of Innovation and Technology, 2020). There is a policy gap, however, as the intention is clear, but there are no enacted policies to make this happen.

1.3. Research Objective and Questions

The objective of this thesis is to develop (or propose) a coherent set of policy measures that could contribute to the creation of 174 energy communities by 2030. Based on this objective, the main research question is as follows:

> What governmental policies could enable the establishment of at least one successful Energy Community in all 174 districts in Hungary by 2030?

Sub-questions include:

1. What is the current state of affairs in Hungarian energy transition in general and of energy communities specifically?
2. What enabling and hindering factors exist to the establishment and operation of Hungarian energy communities?
3. To what extent are current governmental policies sufficient to accelerate the establishment of energy communities and facilitate their operation?
4. How should a set of policy recommendations look like that would facilitate the establishment and operation of energy communities in Hungary?

The focus is on the policy aspect of the problem, because solving this problem is the first step towards better general acceptance from the part of society, which will lead to a different, more environmentally centred perspective.

2. THEORETICAL FRAMEWORK – STRATEGIC NICHE MANAGEMENT

Renewable energy sources are one of the technological options today that have the potential to change the energy sector as we know it. In western industrialized countries, people started gathering in energy communities to represent a new emerging way of operating renewable installations. Their potential is huge on a national level, given proper policies and funding structure. Energy communities can be viewed as intermediary actors which help in the diffusion of new technologies, renewable energy sources in our case (Hargreaves et al. 2013). They form a so-called niche in the current social environment. Their purpose is to accelerate the transition to renewables, among other social benefits.

The rest of the chapter is organized as follows: Section 2.1. explains what Strategic Niche Management means in the context of energy communities. Section 2.2. introduces the concept of energy communities. Section 2.3. explains which types of stakeholders are involved. Section 2.4. details different motivations behind starting an energy community. Section 2.5. discusses enabling and hindering factors behind the emergence and operation of energy communities.

2.1. Strategic niche management

Strategic Niche Management (SNM) is being used as the theoretical framework for this thesis and will be the backbone against which, the results will be discussed in the Discussion chapter. SNM distinguishes three levels of sociotechnical niche, regime and landscape. When speaking of niches, it is referred to technological niches (Hargreaves et al. 2013). Niches are special spaces in which radical innovations are developed (Raven, 2005).

Niches do not exist in an empty space though; they exist within the dominant socio-technical regime (situated hierarchically above the niches). This regime consists of rules, which are the fundamental guides in human actors and technical systems. These rules provide structure and stability to technological development (Raven 2005). Regimes exist in a wider context as well, in the so-called socio-technical landscape (Hargreaves et al. 2013). The landscape refers to the material and immaterial contexts of societies. Geels and Kemp (2000, p. 18) refer to these materials and contexts as "natural resources, infrastructures, political cultures and coalitions, lifestyles and macro-economic aspects". The three levels are situated above one another in a nested hierarchy structure. The three levels are visualized in Figure 1.

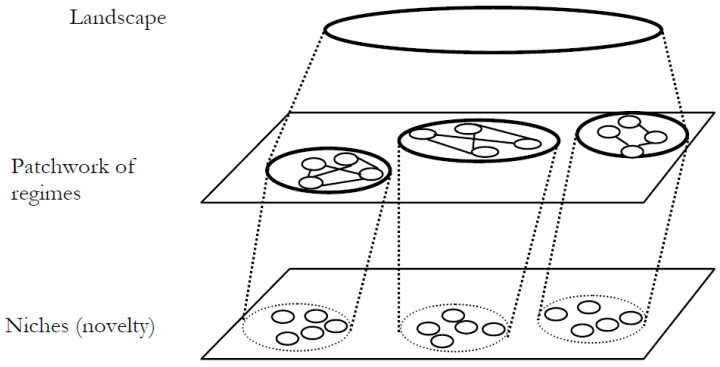

Figure 1: Multiple levels as nested hierarchy
Source: Geels (2002, p. 126)

As stated by Caniëls and Romijn (2008), SNM advocates the creation of socio-technical experiments in which the various innovation stakeholders are encouraged to collaborate and exchange information, knowledge and experience that will facilitate the incubation of the new technology and/or social practice. After the incubation phase, a socio-technological niche will "evolve into an

actual market niche, in which the innovation can sustain itself commercially in a specific market segment" (Hoogma et al. 2002, page 30). This is true for energy communities as well, as they are in the niche category in many European countries. However, they are merely a concept in Hungary, the focus country of this thesis.

The basic idea of SNM is that it is cumbersome to break away from current practices. Changing this regime takes "radical shifts in technological systems […] including a change in consumption patterns, user preferences, regulations, and artefacts." (Hoogma et al. 2002, p. 5). According to Caniëls and Romijn (2008, p. 246), the SNM framework has proven useful for the analysis of success and failure of experiments with a range of sustainable innovations. SNM can help to highlight the important role of energy communities in our society (Hargreaves et al. 2013).

2.2. The concept of energy communities

According to Goldthau (2014), an increasing number of scholars, citizens and policy-makers advocate the transition from the current centralized energy production and distribution towards a more decentralized configuration. Decentralized systems have advantages over centralized ones, including reduced costs for transmission and distribution systems, reduced grid power losses and a larger share of zero-carbon technologies (Sims & Schock, 2007). A move away centralized energy production requires an active role from energy users to become prosumers (Stern, 2014). Community energy reflects a growing desire to find alternative ways of organising and governing energy systems (Van Der Schoor et al. 2016). It is a form of social movement that allows for more participative and democratic energy processes.

Until recently, community energy lacked a clear status in EU and national legislation, taking different forms of legal arrangements (Caramizaru & Uihlein, 2020), as is shown in Figure 2. The types of existing energy communities based on their legal structure according to Caramizaru & Uihlein (2020) are the following:

Energy Cooperative	This is the most common and fast-growing form of energy communities, which consist of persons who voluntarily cooperate for their mutual (social, economic and cultural) benefits. It is popular in countries where renewables and community energy are relatively advanced.
Limited partnerships	A partnership may allow individuals to distribute responsibilities and generate profits by participating in community energy. Governance is usually based on the value of each partner's share, meaning they do not always provide for a one member - one vote.
Community trusts and foundations	Their objective is to generate social value and local development rather than benefits for individual members. Profits are used for the community as a whole, even when citizens do not have the means to invest in projects (for-the-public-good companies).
Housing associations	Non-profit associations that can offer benefits to tenants in social housing, although they may not be directly involved in decision-making. These forms are ideal for addressing energy poverty.
Non-profit customer-owned enterprises	Legal structures used by communities that deal with the management of independent grid networks. Ideal for community district heating networks common in countries like Denmark.
Public-private partnerships	Local authorities can decide to enter into agreements with citizen groups and businesses in order to ensure energy provision and other benefits for a community.
Public utility company	Public utility companies are run by municipalities, who invest in and manage the utility on behalf of taxpayers and citizens. These forms are less common, but are particularly suited for rural or isolated areas.

Figure 2: Legal Structures of Energy Communities
Source: Caramizaru & Uihlein (2020, p. 14)

Most energy communities focus on generating renewable energy but they are increasingly starting to develop other activities. Distributed local energy management is already prevalent in some European countries, in the Netherlands for instance, more than 500 initiatives aim to convert local communities into self-sufficient, low-carbon settlements (Antoniucci & Bisello, 2019). In Germany, there are more than 900 energy cooperatives involved in the management of distributed energy production (Koirala et al. 2016). Caramizaru & Uihlein (2020) gather the activities, besides energy generation and supply, that energy communities develop. These are described as follows:

Generation	Community energy projects collectively using or owning generation assets (mostly solar, wind, hydro) where members do not self-consume the energy produced but feed it into the network and sell it to a supplier (CEER, 2019).
Supply	The sale (and resale) of electricity and gas to customers (electricity, wood pellets, biogas and others). Large communities can have a large number of retail customers in their vicinity, and may also engage in aggregation activities combining customer loads and flexibility or generate electricity for sale, purchase or auction in electricity markets (European Parliament & Council of the European Union, 2019).
Consumption and sharing	The energy produced by the energy community is used and shared inside the community. This includes both consumption (individual and collective self-consumption) and local sharing of energy amongst members that is produced by the generating installations within a community.
Distribution	Ownership and/or management of community-run distribution networks, such as local electricity grids or small-scale district heating and (bio)gas networks; often cooperatives can do both energy generation and distribution, but the network infrastructure is central to their business (Yildiz et al. 2015).
Energy services	Energy efficiency or energy savings (e.g. renovation of buildings, energy auditing, consumption monitoring, heating and air quality assessments); flexibility, energy storage and smart grid integration; energy monitoring and energy management for network operations; financial services.
Electro-mobility	Car sharing, car-pooling and/or charging stations operation and management, or provision of e-cards for members and cooperatives.
Other activities	Consultation services to develop community ownership initiatives or to establish local cooperatives, information and awareness raising campaigns, or fuel poverty measures.

Figure 3: Activities Pursued by Energy Communities
Source: Caramizaru & Uihlein (2020, p. 12)

According to Caramizaru & Uihlein (2020) the technologies energy communities use mainly solar, wind and hydro energy, biomass and biogas. The technologies are described by taking the International Renewable Energy Agency's explanation as a base:

- **Solar** power is generated in two main ways: **Photovoltaics (PV),** also called solar cells, are electronic devices that convert sunlight directly into electricity. The other type is **Concentrated solar power,** which usually features a field of mirrors that redirect rays to a tall thin tower. Concentrated solar power is used to generate electricity in large-scale power plants, while PV can be used in large or small-scale plants, too.[2]
- **Wind:** The kinetic energy created by air in motion is transformed into electrical energy using wind turbines. The amount of power that can be harvested from wind depends on the size of the turbine and the length of its blades.[3]

[2] https://www.irena.org/solar
[3] https://www.irena.org/wind

- **Bioenergy (biomass and biogas)**: Traditional use refers to the combustion of biomass in such forms as wood, animal waste and traditional charcoal. Modern bioenergy technologies include liquid biofuels produced from bagasse and other plants; and biogas produced through anaerobic digestion of residues amongst others.[4]
- **Hydropower** is energy derived from flowing water, using water to drive turbines. Many consider small-scale hydro a more environmentally-friendly option than larger ones because of their effect on the surrounding environment.[5]

2.3. Stakeholders Involved

There are two types of stakeholders to be considered when mapping them. The first type refers to people who are key actors participating in the creation of energy communities. The other type consists of people who are not directly involved; however, their work is vital to make existence for energy communities feasible. Dvarioniene et al. (2015) categorizes stakeholders on two axes. The power or influence of the stakeholder is displayed on the horizontal axis and the necessity of the involvement of the stakeholders is shown on the vertical axis. Figure 4 shows the type of stakeholders in a matrix.

