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LECO

Local Energy Communities



PESTLE ANALYSIS

of Barriers to Community Energy Development

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1 INTRODUCTION

European Policy Context: The 2020 climate and energy package is a set of binding legislation to ensure the EU meets its climate and energy targets for the year 2020. The package sets three key targets:

- 20 per cent cut in greenhouse gas emissions (from 1990 levels)
- 20 per cent of EU energy from renewables
- 20 per cent improvement in energy efficiency

Under the EU Directive 2009/28/EC member countries of the European Union are obliged to draft and submit to the European Commission National Renewable Action Plans (NREAPs), outlining pathways which will allow them to meet their 2020 renewable energy, energy efficiency and greenhouse gas (GHG) target reductions.

EU 2020 targets

Measurement	2020 Target	Where Europe is at end 2016
Final Energy Consumption	20% reduction	Already achieved: in 2014 the FEC was only 1.6% above the 2020 target
GHG Emissions	20% reduction	In 2015, already 22% below 1990 level
Renewables in Final Energy Use	26%	In 2016, it was 17.0%
Energy Efficiency (Overall)	20% reduction in demand	On track to meet targets
Energy Efficiency (Public Sector)	33% reduction in demand	21% by 2015

Role of communities in the energy transition: Within the context of an energy transition to a low carbon economy, new roles for local communities are emerging, whereby they are transitioned from being passive consumers to active prosumers with the possibility of local generation, demand response and energy efficiency measures. The energy transition will require significant mainstreaming of niche social and technical innovations to succeed at the community level, for example electric vehicles, heat pumps, smart meters, sustainable energy communities, domestic PV, and battery storage.

Role of the LECo Project in community energy initiatives: The LECo project shall respond to the needs of remote communities for a sustainable energy supply. The project aims to deliver a set of locally adapted concepts for community based energy solutions in remote areas. These concepts will be modelled, developed and implemented in selected test communities in each participating country. The methodology for setting up such local adapted concepts and their implementation will be made available in the form of a practical guideline which can then be used for transferring the results to other locations.

Barriers to community energy: The LECO policy paper has identified common barriers to community energy projects (see below); the PESTLE analyses in sections 1.2-1.5 are specific to each of the Northern Periphery and Arctic (NPA) regions?

Societal, cultural, political and/or organizational:

- Lack of historic experience with cooperatives and civic activism
- Low trust in the cooperative model as a viable alternative
- Lack of political support from local representatives
- No experience with setting up cooperatives
- Organisational challenges – pre-planning stage barriers

Legal, administrative, bureaucratic:

- Complicated legal framework, high levels of bureaucracy to acquire licenses
- Lack of national community energy strategy; lack of national targets for community energy projects, which then are broken down in Local Energy Action Plans by local authorities
- Bureaucratic barriers to grid connection (complicated application procedures, uncertainty of approval, costs, time consuming)
- Not allowed to operate micro-grids - producing, own-use, selling within community, selling to third-parties – as compared to only: sell it to the grid and buy it back (often with low financial returns to the community – profits are again made by companies outside the community, which defeats the idea to keep revenue within the community)
- Lack of supportive local authorities and/or local energy agencies
- Generally no support schemes for Renewable Energy Sources (RES) projects

Technical:

- Technical challenges – lack of expert knowledge to design, plan, procure, implement, commission a project
- Lack of expert knowledge for operation and maintenance
- Size of energy project

Financial:

- Financial challenges in the initial stages of project development; access to finance, grants, etc.
- Fair and secure payments for energy generated (insufficient Feed-in-tariffs (FIT), FIT only for wind, but not for Solar PV, no standardized PPAs, third-party-offtake not possible)
- Insufficient incentives for renewable heat projects: replacing fossil fuel heating with biomass boilers or solar thermal, heat pumps
- Complicated tax rules, no tax exemptions
- Generally no tax incentives for RES projects, lack of guarantees

Challenges in mature cooperatives:

- Expansion of power generation, of number of members – how shall older and new membership shares be valued?
- Re-investment into existing installations

2 WHAT IS A PESTLE ANALYSIS?

A **PESTLE analysis** is a framework or tool used to analyse and monitor the macro-environmental factors that have an impact on an organisation or sector. The draft policy paper has identified common barriers to community energy projects; this analysis is specific to each of the LECo regions.

POLITICAL factors determine the extent to which a government may influence the economy or a certain industry. These include e.g. tariffs, legal frameworks, competition regulation, regulation and deregulation, tax policy (tax rates and incentives), government stability and related changes, government involvement in trade unions and agreements, import restrictions on quality and quantity of product, intellectual property law (copyright, patents), consumer protection and e-commerce, laws that regulate environment pollution. From an energy perspective, the factors may include: 2020 targets, grant aid, REFITs, tax regime etc.

ECONOMIC factors are determinants of an economy's performance that directly impact a company/industry and have resonating long term effects. They may include: inflation rate, interest rates, foreign exchange rates, economic growth patterns etc. From an energy perspective, the factors may include: cost of renewables, access to finance, and access to funding.

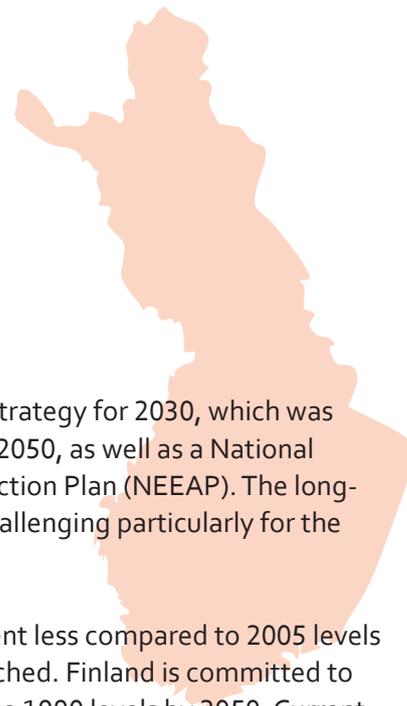
SOCIAL factors analyse the social environment of the industry, and assess determinants such as cultural trends, demographics, population analytics. From an energy perspective, the factors may include: community structures, level of engagement with communities, acceptance of the technologies, tourist impact, NIMBYism, and stakeholder impact.