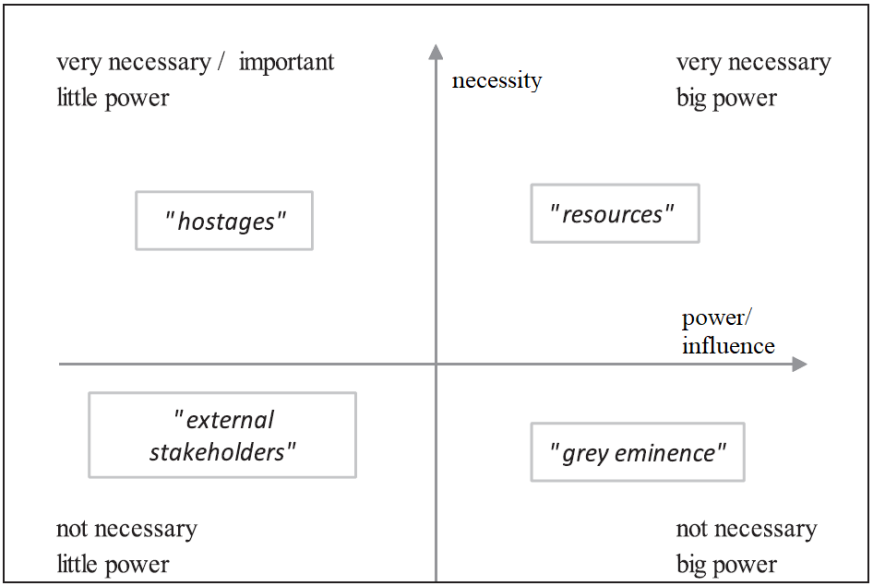

Figure 4: Type of stakeholders
Source: Dvarioniene et al. (2015, p. 514)

As explained by Dvarioniene et al. (2015), finding the right stakeholder who are involved in a community project "helps to enlighten community problems from several points of views, and […] it makes possible to define common goals […] towards sustainability" (Dvarioniene et al. 2015, p. 514). However, there are people who are not participating in the creation of energy communities, but they "could be affected by project outcomes and policy decisions, and at the same time they can have an impact on the implementation of policy and measures" (Dvarioniene et al. 2015, p. 514). Furthermore, stakeholders can "support or hinder a project, be influential in the organization or within the community, in which the project operates, hold relevant information, official positions or be affected in any of these terms in the longer run" (Dvarioniene et al. 2015, p. 514). Thus, when mapping stakeholders, one should not only look at groups of people directly involved, because there can be other important groups at stake, who probably also have a say in the community initiative.

[4] https://www.irena.org/bioenergy
[5] https://www.irena.org/hydropower

According to the Community-Based Strategic Planning (Mendes et al. 2011) stakeholders should represent groups from all levels of community and government, including:

- Groups of people with power e.g. politicians, municipality officials, bank officials.
- Groups of people with technical background e.g. lawyers, engineers, scientists.
- Citizens affected by policies e.g. local community members and leaders.
- Local investors e.g. business community, civic groups, NGOs.

Apart from stakeholder representation, voting power also plays an important role in the establishment of an energy community. A Hicks & Ison (2018) study specifies stakeholder involvement on two different dimensions, the first spectrum concerns stakeholder composition, the second spectrum shows who has control over decision-making in the community. There is no correct mix of stakeholders and no optimal voting-power distribution, every community has to decide for themselves. The two spectra can be seen on Figure 5.

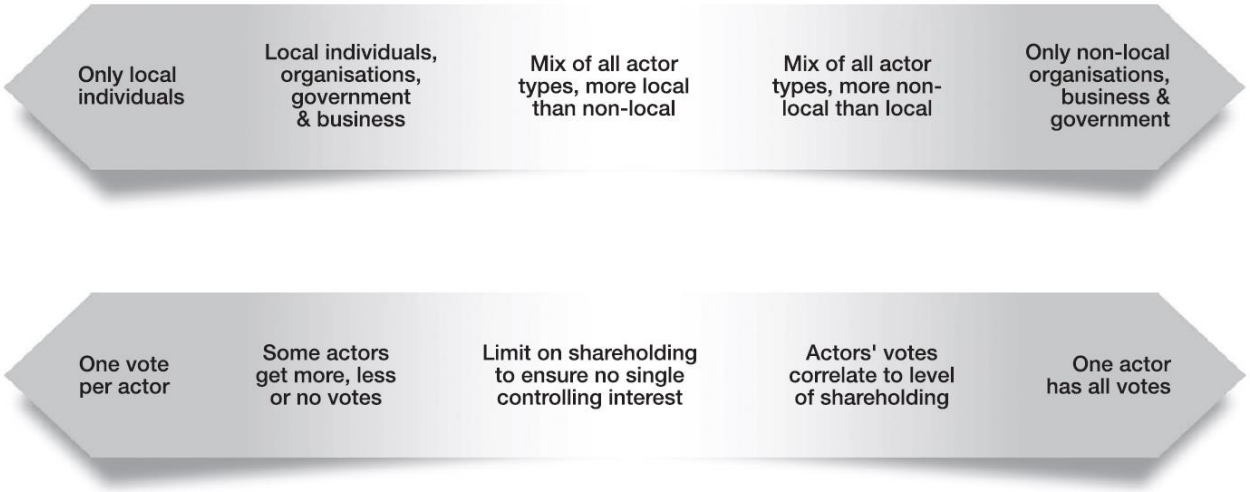

Figure 5: Stakeholder composition and voting power.
Source Hicks & Ison (2018, p. 529)

A Lowitzsch (2019) highlights the importance of stakeholders in energy communities by comparing the actors with different roles between that of a cooperative initiative and a business corporation. The comparison reflects on the nature of underlying values. The members who are actively participating in their energy communities are the ones who own equity in their operations. In a company, shareholders own the company and not the ones who operate it. In an energy community, equality can be found on every level of operation, be it management, board membership, and election; communities work in a very democratic way, distributing voting power equally are. By contrast, in a company, voting power is allocated to the largest shareholders, leaving smaller shareholders quasi-powerless.

The company life is usually circling around quarterly financial reports and profitability charts, making them myopic to long-term goals, whereas communities work towards sustainability in the future and bearing the cost of installing renewable capacities with little to no revenue in the present.

This comparison shows how profit oriented a business corporation is and how people-centred a cooperative is. The comparison can be seen on Figure 6.

Attributes	Cooperatives	Business corporations
Ownership	Separate legal entity with members holding equity shares	Separate legal entity with its shareholders owning equity interest
Control	Democratically controlled; one member, one vote; equal voice regardless of equity share; members are involved in the day-to-day business operations	Controlled by shareholders proportional to their investment share; business decisions are taken by a board of directors and corporate officers
Board membership, compensation	Made up of cooperative members elected by them: usually, they do not work for the cooperative and serve on an uncompensated, volunteer basis; cost of board meetings reimbursed	Board is comprised of a combination of independent directors, management and other directors with financial or business ties to the organisation; financial compensation is provided for board service
Board nomination, elections	Candidates nominated either directly or by a nominating committee made up of members; usually, any member can nominate a director candidate; board is elected by members on a one member, one vote basis	Candidates nominated by the board of directors and management, often by a nominating committee; shareholders have limited ability to nominate and elect director candidates
Earnings/ dividends	Any profits earned by the cooperative are reinvested and/ or returned to members; many cooperatives are obliged to return a portion of their profits to members each year; members share losses and earnings	Profits returned to shareholders based on ownership share; corporations are generally not obligated to pay out dividends; timing and amount of dividend payout are determined by the board of directors
Motivation	Maximise customer service and satisfaction	Maximise shareholder returns
Source of funds	Typically raise resources through the equity of members: (1) direct investment, (2) retained margins and (3) per-unit capital retains	Typically raise money through capital markets
Community	Promote and assist community development	May engage in selected CSR activities

Figure 6: Comparing the roles of stakeholders in a cooperative versus in a business corporation
Source: Lowitzsch (2019, p. 144)

This clear difference stems from different motivations that drive the establishment of an energy community and a business. In the next subsection, the motivations behind establishing an energy community are analysed.

2.4. Motivations to start an energy community

Citizens who are involved with energy communities often show traits of sustainable energy behaviour (Sloot et al. 2017). This behaviour can be explained by the motivations of citizens to start or participate in an energy community. People can have multiple reasons to be involved, one simple reason for participation can be of self-interest, in the form of financial benefits (Dietz, 2015). Being in a community lets one minimize costs of ownership and management and the investment in renewable capacities can be profitable in the long-term, thus many people join for the purpose of saving money by investing in renewable capacities.

Apart from saving money, another interest is the community interest of people to become more involved in their community, thus, to become more connected with one another (Sloot et al. 2017). In other words, people are motivated to be involved in relevant social groups, such as their own local community (Sloot et al. 2019).

Besides financial and social interests, people may also join energy communities for the environmental interest. People act together to create a cleaner environment for the locals and this activity, as Taufik et al. (2015) describes, reflects positively on the participants self-concept, and elicits positive feelings. Financial, environmental and social motivations are all behind sustainable energy behaviour. The three different "levels" of motivation are depicted in a hierarchical framework in Figure 7.

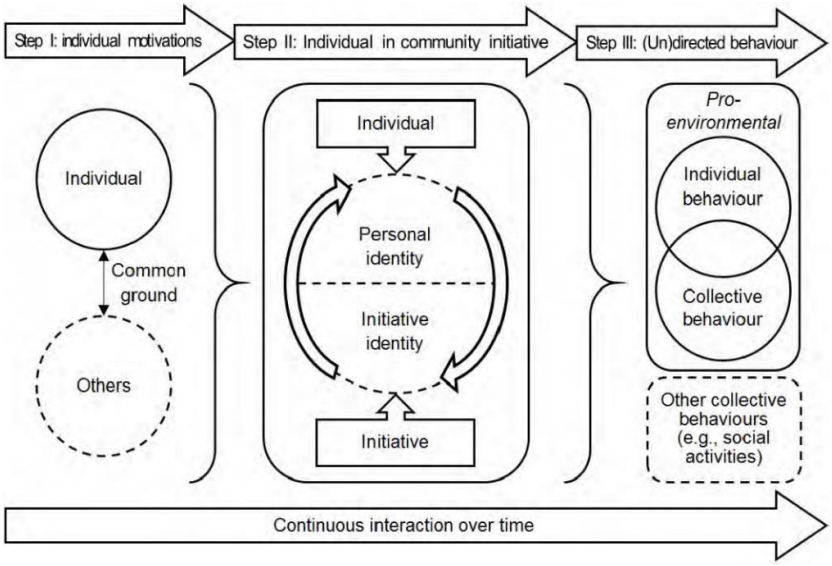

Figure 7: Three steps of becoming more pro-environmental in an energy community
Source: Sloot et al. (2019, p. 29)

Although the different motivations can co-exist in energy communities, the framework in Figure 2 suggests causality. As the time passes and interactions in the community cumulate, member behaviour will become more pro-environmental and self-interest induced motivation will be complemented with community and pro-environmental motivation, once members start to see the benefits of acting in a community initiative (Sloot et al. 2019).

2.5. Enabling and hindering factors for the emergence and operation of energy communities

Of course, motivation only is not enough to build energy communities, there are many hindering factors in the way that a community has to overcome to be successful. Brummer (2018) studied energy communities in the UK, Germany and the USA and based on his finding there, he categorizes such barriers in six groups. These are:

- Organizational issues / Legal framework / Planning requirements;
- Discrimination against big companies, incumbents;
- Lack of institutional and political support;
- Scepticism about Community Energy / Not In My Back Yard opposition;
- Lack of resources / expertise / resilience;
- Saturation effect

Unfortunately, there are factors, such as the legal framework (as is the case in Hungary) in absence of which it is infeasible to build communities, as it will be shown in the Results section. Besides hindering factors, there are many stimulating factors or benefits as well. Brummer (2018) categorizes benefits from creating an energy community in six groups:

- Economic Benefits, Education and Acceptance; Participation; Climate protection and sustainability; Community building and self-realization; Renewable Energy generation targets; Innovation.

The hindering factor categories created by Brummer (2018) are comparable to the five categories used in the Results section's hindering factors table (Table 2). These are the following: Socio-cultural problems in the results section cannot be categorized in any of the ones created by Brummer (2018). Policy problems, however match the "Organizational issues / Legal framework / Planning requirements" category. Political problems refer to Brummer's (2018) "Lack of institutional and political support". Financial problems fit the "Lack of resources / expertise / resilience" category. Motivational problems correspond to "Scepticism about Community Energy / Not In My Back Yard opposition" category. There are two categories of Brummer's (2018), which are not used in the research, because the current state of energy communities in Hungary make these categories unnecessary. These are "Discrimination against big companies, incumbents" and "Saturation effect".

Concerning facilitating factors, Oteman, Wiering and Helderman (2014) studied energy communities in the Netherlands, Germany and Denmark. They proposed three categories of enabling characteristics (Strategic, Institutional and (Bio-)physical) and they assigned several dimensions to the Strategic and Institutional types, while they only assign one characteristic to the (Bio-)physical type. Figure 8 shows these enabling factors.

Type	Dimension	Characteristics
Strategic	Cultural	Legitimacy of sustainability objectives, pro-environmental attitude, willingness to act
	Organizational	Support for community action
	Personal	Leadership, knowledge and expertise, access to technology and grid, adaptive capacity, management skills
Institutional	Political	Subsidies, flexibility, priority for sustainability goals, project support (advice, financial), network
	Legal	Formal rules and regulations, decision-making procedures, degree of discretionary space, control mechanisms
	Economic	Division of material resources, availability of investors, expected profitability
	Socio-cultural	Capacity for institutional learning, problem perception, attitude on experimentation
(Bio-)physical		Wind speed, solar hours, tidal waves, hydropower; presence of fossil fuels, urbanization, technological developments

Figure 8: Characteristics that influence occurrence and success of energy community initiatives
Source: Oteman, Wiering & Helderman (2014, p. 4)

The strategic type of enabling factors includes cultural, organizational and personal dimensions and the institutional type consists of political, legal, economic and socio-cultural dimensions. Note that Oteman, Wiering and Helderman (2014) do not account for hindering factors, only facilitating ones. This could be the case, because the case countries are the ones with the longest tradition of energy communities and by now, the major obstacles have been overcome and the government and prospective energy community members can focus on the facilitating factors and operating a community successfully.

Out of the 7 dimensions, 5 will be used to categorize the findings in the results section's stakeholder recommendations table (Table 3). Enabling factors in the Legal dimension are presented under the Policy category in the results section. Factors in the Socio-cultural and Political dimension are shown with the same title in the results, while Cultural factors are named Motivational factors in the results and Economic factors are titled Financial factors in the results.

To further nuance the enabling factors, studies focusing on the UK, the Netherlands and Sweden are discussed. In the UK, 161 community group representatives and energy professionals supporting community groups were asked about enabling factors of energy community involvement (Department of Energy & Climate Change, 2014). The Boon & Dieperink (2014) study focuses exclusively on the Netherlands and they categorize enabling factors in six categories. A Swedish country specific example, written by Magnusson & Palm (2019) list the four main enabling factors. These findings are compiled in Table 1.

Table 1: Enabling factors in the UK, the Netherlands and Sweden (based on: Department of Energy & Climate Change (2014), Boon & Dieperink (2014), Magnusson & Palm (2019))

United Kingdom	Netherlands	Sweden
Committed facilitators or volunteers	Technological characteristics	Personal interests from the involved actors (environmental interests and drive to take matters into their own hands)
Community needs and awareness	Organisational characteristics	Economic support for renewable energy in general
Access to support (e.g. grant funding or advice services)	Economical characteristics	The competence within the organizations
Incentives	Governmental Interventions	The capabilities to involve local energy companies (especially among electricity producing organizations)
	Market and society	
	Macro developments	

Personal interest from actors is a key factor in the UK and Sweden, although it is not emphasized in the Netherlands. Economic support is also specified in the UK and Sweden, although "economic characteristics" is an important factor in the Netherlands, it plays an important role in all three case countries. Organizational characteristics are expressed in the Netherlands and Sweden, although it does not have a high priority in the UK. Government interventions are highlighted in the UK and the Netherlands, but not in Sweden. Of course, given that this comparison is based on one study, different authors may give different weight to the enabling factors, thus one may understate or overstate their importance. As it will be shown in the results section, the Hungarian situation is similar in a sense that the suggestions of interview stakeholders of this study can be categorized in the same issue areas. Thus, these country case studies are good examples which could be used to help Hungarian policy makers in the process of making enabling policies for future energy communities.

3. METHOD AND DATA

This chapter explains the methodology that is being applied in the research and explains why this is considered a proper way of gathering data. Section 3.1. explains the type of interviews used for data gathering and a step-by-step flowchart makes the process clear at a glance. Section 3.2. details the sampling method. Section 3.3. explores how the interviews were conducted with a short explanation of each interview question. Section 3.4. explains where the data was gathered and what other possible sources could have been used. Section 3.5. gives a short explanation to the data analysis which will be explored in detail in the next chapter.

3.1. Semi-structured interviews

Semi-structured interviews were conducted for data gathering, 11 interviews in total (Adams, 2015). Out of these 11, 7 were through the Zoom video chat application, 2 through telephone call and 2 via email. For the majority of the interviews, the Zoom application was used, as it is relatively popular, free to use, has a stable high-quality connection and being online, the respondent did not have to leave his or her home during the pandemic. Also, the application has a built-in voice recorder, thus all the attention was on the interviewee and the direction of the discussion rather than being disoriented while noting everything important right as it was being said.

The reason for choosing semi-structured interviews is that getting answers to the most important questions is granted, although the respondents had the opportunity to express their feelings on other related issues as well (Adams, 2015). Due to the time constraints of the research (three months) this extra flexibility was invaluable.

3.2. Sampling and snowballing

The whole process from formulating the research question till the summarisation took three months. After formulating the research question and interview questions, the stakeholder mapping took place, which meant a search for anyone with a background in renewables and experience with energy communities. Given the new concept of energy communities in Hungary, stakeholder mapping meant only a few places, where relevant stakeholders could be. Hungarian NGOs, civil societies and companies in the renewables field, governmental offices which published the documents that are reviewed in the Literature Review and leaders, members or associates of current Hungarian energy communities. Strategic (non-random) sampling (Robinson, 2014) was used as a method of sampling interviewees. The base of the research lied on the knowledge of key stakeholders in the renewables sector and not on the average citizens. Twenty emails were sent out to prospective stakeholders and after the first respondent agreed to take part in the research, reaching out to other stakeholders were more simple, because the previous respondent acted as a contact person to the new ones.

At the end of each interview, the interviewee was asked whom to approach next and a referral was acquired from the person. This way, after 5 interviews the respondents pointed to some people whom had already been interviewed. This snowball sampling is an effective way to gain access to people with more experience and knowledge about the topic and theory saturation is reached much faster, than randomly selecting interview candidates (Robinson, 2014).

Figure 9 shows a step-by-step flowchart for the interviewing process of the interview and the work after the interviews.