TECHNOLOGICAL factors refer to innovations in technology that may affect the operations of the industry and include the levels of automation, research and development and also the level of technological awareness. From an energy perspective, the factors may include: renewable technologies, grid access, planning process.

LEGISLATIVE factors include the laws that affect that industry within a certain country and may include consumer law and safety standards. From an energy perspective, the factors may include: planning, access to resources, grid access, ownership models and local benefit frameworks.

ENVIRONMENTAL factors include all those that influence or are determined by the surrounding environment and may include climate, weather, climate change, and environmental offsets. From an energy perspective, the factors may include: Climate change, planning issues near protected areas, challenges associated with living in rural areas.

3 FINLAND



The latest national strategy of Finland is the National Energy and Climate Strategy for 2030, which was updated in 2016. There is also a report called Energy and Climate roadmap 2050, as well as a National Renewable Energy Action Plan (NREAP) and a National Energy Efficiency Action Plan (NEEAP). The long-term objective of Finland is to become a carbon-neutral society, which is challenging particularly for the energy sector.

Finland's national target for reducing greenhouse gas emissions is 16 per cent less compared to 2005 levels (EU target 20 per cent less compared to 1990 levels). This target will be reached. Finland is committed to EU's goal of reducing greenhouse gas emissions 80–95 per cent compared to 1990 levels by 2050. Currently, 80 per cent of the greenhouse gas emissions are caused by the production and use of energy.

Finland's national target for the share of renewable energy is 38 per cent of final energy consumption in 2020 (EU target 20 per cent). This target was first reached in 2014. In 2017, the share of renewable energy was over 40 per cent. In the National Energy and Climate Strategy for 2030, the aim is to reach over 50 per cent of the final energy consumption (EU target 27 per cent). A strength in renewable energy in Finland is wood-based bioenergy. In 2017, the percentage shares of total energy consumption of wood fuels were 27 per cent, and e.g. wind power 1.3 per cent. Most important renewable energy sources are bioenergy, hydropower, wind power (since 1990), geothermal and solar energy. Bioenergy accounts for 80 per cent of renewable energy forms in Finland and includes wood and wood-based fuel such as wood residue and waste, black liquor and other by-products of the forest industry, as well as peat.

The EU 2020 target for energy efficiency is 20 per cent saving in energy. In 2013 Finland has given the indicative target for final energy consumption to be 310 TWh in 2020. In 2016, final energy consumption in Finland was 25.8 Mtoe = 300.1 TWh. Energy saving of 20 per cent in 2020 will be reached.

3.1 PESTLE Analysis – Barrier analysis specific to Finland

1. ENERGY POLICY AND CONFLICTING INTERESTS: Earlier, energy policy in Finland has concentrated on the price and availability of energy [2]. Later also emissions and now also business activity and employment are taken into account. Therefore, there have not been instruments to encourage independent energy solutions of small-scale consumers. Legislation / policies should become more dynamic in order to include consumers to the markets [7]. However, the change in energy markets is difficult to accept for the traditional energy companies [6], and there is conflict of interests of the following five groups in energy discussion: 1) Traditional energy companies, 2) energy-intensive industry, 3) developers and producers of technology, 4) environmental organizations, and 5) large producers of pulp and paper [2]. Small-scale energy production is not an advantage for energy companies (there have been enormous investments in the old system: nuclear power and fossil fuel) [2; 4], and it does not increase total effectiveness of the society [9]. Support and high subsidies for conventional energy system and fossil fuel lobbying are barriers for small-scale energy production [4]. People experience that the energy policy in Finland has been shortsighted: the support has been directed periodically to different forms of energy production, which makes long-term investments is challenging [6]. People also feel that there is too much bureaucracy and regulation: emission trading, production aid for electricity, the size/scale and origin of the wood that is used for energy etc. [6] Current legislation and forms of support/ funding are diverse, and there is lack of knowledge about possibilities of local renewable energy resources but also supports / funding of them [7]. There may also be administrative and technical barriers to market access (related to licensing /authorization of construction projects, connecting the small-scale production to electricity network as well as measuring surplus electricity) [1].

2. PROFITABILITY OF INVESTMENTS: An important barrier for local energy communities is the profitability of the investments. Low prices of electricity make it difficult to get any form of electricity production profitable, especially if the electricity is fed to electricity markets. Producing electricity for the own use may be profitable. [3; 4]. Thus dimensioning e.g. solar panels according to needs is important and e.g. small CHP are not profitable / are difficult to get profitable [3; 7]. Barriers for investments can be lack of capital for initial investments, but also problems in accessing grants [6; 1]. Up to now, the Finnish tariff policy has favored wind power (Feed-in tariff has made the wind power profitable, but there has been some excessive support of wind power? [6]), but a technology neutral aid for renewable energy is coming. However, feed-in tariff does not apply to small-scale wind power plants (and conditions for small-scale wind power are not profitable inland) [3]. Tariff policy has not treated different forms of energy production equally, which prevents developing more diverse forms of energy production [7]. E.g. wood fuel usage would be better for the local economy than wind power [7]. In Finland there is no experience/tradition of cooperatives with wind power (which would have most potential for energy use, and would be profitable due to tariff policy) [6]. There is also opposition to wind power, partly NIMBY (due to noise, appearance, birds and bats), partly because local inhabitants do not perceive that they are benefiting from wind power / building wind power. Solar energy is also excluded from the current feed-in tariff system, and will probably not be competitive with wind power in the next support scheme based on auctioning [5]. The Government focuses on bioenergy and does not have solar energy targets [5]. There is hardly any support policy for solar energy in Finland (such as feed-in tariffs, green certificates with quota systems, investment and tax incentives, and bids on quota systems in other countries), although there is a growing interest to solar energy [4]. Housing sector, state properties and energy cooperatives cannot get investment grants (companies and municipalities get 25-40 per cent) [1; 5]. Single houses can get household tax deduction from the installation work of solar PV (5-10 per cent from the whole investment price), but house co-operatives do not get even that [5]. Thus competitiveness of solar energy and solar PV module [4] as well as attitudes are barriers for solar energy, although interest is growing and is (can be) profitable today in Finland. Calculations (angles, shadowing etc.) of profitability have to be done carefully, and thus knowledge is needed [9]. One barrier with solar heat is naturally that it produces most when it is needed least. Another barrier for exploiting solar energy better is the lack of

energy storage solutions [4], and regarding solar PV in energy communities: current legislation does not acknowledge house cooperative grids [5]. Current energy policy does not either support digestion plants at farms (would be solution both for nutrient recycling and energy production) [2]. Legislation/politics does not support utilization of the biogas potential (manure, forest and straw) at farm scale: Small biogas plant does not belong to feed-in tariff (100 kVA) [3; 6]. There is also lack on well-functioning technology for small-scale needs of biogas [7]. Gate fee prerequisite for the profitability of biogas. In addition to economic barriers, permission procedures for wind-power and biogas are time-consuming.