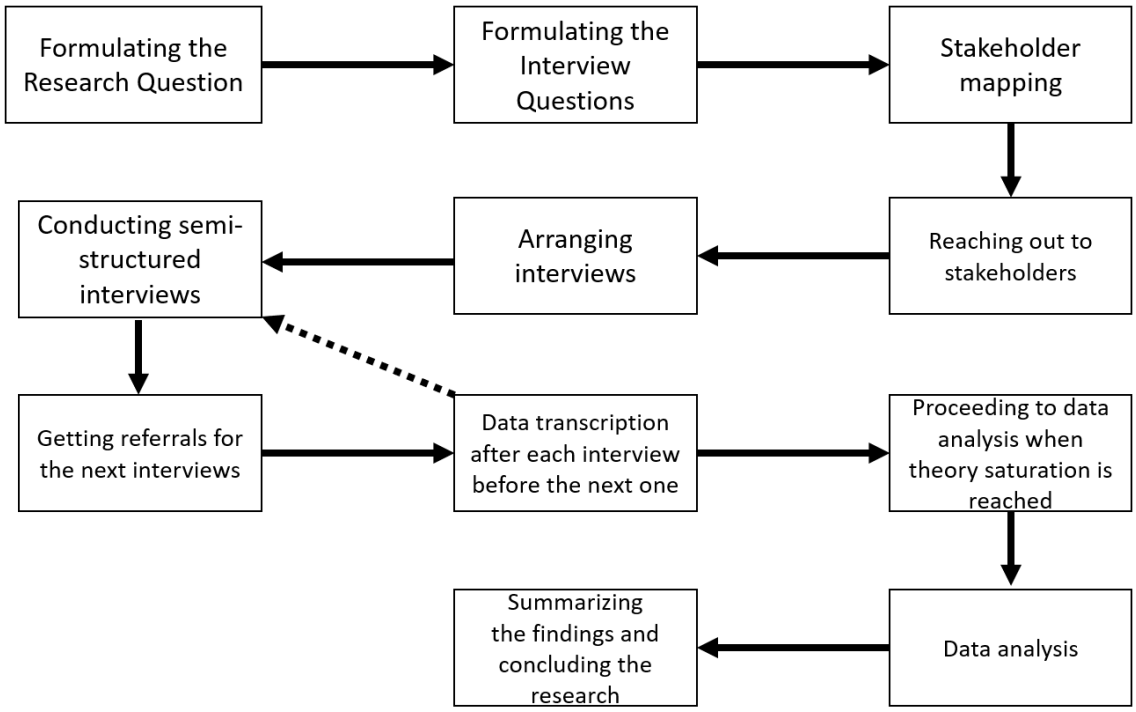

Figure 9: Flow chart for the process of the interviews
Source: Own work

3.3. Conducting interviews

One of the main impacts on the interviews is the language used. Although English is widely spoken in Hungary, Hungarian was the language of the interviews, as interviewees feel more comfortable answering to questions in their mother tongue. Every respondent agreed to be recorded. The exact time and date, place, the number of the interview and the name of the interviewee was indicated at the beginning.

3.3.1. Theory saturation

The total number of conducted interviews is 11. Theory-saturation was reached, i.e. when a comprehensive examination of the phenomena being studied has been done (Faulkner and Trotter, 2017) after about 9 interviews. Three types of stakeholders out of the four types proposed by Mendes et al. (2011) in their Community-Based Strategic Planning were included in the research. These are people with technical background (economists), citizens affected by policies (future local community leaders, civil societies) and local investors (NGOs, trade associations). Theory saturation was reached relatively fast, because relevant stakeholders answered to the interview request very fast and almost everyone agreed to make an appointment early on in the research, only three people refused, although they all pointed to their colleagues at their organisation or company and those people agreed to make an appointment.

3.3.2. Each interview question explained

Four questions were used, which were open, non-dichotomous questions (see Appendix I). The first interview question referred to how the occupation of the interviewee is connected to the topic of energy communities. This is a great way of making the participant really think about energy communities and asking only about the connection did not feel like a too probing question and the interviewee opened up promptly.

The second question was a dichotomous question, although it was chosen for the sole purpose to not persuade the interviewee in any direction. The second question refers to whether there are still barriers which hold back the formation of energy communities. Every stakeholder said yes and they went on talking about the specific barriers, thus the optional follow-up question (What barriers are these?) was never used. Another follow-up question was whether the government has a role in this situation and what the government could do to facilitate the growth of energy communities. Given the centralized nature of energy production in Hungary, asking about the government's role is a great way of uncovering flaws in the current system as well as providing solutions.

The third question was about citizen involvement in the Hungarian energy transition and here every stakeholder talked about various societal problems and solutions.

The last question explored what the most desired policy measure was the participants would implement as prime ministers. This question turned out to be the most exciting one, because stakeholders would think deeply before answering the question. In the Results section every answer for every question is reviewed, after which the answers are synthesized in a table. All questions are listed in Appendix I.

3.4. Data gathering

When it comes to energy communities there are many different stakeholders to consider for an interview. First of all, there are members of current energy communities, which are not too numerous at present in Hungary. Three of the interviewees are working at different organizations and are working together to create an energy community together and their thoughts allowed a major insight into the current environment of establishing an energy community. A list of all participants with organization and date of interview can be found in Annex 1.

Apart from energy communities, NGOs were contacted. The occupation of two of the participants is not directly related to the establishment of their own energy communities, but rather to help citizens to gain insight into what energy communities are and how they could function. They are showing through examples from other countries and some Hungarian examples as well, which revolves around energy efficiency but not energy production. These participants are executives at Hungarian NGOs. Another two of the participants represent organizations, such as the Hungarian Solar Industry Association (MANAP), a civil society and the Hungarian Solar Panel Solar Collector Alliance (MNNSZ), a trade association, because these organizations have ties with many other associations. An interview with a top member of these organizations was conducted. The experience with NGOs and energy community members was different from that of the government, most people replied fast, even though some people ignored the interview request, snowballing stakeholders was plausible.

The work of the last four respondents is not directly related to the creation of energy communities at the moment, although they all work (or have worked) on projects in their own fields which are related to energy communities.

Apart from communities, some governmental bodies were targeted. There is the Hungarian Energy and Public Utility Regulatory Authority (HEA)[6], which is the independent regulatory body of the energy and public utility market, supervising the national economy's sectors of strategic importance. The Ministry for Innovation and Technology also holds many potential interviewees and had published some of the government documents that were used in the literature review as a background for the current situation and planned Hungarian energy policies. Nobody ever replied to the interview request emails, even though every stakeholder was contacted more than once during the data gathering phase of the research. This happened possibly because of the ongoing pandemic. Unfortunately, it was not possible to visit any of the Ministries in person to ask for their time because of the quarantine order.

By the end of the 10th interview, when the interviewee was asked whom to approach next and then listed whom have already been contacted or conducted an interview with, the respondent said that the stakeholder map covers just about everyone they would suggest. It was a surprising finding because at least 5 people pointed to their direction before the 10th interview, so it was concluded that every relevant stakeholder except the governmental authorities was contacted and everyone who was available was reached successfully.

3.5. Data analysis – Codebook

After conducting the last interview, the data analysis started by highlighting the more important sentences or group of words in each transcript. Statements, explanations, personal thoughts, theories, suggestions were highlighted, which related to the research or theory building (Johnny, 2016). After this process, a list of important themes, concepts or ideas was drawn up. This was based on the notion that recurring problems and suggestions or solutions for that problem from the highlighted text was the next step in synthesizing the results (Johnny, 2016). Each new idea was written in a new line and after completing the list of ideas from the first interview only the new ideas were added from the second interview. Continuing this process a list of about 50 ideas was written. Out of the 50 ideas, 20 ideas were selected and organized in a table. Most ideas which were only mentioned by one person were eliminated, but some very insightful ones were selected for the table. After completing this table of ideas, they were organized on a category basis of issues or solution (Johnny, 2016) e.g. social, financial or political issues.

Before continuing with the results of the study, the literature review is introduced to delineate the current state of Hungarian energy transition. This review provides a better understanding of underlying motivations guiding Hungarian citizens and the government.

[6] http://www.mekh.hu/home

4. LITERATURE REVIEW: THE HUNGARIAN ENERGY TRANSITION

This section reviews the literature on Hungary's energy transition. This part of the data was gathered from recent Hungarian governmental documents and presents the Hungarian energy transition in its currents state. Section 4.1. explains Hungary's current energy mix. Section 4.2. details Hungary's plan, named National Energy Strategy, to have a different energy mix by 2030. Section 4.3. concerns the state of energy communities in Hungary in the present also by illustrating some successful examples.

4.1. Hungary's current energy mix and emitters

Today, Hungary heavily depends on imported natural gas for heating and electricity production (Ministry of Innovation and Technology, 2020). This gas comes mostly from Russia, which may be considered less desirable for energy security reasons, because Hungary has a weak position when negotiating gas prices. Hungary has its own gas fields, but their gas production cannot cover the required amount. Despite a weak negotiation position with Russia, Hungary has one of the lowest gas prices in the neighbouring countries, which is one of the achievements of the Government from the last decade.

Low gas prices appeal for many, because Hungarians keep room temperature relatively high during winter. The energy used for the heating of 1 m^2 of residential housing in 2015 in Hungary was 37,5% higher than the EU28 average, after controlling for differences in climate (Ministry of Innovation and Technology, 2020). 40% of the national energy is used for heating and cooling and the residential and tertial sector's share of this energy is over 60%. 46.000 $ktCO_2$ can be associated with the consumed energy in 2017, so over 11.000 $ktCO_2$ can be allocated to the residential and tertial sector alone. The building renovation rate is also low, so changes in energy consumption patterns are not to be expected in the near future.

Despite the low energy prices, energy poverty is a common phenomenon in Hungary. Depending on the definition, 10-21% of households categorize as energy poor and 75-80% of these people live in family houses (Fülöp & Lehoczki-Krsjak, 2014). According to one definition, most energy poor dwellers are single, according to the other definition it is mostly dwellers with children (Fülöp & Lehoczki-Krsjak, 2014). Also, people who classify as energy poor and who classify as low income do not comprise of the same people.

Besides natural gas, nuclear power is an important energy source. Hungary produces half of its electricity from one nuclear plant in Paks (Ministry of Innovation and Technology, 2020). It is a reliable, CO_2 neutral source and the government emphasizes that nuclear energy plays an equally important role in the future of Hungary's energy mix as well, by phasing out the power plant's four old blocks and constructing two new blocks, which are in the planning phase now.

Furthermore, Hungary has a lignite fire plant in Visonta, which generates about one sixth of the total electricity. This is very harmful for the climate that is why the government has started to think of a way of shifting the burning of lignite to less harmful fuels, because most families living near Visonta have family members working in this plant and the government aims to secure employment in the area (Ministry of Innovation and Technology, 2020). The current plan is to switch the plant's fuel to natural gas in 2025.

Figure 10 shows the total gross electricity production by source in 2017.

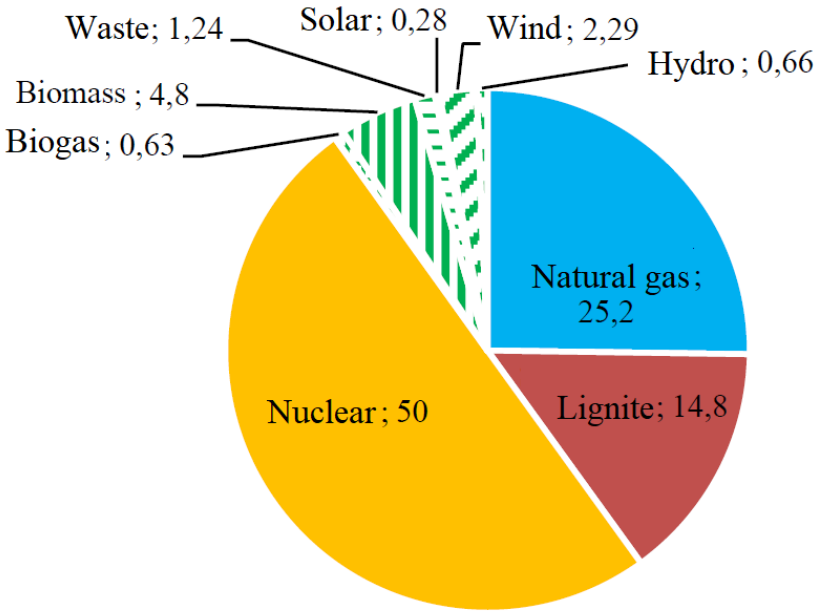

Figure 10: Total gross electricity production in 2017
Source: National Energy Strategy (2020), page 36

The renewables' share in 2018 was at 12.5% of the total electricity production, this is barely lower that the 2020 goal of 13% that Hungary pledged to the EU. Biomass has the highest share among renewables, which comes mostly from forests in the form of wood. The second largest source of biomass is from unused parts and by-products of agricultural products such as cereals. Other sources include reeds and roots of trees. Fortunately, Hungarian power plants nowadays are utilizing a mix of fuels, so biomass is included in the fuel of the coal and oil power plants, too. Wind energy has the second highest share, as Hungary has 37 wind energy plants in total with 179 towers in total. Unfortunately, there have been no new capacities added in recent years and there are no plans for further wind capacities. Experts expect that it will remain the same in the coming decades (Ministry of Innovation and Technology, 2019). This is due to a policy which renders wind capacity installations impossible in the country, which will be detailed later in the policy recommendations section. After a declining share of wind energy, there is a shrinking share of hydro energy, because there are 4 hydro power plants in Hungary, and the plan for one plant, near the Bős-Nagymaros Barrage, were scrapped in 1989 partly because of environmental reasons. New capacities are not added because there are no large differences in elevation in the country, and there is concern for the well-being of local plant and fish species, thus there are no plans for new capacities.

Apart from hydro, there is an almost absent geothermal energy with huge potential. So far geothermal energy has been a major unused source of heat. Today, Hungary only uses about 10-15% of the potential geothermal capacity, even though geothermal could serve as a viable alternative to competitive energy sources (Ministry of Innovation and Technology, 2019). Geothermal energy could play an important role in heating residential homes, instead of burning imported natural gas. Solar energy, however, is expected to experience a huge uptake and will be one of the leading renewables in 2040. At the end of 2018, there were more than 50.000 houses equipped with solar panels and the rate of uptake is tremendous, because 1/5 of new installations were realized in 2018.

4.2. Hungary's plan to have a different energy mix in the future

The main goals of the National Energy Strategy (NES) are the provision of energy sovereignty, safety, keeping the cost of heat and electricity low and decarbonising the energy production (Jensen et al. 2018).

Under energy sovereignty, the NES states the reduction of import dependency of natural gas, by slowly substituting it with renewable and nuclear power. Part of the plan, is to extend the construction of gas pipes with more countries e.g. Slovenia and Croatia and decrease the gas import from 80% to 70% by 2030 (Ministry of Innovation and Technology, 2020). This will result in a better negotiation position and more security. Figure 11 depicts the current gas pipe routes with continuous lines and the planned routes with dashed lines.

Figure 11: Hungary's existing and planned main gas pipelines in 2019
Source: National Energy Strategy (2020), page 70

Carbon neutral electricity production is set to reach 90% by 2030, led by nuclear, biomass and solar energy. Greenhouse gas emissions are set to be 40% below 1990 level by 2030 (Ministry of Innovation and Technology, 2020). Current gas plants will be used mainly to maintain supply and complement the electricity from variable renewable sources. These variable renewable sources will be complemented with batteries as a backup storage to make energy flow constant. The long-term plan for the Visonta coal plant is that it will be only used as a back-up capacity, the older blocks will be phased out gradually (Ministry of Innovation and Technology, 2020).

The government stresses without specific target numbers that there is a need for a more rational and modern utilization of biomass. Priority should be given to biomass produced from waste, biomass produced in a backyard farm and used in an energy-efficient building and boiler. The goal is to extract biomass from sustainable farming by encouraging the planting of energy tree plantations (Ministry of Innovation and Technology, 2020). The emphasis should also be placed on transportation and the implementation of better processing and shredding techniques.

The NES details that electricity consumption from renewable (13.3% in 2017) will reach 20% in 2030 and will have a 30% share in 2040. Figure 12 shows the share of energy consumption by different sources in 2017 and a projection to 2030.

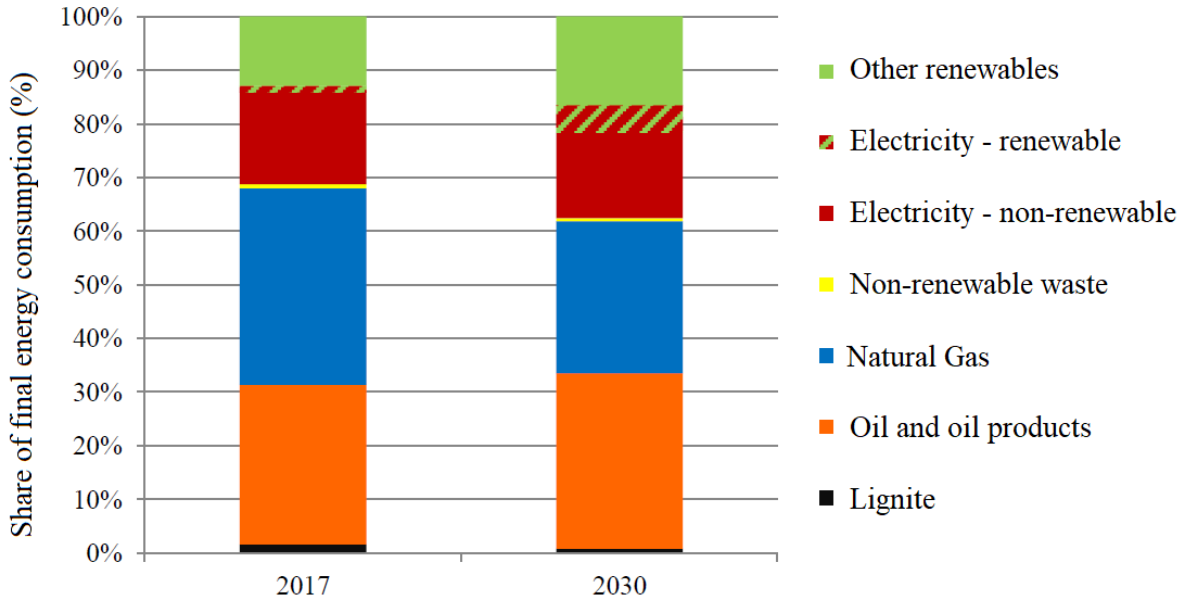

Figure 12: Share of energy consumption by source in 2017 and 2030
Source: National Energy Strategy (2020), page 32

It is clear that oil and its products will play an important role in the future as well, this is because the NES does not detail a plan on reducing oil consumption in Hungary in the near future (Ministry of Innovation and Technology, 2020).

4.3. The state of Energy Communities in Hungary

The NES states that citizen-led initiatives have a part in achieving these targets. One of the goals is that every district needs to have at least one well-functioning energy community by 2030 (Ministry of Innovation and Technology, 2020). The government aims to achieve this by initiating tenders for solar photovoltaic (PV) plants every few months, starting from the end of 2019. Financing is a huge factor and these projects can be realised from the Just Transition Fund and Modernisation Fund, which are EU funds as well as the Renewable Energy Support System (METÁR) which is a new, tender based Hungarian governmental funding system (Hungarian Energy and Public Utility Regulatory Authority, 2017).

Energy communities will produce, use and even store unused energy in batteries locally. The Hungarian government suggest that it will happen almost entirely by solar power, due to the cost effectiveness and increasing efficiency of solar PV (Ministry of Innovation and Technology, 2020). This is the main idea behind energy communities.

According to the Ministry of Innovation and Technology (2020), the main barriers of establishing energy communities can be categorized into four groups. First, Hungarian policies does not acknowledge energy communities as a legal entity right now, so it is vital to create new policies, which handle energy communities apart from individual consumers. Helping new communities administratively by simplifying all legal processes is also part of the solution for legal problems. Second, there is a lack of smart meters on most residential houses, so it is currently not possible to distribute costs among members of a community. Implementing a policy that regulates the

replacement of old meters by smart meters is a key point and it is already part of the NES. Third, the financial support is still lacking and it is a handicap for energy communities that both they and companies are competing for the same renewable subsidy budget. Forth, micro-grids are not a well understood form of energy distribution in Hungary, so consumer information and education are also vital to develop these projects. The NES emphasizes the creation of legal conditions in the short term. In the long term, the replacement of meters and the shifting of grid operator's mentality and incentive system from the current tariff based large-scale system to a nuanced micro-grid-based system is of key importance.

Successful energy community initiatives are scarce in Hungary, but not absent. There is one successful community in Derekegyház, where the municipality cooperating with local civil society has installed solar panels on the roofs of common buildings, uses bacteria to clean the water of the sewers, uses biowaste to heat common buildings and locally grows plants to feed the children of the local school (Association for Hungarian Environmentalists, 2016). There are other successful projects in Hungary, such as the Wekerle Insulation Brigade which operates since 2009 and the Strawbale House project since 2016, to name a few (Association for Hungarian Environmentalists, 2016).

Of course, the issue of establishing energy communities is a Europe-wide question, so Hungary does not have to do everything on its own. Hungary is part of some European level initiatives which are some form of support platforms for energy communities. An EU-funded project, Community Power is an initiative, that aims amongst others to make recommendations to enable policy change in European countries (Hungary included) and to make recommendations to support community energy projects in the EU.[7] Another aim of Community Power is to educate and engage citizens on community renewables projects in Eastern European countries.