3. WOOD-BASED BIOENERGY: One strength of renewable energies in Finland is wood-based bioenergy. From the viewpoint of wood chip based energy co-operatives, barriers are e.g. access to supports and funding. It is not so easy for energy cooperatives to get money/funding, and shareholders' equity is needed. Only new heat plants can get support, not reparation of old ones. The requirement that an investment to be supported by business subsidy has to employ at least one person-year is difficult/unreasonable to fulfill for co-operatives. This prevents increasing number of small heating plants [6; 8; 9]. A conflicting interests regarding wood-based bioenergy is: influence of electricity / heat companies owned by municipalities may prevent development / generation of new smaller plant. Large companies of wood-sector oppose larger heating plants and use industrial wood for energy. Policy of town council and government affect the use of local energy resources: oil based fuel may be chosen only due to lower price, and the influence of using local energy resources on the local economy is not taken into account, neither the impact on climate. Wood chip plant can also be regarded more difficult / labour-consuming than oil based heating. Links/ties of decision makers in energy companies may also affect decisions in municipalities. [7-9]. Profitability of the plant depends on initial investment and annual costs as well as the selling price of energy. The payback period and estimated life cycle of an investment have to be taken into account. Optimizing the size of the heat plant and considering full load hours is important for profitability. Lack of suitable objects/sites (e.g. schools) especially at sparsely populated areas may be a barrier for the investment. In addition, permission and regulation in building may be a barrier. Discussion, facts and attitudes of CO₂ influence of burning wood is also a barrier for utilization of wood-based bioenergy [8, 9].

4. MORE SOCIAL BARRIERS: The general attitude that in these latitudes, other forms of heating than electricity and oil is just daydreaming [2, 4]. There is lack of knowledge about local renewable energy resources and about various support forms etc. [6, 7] There is also lack of time, lack of sense of community, lack of cooperation between farms (to be profitable, e.g. digestion plants should be large enough), lack of courage for making investments [6] and lack of enthusiasm. [2, 6, 9]. Social barriers regarding wood based energy cooperatives are interest and knowledge about cooperative model of decision-makers, and undervaluation of small entrepreneurship, and appreciating local energy. Also attitudes of neighbors (near-by real estates of the heating plant). Another social barrier is the ageing of the rural population. Heat entrepreneurship is often a secondary occupation beside agriculture, and this population is ageing, they have no desire for long-term investments. There is also lack of time, lack of sense of community, and lack of enthusiasm. [8, 9]

3.2 Summary

FINLAND: Barriers to Community Energy Projects	
<p>POLITICAL BARRIERS:</p> <ul style="list-style-type: none"> • Lack of history for encouraging small-scale energy production [2] • Shortsighted energy policy • Conflict of interest /vested interests: <ul style="list-style-type: none"> – Small-scale energy production is not an advantage for traditional energy companies [2] – Opposition to larger heating plants and using industrial wood for energy [7] – Links/ties of decision makers in energy companies [8] • Fossil fuel lobbying [4] • Government focuses on bioenergy, lack of support policy for <ul style="list-style-type: none"> – Solar PV [4; 5] – Farm scale biogas [6] – Small CHP-plants [3] • Tariff policy favors / has favored wind power [7] • Solar PV in energy communities: current legislation does not acknowledge house co-operative grids [5] • Administrative barriers to market access [1] • At municipal level: Decisions depend on the decision makers of the municipality [6; 9] • Policy of town council and government (e.g. only price of the chosen fuel considered) [8] • In small municipalities: lack of knowledge and resources for energy work [6] • Permission and regulation in building [8] 	<p>ECONOMIC BARRIERS:</p> <ul style="list-style-type: none"> • Profitability of energy / electricity production (low price of electricity) [3; 4] • Not profitable to sell surplus electricity [7] • Support and high subsidies for conventional energy system [4] • No capital for initial investments [6] • Problems in accessing to grants [8] <ul style="list-style-type: none"> – No feed-in tariff to small-scale wind power [3] – Small biogas plant does not belong to feed-in tariff (100 kVA) [3] – Hardly any support policy for solar PV [4] – Investment grants only for companies and municipalities get 25-40 per cent [1; 5] – Employment requirement for an investment to be supported by business subsidy [6] • Profitability of the investments <ul style="list-style-type: none"> – Initial investment and annual costs «» selling price of energy [8] – Return on an investment and profitability [8] – Repayment period of the investment [8] – Estimated life cycle of the investment [8] • Optimizing the size of the plant, full load hours [8] <ul style="list-style-type: none"> – Wood-based heating: Heat load and loss in transmission [8] – Small-scale CHP not profitable [9] – Gate fees prerequisite for profitability of biogas [9]
<p>SOCIAL BARRIERS:</p> <ul style="list-style-type: none"> • General attitude against other forms of heating than electricity and oil [2] • Values, appreciating local energy [8] • Lack of knowledge: <ul style="list-style-type: none"> – About local renewable energy resources [7] – About various support forms etc. [6] • Opposition to wind power; NIMBY, benefit for local people? • Energy transition difficult to accept for the traditional energy companies [6] • No experience/tradition of cooperatives with wind power [6] • Interest and knowledge about co-operative model of decision-makers [8] • Undervaluation of small entrepreneurship [8] • Attitudes of stakeholder groups [8] • Attitudes of neighbors (near-by real estates of the heating plant) [8] • Ageing of rural population [8] • Lack of: time [9], sense of community [9], co-operation between farms (e.g. digestion plants) [2, chapter 1], courage for making investments [6], enthusiasm [9] 	<p>TECHNOLOGICAL BARRIERS:</p> <ul style="list-style-type: none"> • Lack of energy storage solutions [4] • Technical barriers to market access [1] • Grid and grid monopoly [4] • Lack of knowledge • Biogas: Lack on well-functioning technology for small-scale needs [7] • Choosing good site/object for the heating plant (lack of suitable objects/sites (e.g. schools) [8] [9]) • Planning, dimensioning, place for the plant [8] • Price development of oil [8] • Small-scale CHP not profitable [9] • Small-scale energy production does not increase total effectiveness of the society [9]