Apart from this initiative, interactive maps help in a promotional way. Repowermap is a platform, where participants can show their projects by tagging their location on an interactive map, which is coupled with local information in each contributing person's neighbourhood.[8] This serves as a promotional platform and anyone can contribute to this page from Europe. 100% RES Communities is another platform which brings together successful initiatives as a way of informing citizens about the benefits of starting an energy community.[9]

Last but not least, there is the Central and Eastern Europe Sustainable Energy Network (CEESEN), which is an online platform created to facilitate communication and unite different energy actors in the regions. In their own words, CEESEN claims on their homepage that "with the support of the project partners and wider involvement of the CEESEN network organizations and individuals can start to design the sustainable future for their community.".[10]

Apart from the economic and environmental benefits, these communities create stronger ties among members (Association for Hungarian Environmentalists, 2016).

[7] https://www.communitypower.eu/en/publications.html
[8] https://www.repowermap.org/about.php?ln=en
[9] http://www.100-res-communities.eu/about-the-action
[10] https://ceesen.org/panel2050/

5. RESULTS

This chapter aims to report about the results of the 11 stakeholder interviews. It is structured as follows. Section 5.1. deals with the current occupation of the interviewees and their connection to energy communities. Section 5.2. lists the main barriers that hinder the creation of energy communities. Section 5.3. explores the role of individuals in the Hungarian energy transition. Section 5.4. details some of the main factors which could facilitate the establishment of new energy communities.

5.1. Occupation and energy community involvement of stakeholders

All interviewees had in common that they were all some way or another involved with the setting up of energy communities in Hungary. When asked about their occupation and their connection to energy communities, three interviewees said that they are working towards creating an energy community together, and currently they are occupied with overcoming the barriers ahead of them. One such issue "is finding the correct business model in which the energy community operates".[11] Another said that he already tried to create an energy community with little success, because he "could not find the right business model for the energy community".[12] One stakeholder is working on making suggestions for policy makers on the legal and administrative issues of energy communities and has already helped with the establishment of a community based residential energy efficiency upgrade project.[13] One stakeholders is working on educating the public about energy communities through international examples.[14] One stakeholder makes renewable energy feasibility studies for cities.[15] These feasibility studies detail plans for involving local municipality and the creation of local energy communities as well. Two stakeholders work in the solar energy sector and "would like to create community solar power plants" as they "have been working on this for years now"[16]. The remaining two stakeholders do not have a direct connection with energy communities, although they work towards a future in which establishing energy communities will be easier.[17]

5.2. Hindering factors to the development of energy communities

5.2.1. Categorization of hindering factors

All interviewees confirmed that there are several barriers for the development of energy communities, ranging from socio-cultural, to policy, and to political, financial and motivational problems in Hungary. Two socio-cultural issues could be identified, which were mentioned by almost all of the 11 interviewees. First, several interviewees mentioned that there has never been an energy producing community established in Hungary, thus there are no good examples on how to establish or operate these communities successfully.[18] The second socio-cultural problem as stated by the interviewees is that the public has no knowledge on energy communities, and renewables generally.[19] Currently citizens are not exposed to environmentalism in Hungary, thus only those people know

[11] Interview 2, 3, 10
[12] Interview 8
[13] Interview 5
[14] Interviews: 7
[15] Interview 9
[16] Interview 1, 11
[17] Interviews: 4,6
[18] Interviews: 1,2,3,8,11
[19] Interviews: 1,2,3,5,7,9

much about sustainability and environmentally friendly solutions who express an interest in these topics and take the time to educate themselves.

5.2.2. Policy caveats

Four interviewees reported that currently, there are no policies that facilitate the establishment of energy communities. On the contrary, there are a few policies that make it almost impossible to establish such a community.[20] Currently it is not possible for a group of people to produce energy without them being in some form of legal partnership, e.g. a limited liability company. One of the interviewees said that they tried to create an energy community for years, however, none of the legal forms of partnership were ideal for such a community, thus, partly because of this, the administrative barriers made it impossible for them to establish such a community.[21]

Another policy problem as told by the stakeholders is that there was no policy framework facilitating the emergence and operating of energy communities so far, although implementing the EU Renewable Energy Directive in Hungary will change this situation.[22] The government must transpose the guidelines by the second half of 2021. According to one of the interviewees, the Ministry of Innovation and Technology and the Ministry of Justice have been working continuously to ensure that this law package is implemented in Hungary, and this innovation will be a major step towards establishing energy communities in Hungary.[23] Almost all respondents mentioned the importance of implementing the Renewable Energy Directive when talking about solutions.[24]

A very important recurring element of the interviews was the fact that seven respondents stated that using solar PV is by and large the only technology suitable for use in community projects. Wind energy, for example, was not mentioned at all.[25] A possible reason for this could be that there is a policy in Hungary, which makes it impossible to install large (500kW+) wind capacities, because it is not allowed to build wind power plants in the 12-kilometre radius of a settlement in Hungary. Incidentally, there is not any geometrical point in Hungary, which is outside of a 12-kilometre radius of the settlements, because small villages are distributed that way and because this 12-kilometre radius was chosen with a purpose. However, solar PV is thriving in Hungary, the amount of new installations is increasing every year. The size, applicability and uninterrupted (no fuel requirement) operation of solar panels make them superior to all other forms of energy production when citizens consider a new instalment. Every time interviewees talked about community projects (with energy production in mind) they referred to solar power.

The next major policy problem is that energy trade is bound by entitlement in Hungary. This means that anyone can produce energy (with e.g. solar panels), however, selling the produced energy on the energy market is the privilege of mostly government owned energy producing companies. The electricity provider buys back access energy from solar panel owners at a very low price. Thus, producers are incentivized to produce no more energy (i.e. install small capacity) than they directly use. Furthermore, every time a family installs solar panels on their rooftop, they have to ask for permission from the HEA.[26] It is not very complex for families to apply, although sometimes the

[20] Interviews: 1,2,3,4,7,11
[21] Interview 8
[22] Interviews: 1,2,3,4,7,9,10
[23] Interview 5
[24] Interviews: 1,2,3,4,7,9,10
[25] Interviews:1,3,4,5,8,10,11
[26] Interviews: 1,9

administrative process takes months (in the case of communities) and there are many conditions the house and the surroundings have to meet to be accepted. Right now, when a community tries to apply for solar panels, they are rejected every time. The rejection stems from the fact that only one consumer can be allocated to one electricity meter.

There is currently a solar panel subsidy, which is called Small-scale Household (Renewable) Power Plant (HMKE). This scheme can be considered a big step towards prosumerism, although it is only applicable to single family homes. With this system, the single electricity meter of one house has a back-and-forth annual balance billing to the extent of its own production/consumption. Thanks to this, household solar systems can now be set up in a fairly simple billing system. However, with the HMKE system there can be only one consumer for every electricity meter which is not true for communities. The problem is that HMKE incentivizes only families in detached houses to become prosumers and not people living in apartment houses.

5.2.3. Political issues

According to some respondents, the government is not keen on extending this HMKE policy to apartment houses, because the state would prefer to remain the central power of energy production in Hungary.[27] In other words, the energy production is very centralized in Hungary.[28] This statement can be supported by the fact that the largest energy production companies in Hungary are state owned.

Another political problem stressed by some interviewees is the contemporary "overhead reduction" of natural gas, water and electricity for households.[29] This campaign started in 2013, with the aim of seemingly enabling the population to receive gas, water and electricity for their homes at a reduced price. In reality, however, this loss of money is paid by the corporate sector. They pay more for utilities than citizens do and energy producers have to bear the costs of production, too. The low electricity prices for consumers coupled with a low selling price for produced energy (e.g. with a HMKE system) makes financial benefits negligible for solar panel owners. This greatly hinders the ability to establish a profitable business model for energy communities.

There is one more important contemporary political problem, which was mentioned by three respondents.[30] This problem concerns the expansion of the Paks nuclear power plant. Currently, the plant has four working blocks, the construction of two additional blocks has been under discussion for the past ten years and it seems that construction is going to begin soon. Recently, the expansion of the plant has become a public concern for many people, not only because of safety reasons, but also because the development of the two new blocks will be realized with the help of a large loan from Russia, hence increasing Hungary's dependency on that country.

5.2.4. Financial problems

Two stakeholders mentioned that the main problem for many people in Hungary is the lack of funds, as they do not have a savings account, and for them it is unimaginable to set aside some percentage of their pay checks to finance renewables (solar panels for example), even if they joined a common project of an energy community to finance a shared investment.[31]

[27] Interviews: 3,9
[28] Interviews: 1,5,9
[29] Interviews: 1,2,6
[30] Interviews: 1,2,9
[31] Interviews: 2,8

Respondents also expressed their concerns that the lack of a "Green Bank" which specializes in renewable energy investments, is a major problem, as there are no financial institutions to turn to for renewables loans. [32]

On top of financing deficiencies, subsidies for renewables are also scarce, as explained by three stakeholders.[33] Apart from the HMKE system, there is the relatively new METÁR system. METÁR is a tender based Hungarian governmental funding system that has been in effect since 2017. Within the METÁR system, the potential receivers of the funds compete by offering up a price at which they are willing to sell their energy on the electricity market. The electricity sold at the lower price will be sold on the energy market, thus the government will subsidize large electricity producers who are willing to sell energy at a low price. Unfortunately, large and small electricity producers compete in the same tenders and small producers such as energy communities cannot afford electricity prices as low as a large company, so they start at a disadvantage at these auctions.

5.3. Motivational problems hindering energy communities - The role of the individual in the energy transition

Concerning the role of the individual in the energy transition, the lack of community consciousness was mentioned by two respondents.[34] One interviewee has also explained the background of this issue.[35] This interviewee said that the lack of community consciousness stems from decades ago, from the tradition of cooperatives. During the years of socialism there was a forced "cooperativization" that was not seen by members as a voluntary association. It was not a bottom-up form of cooperative, but a membership extended to almost everyone, not much different from a state economy. With the change of regime, a political resistance was created against this idea and these organizations disintegrated.

By now, there is not as much resistance as in the early 1990s. The legacy of this era is that the Hungarian population has become a very individualist society, compared to citizens in neighbouring European countries. This strong individualism can be partly explained with a change of mindset and mental response, a strong opposition towards forced "cooperativization" that developed inside the minds of Hungarians during the socialist era. Although these memories are fading (a generation has grown up since the end of socialism), there is still little trust towards each other and scepticism towards community initiatives.