LEGAL BARRIERS:

- Permission procedures time-consuming (wind power, biogas) [3]
- Too much bureaucracy and regulation [6]
- Current legislation and forms of support are too diverse [7]
- Consumers should be included to the markets, and the legislation should be more dynamic [7]

ENVIRONMENTAL BARRIERS:

- Small-scale wind power: conditions not profitable inland [3]
- Solar heat: produces most when needed least
- Emissions, emission control, management of the plant [8]
- Environmental consciousness of people [8]
- CO₂ influence of burning wood [8]

References

[1] TEM: Pienimuotoisen energiantuotannon edistämistyöryhmän loppuraportti 16.12.2014 (Final report of "promotion team" of small-scale energy production by Ministry of employment and the economy), 2014. Available: <https://tem.fi/documents/1410877/2859687/Pienimuotoisen+energiatuotannon+e-dist%C3%A4misty%C3%B6ryhm%C3%A4n+loppuraportti+16122014.pdf>

[2] Halme, Hukkinen, Korppi-Tommola, Linnanen, Liski, Lovio, Lund, Luukkanen, Nokso-Koivisto, Partanen & Wilenius: Maamme energia. Into 2015, 145 s.

[3] Final report of "Energiakylä: Development of villages towards energy self-sufficiency in the provinces of Ostrobothnia" by University of Vaasa / Levón institute, 2015 (in Finnish). Available: http://www.uva.fi/materiaali/pdf/isbn_978-952-476-693-7.pdf

[4] Child, M, Haukkala, T. Breyer, C. The Role of Solar Photovoltaics and Energy Storage Solutions in a 100% Renewable Energy System for Finland in 2050, Sustainability 2017, 9, 1358-1383. Available: <http://www.mdpi.com/2071-1050/9/8/1358> and (especially) reference 28 therein: Haukkala, T. Does the sun shine in the High North? Vested interests as a barrier to solar energy deployment in Finland. Energy Res. Soc. Sci. 2015, 6, 50–58. Available: <https://doi.org/10.1016/j.erss.2014.11.005>

[5] Auvinen, K. 2017. Solar power in Finland. Slide show of Manager at Smart Energy Transition and FinSolar projects in Aalto University 22.3.2017 at SolarWind Exchange, Vaasa Energy Week, Vaasa Finland. Available: <https://www.slideshare.net/karoliinaauvinen/solar-power-in-finland-20162017>

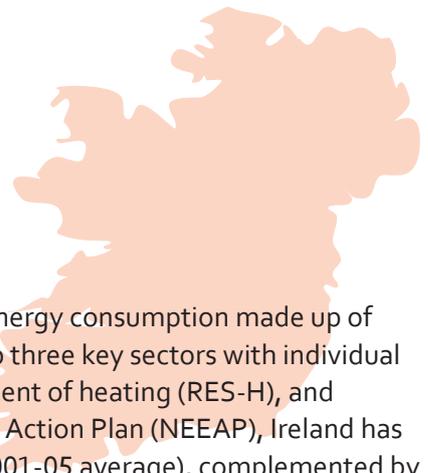
[6] Interviews for LECO Deliverable T2.2.1

[7] Questionnaire in the LECO Workshop Deliverable 1.1.1.

[8] Pentti Etelämäki, Lohtaja Energy Co-operative

[9] Interviews for LECO Pestle analysis Deliverable T1.1.2

4 IRELAND



Ireland's 2020 renewable energy target is to increase the share of final energy consumption made up of renewable energy sources (RES) to 16 per cent. This target is broken into three key sectors with individual targets for each sector: 40 per cent of electricity supply (RES-E), 12 per cent of heating (RES-H), and 10 per cent of transport (RES-T). Through the National Energy Efficiency Action Plan (NEEAP), Ireland has a national target of 20 per cent energy savings in 2020 (relative to the 2001-05 average), complemented by an additional target of energy reduction in the public sector by 33 per cent by 2020.

The third National Energy Efficiency Action Plan in 2014 identifies measures that could reduce annual emissions of around 7.3Mt and save approximately 31,955GWh of energy by 2020. In a recent report from the SEAI, it is evident that we are not on target for 2020, and that a focussed effort will be required to meet these targets [1]. The actual figures can be traced below.

Measurement	2020 Target	Where Ireland is at end 2016
Renewables in Final Energy Use	16%	9.1%
RES-E	40%	25.3%
RES-H	12%	6.5%
RES-T	10%	5.7%
Energy Efficiency (Overall)	20% reduction in demand	10% (Not legally binding)
Energy Efficiency (Public Sector)	33% reduction in demand	21% by 2015 [2]

Climate Policy and Framework:

The White Paper 'Ireland's Transition to a Low Carbon Energy Future 2015-2030' is a complete energy policy update [3]. In it, a framework to guide policy is set out and the actions that Government intends to take in the energy sector from now up to 2030. It takes into account European and International climate change objectives and agreements, as well as Irish social, economic and employment priorities. Ireland's energy citizens will be at the center of the low carbon transition to enable a passive consumer to become an active citizen. Energy efficiency will also be central to the transition along with a decarbonisation of the electricity generation sector.

4.1 PESTLE Analysis – Barrier analysis specific to Ireland

1. COMMUNITY OWNERSHIP/LOCAL BENEFIT FRAMEWORK: The need for those who contribute to and accommodate community energy projects to also reap the financial and social benefits they can bring, (such as job creation, financial rewards and improved security of supply) appears to be a widely held stance which is almost universally supported in the literature [4-6]. In areas of Mainland Europe, the concept of community ownership has proved successful at incentivising the use of medium to large scale wind energy installations. For instance, as much as 80 per cent of Denmark's wind energy capacity is owned by some sort of community partnership. Compare this to Ireland where there is currently only one community owned wind farm in Templederry, County Tipperary with a capacity of 3.9MW. There is currently 3025MW of installed wind capacity in Ireland [1]. This equates to 0.12 per cent. There is no legislation in Ireland that necessitates community ownership in a renewable project.

2. SCARCITY OF RESOURCES: Community groups often face a scarcity of resources relating to the lack of sufficient practical capacity – both at the start and during the energy transition process – that hinders their progress. These issues include time, expertise (financial, technical and equipment), bargaining skills, completing lengthy application forms, engaging with stakeholders, and splitting their time between remunerative work and spending unpaid volunteer time on applications [4; 7]. To compare to Scotland, the community and renewable energy scheme (CARES) is administered by Local Energy Scotland: it is a consortium made up of the Energy Saving Trust (EST); Changeworks; the Energy Agency; SCARF, and the Wise Group. It provides free, impartial advice to communities, rural businesses and land managers, including support to access grant and loan funding [8].

3. LACK OF AN INDEPENDENT INTERMEDIARY BODY: In the European context of a privatized and deregulated energy market, "intermediary organisations" play an increasingly important role, operating between national governments, energy suppliers and energy consumers; and can be described as "bottom-up" policy implementers. To compare to Scotland where Community Energy Scotland (CES) has seven staff across Scotland, including Orkney and Western Isles. It has over 400 members, largely non-profit distributing community groups and has supported over 600 community energy installations of 38MW capacity, with another 140MW in the pipeline.

4. NATIONAL ENERGY POLICY: The national energy policy includes the level of state support, the openness of the system, access to policymaking instruments, and the ability of a community to engage with the State and other policymakers [9]. From a community energy perspective, grid access, planning assistance and feasibility assistance are important areas, where knowledge is vital. Currently, in Ireland there is no REFIT for microgeneration thus excluding homeowners and communities; there is also no priority grid access, limited planning and feasibility assistance through the SEAI SEC mentor programme.

4.2 Summary

IRELAND: Barriers to Community Energy Projects	
<p>POLITICAL BARRIERS:</p> <ul style="list-style-type: none"> • Lack of a microgeneration policy for FIT support (RESS consultation at the end of 2017 excluded it) • No priority grid access for community projects • Complicated grid access process and long time to secure a connection to ensure a FIT (large scale community renewable project) • Lack of intermediary body (RESS consultation mentioned the possibility) • No ownership framework in place • The fragmentation of roles and responsibilities across government departments, agencies, local authorities and other bodies is a barrier for effective planning 	<p>ECONOMIC BARRIERS:</p> <ul style="list-style-type: none"> • Financial challenges in the initial stages of project development; access to finance, grants, etc. • No FIT for microgeneration, no incentive to over produce and export • Grant aid for renewable heat still insufficient (example of heat pump support) • Complicated tax rules, no tax exemptions, • Generally no tax incentives for RES projects, lack of guarantees • High initial capital costs along with a long payback period at a time when fossil fuels are affordable
<p>SOCIAL BARRIERS:</p> <ul style="list-style-type: none"> • No framework for community engagement, leads to acceptance issues • Resource scarcity within the community group (Lack of time from the community volunteer, lack of expertise, complicated funding applications, • Little or no experience with the cooperative model as a viable model (only 4 energy co-ops established in Ireland) • Lack of political support from local representatives • Little experience with setting up cooperatives • Organisational challenges – pre-planning stage barriers 	<p>TECHNOLOGICAL BARRIERS:</p> <ul style="list-style-type: none"> • Lack of expert knowledge to design, plan, procure, implement, commission a project • Lack of expert knowledge for operation and maintenance • Size of energy project • Lack of demonstration sites to increase awareness although the BEC programme has good examples all over Ireland (PV, wind, EE, heat pumps etc) • Technology changing at a fast rate • Lack of confidence in technology vendors (longevity)
<p>LEGAL BARRIERS:</p> <ul style="list-style-type: none"> • Complicated legal framework, high levels of bureaucracy to acquire licenses • Lack of national community energy strategy; lack of national targets for community energy projects, which then are broken down in Local Energy Action Plans by local authorities • Bureaucratic barriers to grid connection including: complicated application procedures, uncertainty of approval, costs, time consuming • Lack of supportive local authorities and/or local energy agencies • Generally no support schemes for RES projects at a community level 	<p>ENVIRONMENTAL BARRIERS:</p> <ul style="list-style-type: none"> • Planning processes are timely • Resource rich and protected areas

References

- [1] Sustainable Energy Authority of Ireland, Ireland's Energy Targets. Progress, Ambition & Impacts, (2016).
- [2] Sustainable Energy Authority of Ireland, Annual Report 2015 on Public Sector Energy Efficiency Performance, (2015).
- [3] Department of Communications Energy and Natural Resources, Ireland's Transition to a Low Carbon Energy Future 2015-2030, (2015) 1-122.
- [4] C. Rae, F. Bradley, Energy autonomy in sustainable communities - A review of key issues, *Renew. Sustain. Energy Rev.* 16 (2012) 6497–6506.
- [5] J.C. Rogers, E.A. Simmons, I. Convery, A. Weatherall, Public perceptions of opportunities for community-based renewable energy projects, *Energy Policy.* 36 (2008) 4217–4226
- [6] G. Walker, What are the barriers and incentives for community-owned means of energy production and use?, *Energy Policy.* 36 (2008) 4401–4405.
- [7] J. C. Rogers, E. A. Simmons, I. Convery, and A. Weatherall, "Public perceptions of opportunities for community-based renewable energy projects," *Energy Policy*, vol. 36, no. 11, pp. 4217–4226, (2008).
- [8] Local Energy Scotland, "CARES Progress and Impact," (2014).
- [9] E. Bomberg and N. McEwen, "Mobilizing community energy," *Energy Policy*, vol. 51, pp. 435–444, (2012).
- [10] Interviews for LECO Pestle analysis WDC
- [11] Interviews for LECO Pestle analysis UnaG

5 SWEDEN



Sweden as a member of the European Union is committed to the EU energy and climate policies and targets. In a national context, agreements on long-term energy and climate policies and targets have been concluded in 2016 as follows: Sweden's energy policy should build on the same three pillars as energy cooperation in the EU. The policy therefore aims to combine ecological sustainability, competitiveness and security of supply. Sweden must have a robust electricity network with high security of supply and low environmental impact, and offer electricity at competitive prices. This creates a long-term perspective and clarity for actors in the market and helps generate new jobs and investment in Sweden. The energy policy is based on the fact that Sweden is closely linked to its neighbours in northern Europe, and aims to find joint solutions to challenges in the common electricity market.