According to this interviewee, the solution for this problem would be that people start thinking outside of their immediate interest and start thinking more in terms of community benefits, instead of individual benefits. This stakeholder illustrated the individualist nature of Hungarians by showing a map based on the work of Geert Hofstede. The map shows European countries, where each country can be placed on a scale depending on how collectivist or individualistic views people have. Subsequently, a blogger created the map based on the data. This exact map is not found in a study, but on an internet blog.[36]

[32] Interviews: 2,3
[33] Interviews: 1,7,10
[34] Interviews: 4,8
[35] Interviews: 4
[36] https://www.eupedia.com/forum/threads/26956-Map-of-Individualism-(vs-Collectivism)

The map is shown on Figure 13.

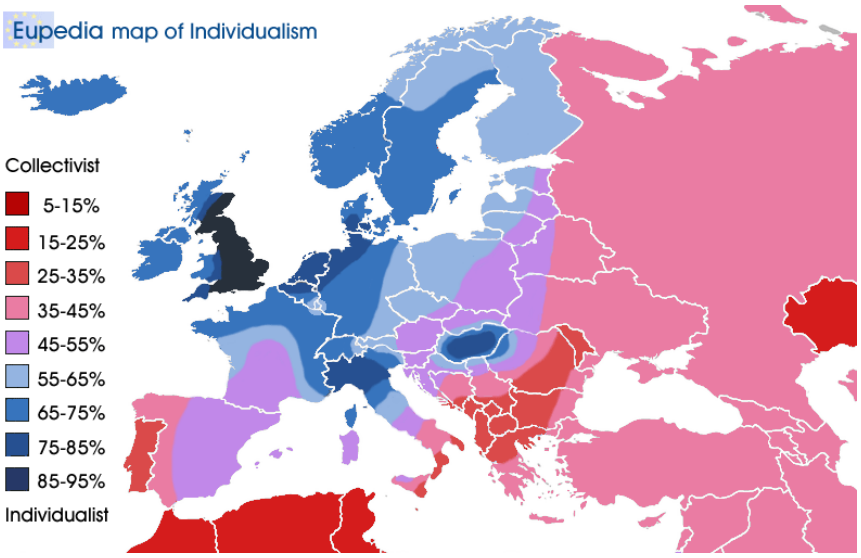

Figure 13: European map of individualism and collectivism
Source: Europedia blog: Map of Individualism

Another motivational problem mentioned by three respondents is that there is nothing that directly motivates the formation of energy communities.[37] They explained that thinking only about the sustainability and environmental benefits is not enough for many people to start building renewable power plants, they also need financial incentives (such as increasing the sales price of electricity for households and communities).

Another problem mentioned by two stakeholders is the absence of agencies where people with energy community aspirations could receive information on the administrative and legal background of setting up an energy community.[38] A few of the interviewees expressed their concerns regarding this matter, although they admitted that currently, the government's stance is not to encourage the formation of energy communities. The interviewees came to the conclusion that such a helping agency will not be created by the government until there is a change of mindset, i.e. not before Hungary implements the Renewable Energy Directive.

5.4. Next steps to be taken to facilitate energy communities

The interviewees made several recommendations to help energy communities develop further, imagining that they were the prime minister of Hungary. The recommendations are ranked in descending order by number of people proposed the same policies. First, what the government could do is the implementation of the EU Directives, which is a major factor that is decisive on the future of the development of energy communities in Hungary.[39]

Second, opening up the electricity market for every actor would be a major step forward.[40] Interviewees said that opening up the market for everyone would facilitate the democratization of energy and would lead to decentralized energy production.

Third, for the lack of education, the unanimous answer was the need for education.[41] This education can come in the form of state intervention that could inform people about new solutions for climate change, because at the moment most citizens acknowledge climate change as a problem,

[37] Interviews: 1,7,10
[38] Interviews: 3,9
[39] Interviews: 1,2,3,4,7,9,10
[40] Interviews: 1,2,5,8,9
[41] Interviews: 1,3,4,9,11

but they think they have no way of reversing it, only the government has the power to do something in this matter.

Fourth, for the lack of a community consciousness of Hungarian people a change of mindset is needed from the part of the public and from the government as well, but people can also start small scale community projects to sway towards more community action. This can be in any form, e.g. community waste collection without any money involved.[42]

Fifth, for the issue of the too centralized nature of energy production in Hungary a suggested solution was mentioned that decentralizing the energy production by introducing more small-scale producers would decrease the import and state dependency.[43]

Sixth, as the Paks nuclear power plant became an issue for many people, a solution recommended by one interviewee to mitigate public concern is to use the development money that would go to the expansion of the Paks nuclear power plant to secure a tax reduction for solar panel installers.[44]

Seventh, facilitating some form of program or agency which specializes in educating the public on the advantages of installing renewable energy and the power of working together in a cooperation with those living around them is key for people to be able to make responsible long-term choices.[45]

Eighth, two interviewees suggested that the government should help by creating policies so that communities will be able to build renewable capacities.[46] Another stakeholder proposed that the state should give technical assistance to people who would like to initiate community projects.[47]

Nineth, for alleviating the financial burdens, two respondents answered that establishing a "Green Bank", which supports energy community funds would be a great solution for financial issues.[48] Such an institution could also provide information on how an energy community may be managed and operated from a financial point of view. State loans and tenders offered in smaller sizes were among stakeholder suggestions as well.[49] This opportunity would make energy communities able to apply for the tenders and they could have a chance to secure funds.

Tenth, there are many solutions for people with lower incomes. Two respondents mentioned the EU Cohesion Fund as a source for solar investments.[50] However, respondents also suggested that people generally should be more conscious about their energy consumption, this would greatly impact their consumption patterns and reduce monthly costs.[51] There are also state provided home renovation grants which aim higher energy efficiency for apartment and house owners.

Eleventh, the extension of the current HMKE system. Thanks to HMKE, household solar systems can now be set up in a fairly simple billing system. This is widely appreciated by the population and more and more people turn to this system. Today, solar panels are no longer a luxury investment, but a completely average building investment for single-family homes. The introduction of HMKE was a major step from the government to push consumers to become prosumers. Two respondents said that they would extend the current HMKE incentive to apartment houses, because today one can only use this system for a single electricity meter.[52]

[42] Interviews: 2,3,4,9,10
[43] Interviews: 4,5,7,8
[44] Interviews: 1,2,7,9
[45] Interviews: 3,4,11
[46] Interviews: 1,8,10
[47] Interview 2
[48] Interviews: 2,3
[49] Interviews: 2,6,8
[50] Interviews: 1,2
[51] Interviews: 2,4
[52] Interviews: 10,11

6. DISCUSSION AND LIMITATIONS OF THE RESEARCH

6.1. Discussion

This study aimed to understand what governmental policies could enable the establishment of successful energy communities in Hungary by 2030. As a method, a literature review on contemporary literature on energy communities and Hungarian governmental documents were used as well as 11 semi-structured interviews with Hungarian stakeholders in the renewable energy sector.

The interviewees highlighted some hindering factors that do not only hinder but also disable the establishment of energy communities in Hungary. This was quite unexpected, because the National Energy Strategy (NES) painted an entirely different picture; full of potential and a thorough guidance to achieve the goals presented in the document. The potential is still there, however, there are no policies which could facilitate growth in community initiatives, even though some people are trying to establish a community, unsuccessfully nonetheless. The findings imply that government goals are indeed achievable, however, prompt measures must be taken to move forward the current situation. This proposed measure package comes in the form of policy suggestions taken from the interviewees categorized in five solution areas to solve as many problems (when implemented) as possible.

Perhaps the most important finding, and also surprising was that (stated by six stakeholders) the public has no knowledge on energy communities, and renewables generally. This is interesting because the NES only briefly mentions the importance of educating the younger generation (still in educational institutions), implying that the older generations have all the information needed to lead a green life. Yet, interviews suggest otherwise. This is an important feedback from citizens, because according to the interviewees, there is a need for education on the importance of renewables and energy communities and apparently current bottom-up initiatives on information dissemination are not enough or are not taken seriously enough. The government could be a leader in educating the public, which would result in a faster uptake of renewable energy technologies.

Another interesting finding was that Hungarians live in a very individualist society compared to neighbouring countries. This is important, because this greatly influences motivations when establishing an energy community. Holding personal values higher than community values hinders community projects, thus people need to change their mindset to a more community centred thinking. A suggestion for this problem would be for people to start with small project, maybe on a street level, by community waste collection with neighbours or similar projects.

These findings were perhaps the most unexpected, yet notable ones, the other ones, given Hungary's little experience with community initiatives were not surprising, but important nonetheless.

The theories set up with Social Niche Management (Hargreaves et al. 2013) are verified in the results, in Hungary, energy communities are in the technology incubation phase, and probably from next year, this concept will start to slowly evolve into the market phase, when the policies are ready for the establishment of energy communities. Regarding the types of existing energy communities based on the legal structure presented by Caramizaru & Uihlein (2020), the findings show that although many forms are possible, none are working examples in Hungary, because there is some issue with all any types of legal structure at present. Relating to the activities of energy communities, Hungary lacks proper policies, thus struggles to facilitate even the energy generation and sharing activities, not to mention supply and distributional activities. These activities will be developed later, once establishment will be a smooth process. Different renewable energy technologies are specified

in the theoretical framework (Caramizaru & Uihlein, 2020), yet the results show that citizens in Hungary think in terms of solar energy, as the by and large the only source of renewable energy when they imagine to own it.

Regarding the Community-Based Strategic Planning (Mendes et al. 2011) proposed in the theoretical framework, three out of the four groups of stakeholders were represented in this study, i.e. groups of people with technical background, citizens affected by policies and local investors. A limitation of this study was the inclusion of groups of people with power, i.e. government officials. The importance of stakeholder mix and distribution of voting-power (Hicks & Ison, 2018) do not play a significant role in Hungary, because the current data do not cover stakeholder opinion on the importance of stakeholder mix and distribution of voting-power. Implementing the right policies to enable their existence is the most important step, and deciding on the stakeholder mix will be an issue of the future.

The motivational factors theory proposed by Sloot et al. (2017) indeed gave a solid ground at which the reality could be checked against. Stakeholders verified that currently Hungarian is driven by individual motivations, such as monetary benefits of installing renewable energy capacities, therefore they are still at the first step of realising the potential of benefits given by community initiatives. Stakeholders gave suggestions to the society's individuals to start thinking in terms of communities and not just their own benefit and start to work in collaboration with those around them on any kind of small-scale sustainability project.