Targets

- By 2045, Sweden is to have no net emissions of greenhouse gases into the atmosphere and should thereafter achieve negative emissions.
- The target by 2040 is 100 per cent renewable electricity production. This is a target, not a deadline for banning nuclear power, nor does it mean closing nuclear power plants through political decisions
- Sweden targets a 50 per cent more efficient energy use by 2030 as compared to 2005. The target is expressed in terms of energy supplied in relation to GDP.

2017 CLIMATE POLICY FRAMEWORK: The Swedish parliament took a decision on the introduction of a climate policy framework for Sweden containing new climate goals, a Climate Act and plans for a climate policy council. The purpose of the framework is to create a clear and coherent climate policy. The framework is based on an agreement within the Cross-Party Committee on Environmental Objectives. The climate policy framework is the most important climate reform in Sweden's history. It will provide the long-term conditions for business and society to implement the transition needed to solve the challenge of climate change. For the first time, Sweden will have an act stating that each government has an obligation to pursue a climate policy based on the climate goals adopted by the Riksdag. Each government must also clearly report on the progress of its efforts. For the first time, Sweden will have long-term climate goals beyond 2020 and an independent climate policy council that reviews climate policy. The reform is a key component of Sweden's efforts to comply with the Paris Agreement. The climate policy framework consists of three pillars: a Climate Act, climate goals and a climate policy council.

1. THE CLIMATE ACT: The Climate Act establishes that the Government's climate policy must be based on the climate goals and specifies how work is to be carried out. The Government is required to present a climate report every year in its Budget Bill. Every fourth year, the Government is required to draw up a climate policy action plan for how the climate goals are to be achieved. The new Climate Act will enter into force on 1 January 2018.

2. CLIMATE GOALS: By 2045, Sweden will have net zero emissions of greenhouse gases into the atmosphere and should thereafter achieve negative emissions. Negative emissions mean that greenhouse gas emissions from activities in Sweden are less than, for example, the amount of carbon dioxide absorbed by nature as part of the ecocycle, or less than the emissions Sweden helps to reduce abroad by investing in various climate projects. However, the remaining emissions from activities on Swedish territory will be at least 85 per cent lower than in 1990. Emissions in Sweden in the sectors that will be covered by the EU regulation on the division of responsibilities should, by 2030, be at least 63 per cent lower than emissions in 1990, and at least 75 per cent lower by 2040. The emissions covered are mainly from transport, machinery, small industrial and energy plants, housing and agriculture. These emissions are not included in the European Union Emissions Trading System, which covers most of the emissions from industry, electricity and district heating output, and flights departing from and arriving in the European Economic Area (EEA). In a similar way as for the long-term goal, parts of the goals may be achieved by 2030 and 2040 through supplementary measures, such as increased uptake of carbon dioxide by forests or by investing in various climate projects abroad. Such measures may be used to achieve a maximum of 8 and 2 percentage points respectively of the emission reduction goals by 2030 and 2040. Emissions from domestic transport, excluding domestic aviation, will be reduced by at least 70 per cent by 2030 compared with 2010. The reason domestic aviation is not included in the goal is that domestic aviation is as well not included in the European Union Emissions Trading System.

3. CLIMATE POLICY COUNCIL: A climate policy council tasked with assisting the Government by providing an independent assessment of how the overall policy presented by the Government is compatible with the climate goals. The council will evaluate whether the direction of various relevant policy areas will increase or reduce the likelihood of achieving the climate goals.

5.1 PESTLE Analysis

Barrier analyses specific to Northern Sweden

1. TARGET CONFLICTS, E.G. PUBLIC OWNED DISTRICT HEATING PLANT ARE EXPECTED TO DELIVER PROFIT.

- Public owned energy companies don't benefit from EE measures at customer's buildings: Lack of "white certificate system" for energy companies in Sweden; Energy companies have not yet developed new business models of delivering energy services instead of energy only
- New renewable production as wind mills, hydro plants are in conflict with e.g. biodiversity, nature protection (National Parks) or military targets (wind): Land and natural resources are limited and target conflicts not avoidable
- Mobility in remote, long-distances, cold regions vs. higher share of renewable fuel in transport: Electric cars still not enough developed, Biogas production from waste limited due to small communities

2. LACK OF AWARENESS IN THE REGION

- Large scale hydro production – "no need to save energy here"
- Population decline is the main priority. Lack of know-how about RES business opportunities and EE benefits; Lack of staff capacities for strategic energy work to implement RES business and EE projects
- Politicians prioritize growth based on industrial production and mining
- Low energy prices, especially for electricity and district heating

3. LACK OF KNOWLEDGE AND STAFF RESOURCES

- Small units, small numbers of employed, lack of experts
- Long distances make it even harder to attract experts coming to the region
- Challenge to hire experts: Lack of knowledge on fundraising and EU project money; Funding process too complicated for smaller communities; Lack of easy solutions to get funding for staff and funding for investments
- Difficult to get funding for experts

4. NONE OR WEAK (NON-BINDING) TARGETS

- Weak targets for buildings, both new construction and renovation: High building cost in Sweden make decision makers hesitant towards new regulations, and high share of RES makes need for EE less urgent
- (Almost) no regional (binding) targets for sustainable transport: Long distances which are difficult to tackle in other ways than individual and fossil based transport, Lots of heavy transport from industry which are difficult to tackle in a regional context only
- No ambitious regional overall energy and climate targets: Regional level has little real power in Sweden; High share of heavy industry in Norrbotten which stands for a high share of emissions and falls under ETS = regional level policy less important

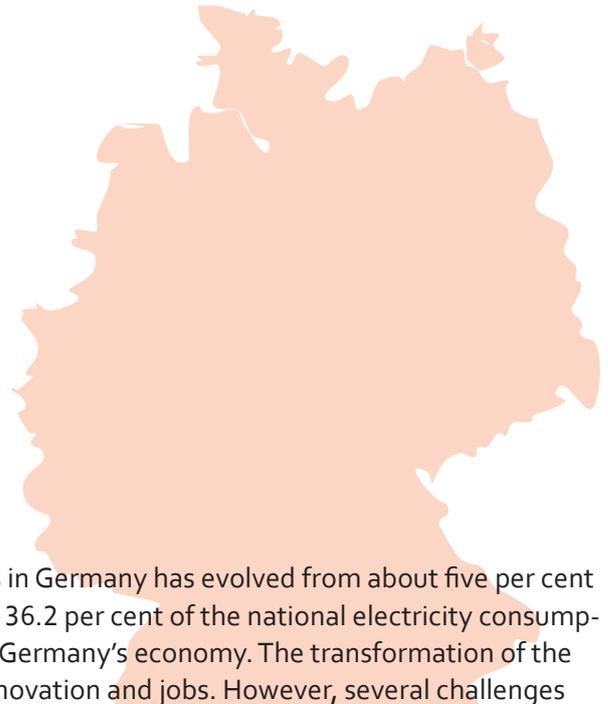
5. COMMON UNCERTAINTY DUE TO E.G. POPULATION DEVELOPMENT, ECONOMIC FACTORS

- Population decline vs. new investments
- Conflict between old industrial and service-orientated (tourism etc.) community
- High rate of elderly people
- Downshifting of public budgets

5.2 Summary

SWEDEN: Barriers to Community Energy Projects	
<p>POLITICAL BARRIERS:</p> <ul style="list-style-type: none"> • A small number of stakeholders who needs to be involved in many processes – problem in terms of time, but also of only a few persons representing a whole county. • Lack of effective funding mechanism for environmental investments. • Lack of regional (legal) instruments for pushing the shift towards low-carbon communities. • Focus on short-term solutions instead of long-term structures. 	<p>ECONOMIC BARRIERS:</p> <ul style="list-style-type: none"> • Energikontor Norr as regional energy agency mainly project financed, what makes long-term planning of service offers difficult. • Lack of funding instruments for investments in energy and climate projects, e.g. passive houses. • Not enough governmental support for e.g. investments in public transport infrastructure.
<p>SOCIAL BARRIERS:</p> <ul style="list-style-type: none"> • Lack of capacities in small municipalities: staff, knowledge and money. • Personal meetings contributing to build up confidence and ensuring continuously collaboration are difficult due to long distances. • More people from the rural areas moving to cities and the coast, thereby weakening small municipalities even more. • Norrbotten’s countryside is characterized through traditional thinking what means that new and innovative services are difficult to implement and push. • Failure in building up working multi-level governance structures lead to less engagement from the few people engaged in energy and climate work. • Interest in energy, environment and climate issues may decrease. 	<p>TECHNOLOGICAL BARRIERS:</p> <ul style="list-style-type: none"> • High energy demand of industry (mining, steel, paper mills) and not enough people for public transport in remote regions.
<p>LEGAL BARRIERS:</p> <ul style="list-style-type: none"> • Divided competencies between two regional authorities (“Region Norrbotten” and “Länsstyrelsen Norrbotten”). 	<p>ENVIRONMENTAL BARRIERS:</p> <ul style="list-style-type: none"> • Long distances and sparsely population make collaboration difficult, time- and cost intensive. • Conflict with other targets, e.g. nature protection and economic growths.

6 GERMANY



Since the turn of the millennium, the share of renewables in Germany has evolved from about five per cent of the electricity supply into its largest component (2017: 36.2 per cent of the national electricity consumption). This is a huge opportunity for the modernization of Germany's economy. The transformation of the energy system plays a vital role as a driver of progress, innovation and jobs. However, several challenges need to be met. The share of Renewable Energies in the heating and transport sectors are still low and despite the progress achieved in the power sector, overall greenhouse gas reductions are stagnating. The use of renewable energies avoided 179 million tonnes of greenhouse gas (GHG) emissions in 2017, compared to 160 million tonnes of saved emissions in 2016. The total GHG emissions stayed largely on the same level due to increased emissions from the industry and transport sectors.

Germany still depends on imports of conventional energy supplies as it imports more than 70 per cent of its primary energy consumption [1]. To a considerable degree, imports come from politically unstable regions with mining conditions that carry heavy consequences for humans and nature. Security of supply can only be guaranteed with renewables [2]. Germany's 2020 renewable energy target is to increase the share of final energy consumption made up of renewable energy sources to 18 per cent, which is 35 per cent of electricity supply (RES-E), 14 per cent of heating (RES-H), and 10 per cent of transport (RES-T).

Measurement	2020 Target	Where Germany is at end 2016
Renewables in Final Energy Use	18%	13.1%
RES-E	35%	33.3%
RES-H	14%	13%
RES-T	10%	5.2%
Primary energy consumption (from 2008)	-20%	-5.7%

In the buildings sector, which accounts for about 40 per cent of Germany's final energy consumption, existing measures include minimum standards relating to the energy demand of new and newly refurbished buildings, which are steadily becoming stricter. However, three-quarters of the building are still largely unrenovated and consequently in a poor condition as regards energy efficiency. Up to 80 per cent of energy demand can be saved through professional refurbishment and the installation of modern building and heating technology. Financial incentives, such as low-interest loans from the KfW development bank are therefore intended to encourage homeowners, for example, to renovate their buildings for energy efficiency.

CLIMATE POLICY AND FRAMEWORK: According to its 2010 energy concept, the German government seeks to reduce its GHG emissions by 80 to 95 per cent until 2050 relative to 1990. In order to achieve this target, it pursues a number of sub targets regarding energy use and energy generation.