Speaking of the enabling and hindering factors to the establishment of energy communities in Hungary, the Oteman, Wiering and Helderman (2014) study introduced the categories that were later used to categorise the suggestions taken from interviewees and the Brummer (2018) study introduced the hindering factors category that were later used in the results section to categorize the issues presented by stakeholders. The categorizations are different in their names only, and they are directly comparable (except for one category) with the ones Oteman, Wiering and Helderman (2014) and Brummer (2018) introduced in their works.

It is certainly notable that the facilitating factors discovered in Western European countries are comparable to the ones that are suggested by Hungarian stakeholders, meaning that the factors which are important to be present in Western European societies with many energy communities can play a role model in the eyes of Hungarian policy makers.

This study helps to fill the gap between government goals and current reality, and also serves as a Hungarian case study, a study focusing on energy communities never written before. The results are valuable for Hungarian policy makers, however, these results might not be applicable to other Eastern European countries, because of the unique individualist view of Hungarians, although other issues may be relevant (lack of financial support, lack of knowledge) for neighbouring countries with similarly little experience with energy communities.

6.2. Limitations of the research

While this study has answered the research questions set out in the Introduction, there are also limitations to both the method and findings.

First of all, the chosen method greatly limits the number of conductible interviews during the three months of research, because data analysis (transcription, translation, highlighting recurring elements, creating tables to synthesize the given answers) takes up much more time than in the case of surveys. Another limitation factor, regarding strategic stakeholder selection was the exclusion of members of real energy communities (because they do not exist in Hungary) with their own (or partially owned) renewable energy capacities.

A further limitation of the study is that the results only apply to Hungary because of the very specific legal and cultural background of the country and its population. Although the results may not be applicable to other countries, they are significant for Hungary and for Hungarian policy makers. Only time will tell when and how these suggestions make their way to being implemented and facilitate the growth of Hungarian energy communities.

Last but not least, another limitation of this research, regarding the ongoing pandemic, is the fact that many people did not respond to the request to participate in an interview, who otherwise, upon agreeing to be questioned would have expressed a different perspective, especially in the case of governmental officials, who have been left out of the research due to being unavailable.

7. CONCLUSION AND RECOMMENDATION FOR FURTHER RESEARCH

7.1. Conclusion

The concept of Social Niche Management in the theoretical framework coupled with the background data of the literature review provided a solid theoretical basis for the research, the only step was to verify these theories through testing, i.e. by asking specifically tailored questions from relevant stakeholders in the renewables sector, the socio-technical niche in which this study takes place.

The main research question was the following: What governmental policies could enable the establishment of at least one successful Energy Community in all 174 districts in Hungary by 2030? Before answering the main research question, the sub-questions will be answered, because once the answers of the sub-questions are put together, they will also answer the main question.

The first sub question was as follows: What is the current state of affairs in Hungarian energy transition in general and of energy communities specifically?

This question refers to the National Energy Strategy (NES) and its many goals set by the Hungarian Government. These goals focus on a slow but steady transition away from fossil fuels towards a higher percentage of renewables and nuclear energy. Furthermore, the document emphasizes that Hungary has to decrease its dependence on imported gas and oil, which is planned to take place with a higher percentage of renewables in the energy mix by installing more capacities (of mostly solar). Hungary aims for a 20% renewable source of energy by 2030 (13% in 2020), and slowly increasing this percentage in the future. Although the document does not credit a large weigh to energy communities in the near future, the document does acknowledge the main hindering factors and acknowledges what shall be done as soon as possible to facilitate the growth of the renewable sector and community initiatives, too.

The second sub-question was the following: What enabling and hindering factors exist to the establishment and operation of Hungarian energy communities?

The answer can be found in Table 2 and Table 3. A categorized overview of all the main hindering factors is shown in Table 2. Enabling factors are coupled with policy recommendations taken from stakeholders and are depicted in Table 3 while answering the main research question.

Table 2: Problems Matrix sorted into five different categories

Socio-cultural	Policy	Political	Financial	Motivational
Energy Communities do not exist in Hungary	There are no enacted policies for the establishment of Energy Communities	Overhead reduction – water, gas and electricity at a lower price for households, companies pay more for electricity	People do not have much money for renewable investments	Government has no motivation to make an agency that helps the administrative and informative matters
The public has no knowledge about Energy Communities in Hungary	Some form of partnership needed to start a community energy initiative, however, today none is suitable for one	Expansion of the Paks nuclear power plant and its cost, the plant has become a public concern for many people during the past few years	No state tenders with the right size for the size of energy communities, only 0,5 MW capacity and above	Bad memories about cooperatives from the socialist era; people are sceptic, do not trust in each other enough to make cooperatives
	Energy trade is bound by entitlement; thus, it is very difficult to gain rights for energy sales	Government wants to remain central power of energy production	There is no bank that offers investment for cooperative initiatives	No community consciousness in citizens, very individualist population
	Government wants citizens to produce as much energy as they use, not more	Centralized energy production, only state-owned energy production companies	No subsidies to facilitate the growth of community investment	People invest in solar in single-family houses, but not in apartment houses
	EU directives not implemented in Hungary		High VAT rate (27%), 2nd lowest consumer electricity price in EU	Nothing motivates the spread of energy communities

The third sub-question was the following: To what extent are current governmental policies sufficient to accelerate the establishment of energy communities and facilitate their operation?

If one only studies the compiled table above, it shows a harsh reality in the shape a list of policy caveats that are revealed by Hungarian people who work at the core of energy transition. If one looks at the goals set by the government, it is clear that it depicts a detailed and thorough checklist, considering every aspect of moving Hungary away from the current heavy dependence on fossil fuels towards a more self-supporting country scheme. However, momentarily, these goals are only a wish list from the government, therefore, current policies are insufficient to accelerate the establishment of energy communities in Hungary.

The fourth sub-question was as follows: How should a set of policy recommendations look like that would facilitate the establishment and operation of energy communities in Hungary?

The answer can be found once all interviewee statements are accounted for. The interviewees suggested many policies ranging from social, governmental and financial aspects, aligning with the hindering and facilitating factors proposed by Brummer (2018) in the theoretical framework.

In spite of the current results, more interview data from a larger representative sample would be needed to strengthen the claims of the results. Although the interviewees all come from a diverse background, the answers given by them are relevant, because there is a considerable overlap between

the NES and the stakeholders' policy suggestions. The interviewees trust that once the problems mentioned by them and the NES are solved, energy communities will form without incentives, although in the beginning incentives will play an important promotional role. Therefore, the answer for the fourth sub-question is a thorough set of policy recommendations taken and synthesized from relevant Hungarian stakeholders. The set of policy recommendations are shown in Table 3 while answering the main research question.

The main research question shall now be answered. For the main research question, the answer is the policy package suggested by stakeholders. The main suggestions are, amongst others: the government should implement the EU Directives in Hungary, educate the public on renewables and energy communities and a change of mindset is needed (become more decentralized in terms of energy production). Apart from the government the public needs to become more community conscious as well to be able to establish energy communities in the near future. Table 3 visualizes the enabling factors, which are part of the main recommendations and solutions for the above stated problems, in a concise manner.

Table 3: Recommendations Matrix sorted into five different categories

Socio-cultural	Policy	Political	Motivational	Financial
Change of mindset is needed from the government and the also the public to establish Energy Communities	Government should help by creating policies so that communities can build renewables together	Democratize energy system (open up energy trade to everyone)	People can renovate their homes/ install energy efficiency upgrade	Education on how citizens can use EU financing options for their renewable investments
Develop an ecosystem favourable for Energy Communities	A specific % of a company investment into renewables should be offered to locals so can they buy into the investment	Decentralize energy production (install more small capacity renewables)	HMKE: consumers becoming prosumers – good first step – should be expanded to apartment houses	State should give loans to encourage initial establishment of Energy Communities
Break away from individualism, develop community consciousness	State should give technical assistance to people who would like to initiate community projects	Stop the expansion of Paks nuclear power plant	Government should create a counselling office to help people understand the administrative background of initiatives	Raise price of electricity sold back to provider to encourage more solar installations
	Develop a specific legal framework for a Savings company and Cooperative hybrid		Become more conscious about energy consumption	Establish "Green Bank" that gives support for Energy Communities
	Implement the EU Directives in Hungary		Educating the public on Energy Communities	Tax reduction for solar panel installers
				More state tenders with smaller capacity

In short, the answer to the main research question is that the aforementioned set of policy recommendations are the ones that would facilitate the establishment and operation of energy communities in the near future.

This study aimed to understand what the hindering and facilitating factors are behind the establishment of Hungarian energy communities. Besides a literature review on the current renewable's situation in Hungary, 11 semi-structured interviews were conducted with Hungarian stakeholders. Some of these stakeholders are working on making energy communities feasible for Hungarians by making suggestions to policy makers, while others work in the renewables sector to provide a solid technological background for energy communities, once they to develop. The interview questions inquired about these experts' opinion on the current barriers to the establishment of energy communities as well as their own policy suggestions for policy makers.

The answers given by stakeholders are relevant, because, despite their diverse background, there is a considerable overlap between the NES and the stakeholders' policy suggestions. The results of the study are promising, although a limitation of the research is the number of stakeholders interviewed.

7.2. Suggestions for further research

Further research is needed with a wider range of stakeholders, i.e. the inclusion of government and municipality officials and energy community members from other European countries with a backlog of many successful energy communities e.g. the Netherlands, Germany and Denmark.

Another suggestion would be to organize a survey among Hungarian citizens. This way, hundreds of answers could be recorded in a shorter time period and the result would be a more layered answer.

A suggestion for further research would be to ask members of tangible energy communities from other European countries about their opinion on the regional and local policies, the importance of these policies and suggestions for improvement or ask Hungarian members in two years when some communities have already been established.

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APPENDIX I – INTERVIEW GUIDE

Main Questions

1. How does your work relate to energy communities?
2. Do you think there are still barriers which hold back the formation of energy communities? - What barriers are these?

    Follow up: If the *government* is not mentioned, the next question is:

    2.1. How do you think the government can help in the formulation of energy communities?
3. What do you think citizens can do on an individual level to accelerate the energy transition in Hungary?
4. If you were the prime minister in Hungary for a day, which single policy would you implement to help energy communities?

APPENDIX 2 – TIME PLAN