The overall primary energy consumption is set to be cut by 50 per cent compared to 2008 until the same target year, while more than 80 per cent of the electricity consumption and 60 per cent of the overall final energy consumption is to be covered with RES.

On the efficiency field, the Energy Saving Ordinance (EnEV) sets minimum requirements for efficient energy use in new buildings and for large-scale renovations of existing buildings. EU-wide provisions on energy labeling of products ensure transparency and provide incentives for more efficient products. Requirements to ecodesign set binding minimum standards for the environmentally friendly design of energy-related products. On the energy generation side, the Renewable Energy Sources Act (EEG) is the central incentive scheme fostering the growth of renewable electricity generation using a feed-in tariff.

Measurement	2020	2030	2040	2050
Greenhouse gas emissions (from 1990)	-40%	-55%	-70%	-80% to -95%
Primary energy consumption (from 2008)	-20%			-50%
Electricity consumption (from 2008)	-10%			-25%
Energy demand in buildings (from 2008)				-80%
Heat demand in buildings (from 2008)	-20%			
Energy consumption in transport (from 2005)	-10%			-40%
RE share in final energy consumption	18%	30%	45%	60%
RE share in electricity consumption	35%	40%-45% (2025)	55%-60% (2035)	>80%
RE share in heating	14%			
RE share in transport	10%			
Increase number of electric cars	1 million	6 million		

Sticking to these targets, the German government outlines principles and goals of its climate policy in the Climate Action Plan 2050 [3]. The climate policy is guided by the principle of GHG emission neutrality in Germany by 2050 and its key elements include strategic measures for every area of action. The Plan acknowledges the key role of municipalities in climate action and recognizes local communities as important actors for contributing to the great energy transition called the Energiewende through community energy initiatives. Sustainable urban development, climate-friendly smart city and smart community concepts should be supported and funded.

6.1 PESTLE Analysis

Barrier analysis specific to Germany

1. INSUFFICIENT STRATEGIES FOR RENEWABLE ENERGY PROJECTS IN THE HEAT AND TRANSPORT SECTOR [4]: In contrast to power generation, renewable energies in the heat and transport sectors are still playing a minor role (2016: 13 per cent and 5.2 per cent of final energy consumption respectively). Modern energy projects with storages and sector coupling technologies still suffer regulatory barriers and lack profitability. Prices of fossil fuels were low in the last years, which has lowered the municipalities interest to invest in renewable heating and transport systems. Germany does not have a national CO₂-pricing scheme which enables renewable energies to be comparably cheaper. Bioenergy, which can provide heat and transport, is controversially discussed in Germany, the proportion of bio-fuels did not increase in the last years. Farmer's investment in renewable energy projects are decreasing and the potential of deep geothermal energy is limited in Germany.

2. SCARCITY OF RESOURCES: Resource scarcity often prevents capacity building even before governmental aid can take effect. Many municipal administrations as well as civil community energy initiatives lack financial resources, expertise and labour capacities to tackle even the initial stages of project development while funding applications are often complex.

3. LACK OF COOPERATION BETWEEN DIFFERENT POLITICAL LEVELS: The success of reaching national climate goals are highly dependent on the individual politics in the federal states in Germany. Federalism grants them a broad spectrum of legislative power, strongly affecting energy policy. So does regional planning directly impact the construction of wind farms and groundmounted solar PV facilities through land use permits and the designation of wind priority areas. Aside from the grid-bound energies of electricity and natural gas, the federal states also have the authority to amend federal energy legislation, especially regarding the heat sector. In conjunction with other legislative fields (e.g. community law and building regulation) within the states' scope of action, multiple states have issued a state energy law or concept including energy targets of their own. Therefore, the overall conditions and also the achievements in terms of renewable energy projects in the federal states are varying strongly [5] [6]. Among the pioneering municipalities regarding renewable energy use, a considerable share criticizes the lack of will to cooperate [7] and the resistance among the civil society.

4. REFORM OF THE FEED-IN TARIFF SCHEME: In federal legislation, the Renewable Energy Sources Act (EEG, Erneuerbare-Energien-Gesetz) did not only play a key role in the development of renewable energy in Germany, but also turned out to be a key incentive for community energy in Germany. Fixed and guaranteed feed-in tariffs (FIT) over 20 years for renewables along with feed-in priority over conventional electricity provided a secure and simple investment model for private individuals and decentralized actors in community energy.

A potentially decisive turning point for community energy is the EEG amendment in 2017 introducing a tendering process in the FIT scheme. Under the new regime, a power producer needs to win the auction for a given capacity in order to be eligible for FIT funding (for ground-mounted photovoltaics and onshore wind energy larger than 750 kW as well as biomass over 150 kW). Critics worry that this tendering process could result in disadvantages for small scale local and citizen owned businesses, since the financial risk of losing a bid might prevent them even from participating in the auction in the first place. Although these concerns were addressed by exemption regulations for "citizen's energy companies" applying for onshore wind power, misuse of these exemptions [8] led to further adjustments in the regulations. It remains unclear, how citizen's energy will succeed in future wind auctions under the current and coming FIT regimes. This uncertainty of future regulations is perceived as a barrier for local energy transition efforts by many municipalities active with RES [7].

6.2 Summary

GERMANY: Barriers to Community Energy Projects	
<p>POLITICAL BARRIERS:</p> <ul style="list-style-type: none"> • Municipalities criticize lack of political responsibility (78 per cent out of the majority of pioneering municipalities on the field of RES see a danger in capping the development goals of renewable energy projects) [7]. Changes in the German Renewable Energy Act made business models for energy cooperatives unprofitable. • Electricity tariffs for locally produced electricity are yet to develop in large scale due to lacking incentives [7]. • FIT scheme for biogas-based electricity has been cut down to an minimum. Only small-scale projects using manure are projected to grow. • Political instruments for renewable energy projects in the heat and transport sector are not sufficient. 	<p>ECONOMIC BARRIERS:</p> <ul style="list-style-type: none"> • Costs of investments: Many communities lack sufficient funds in order to invest into modern energy supply. 45 per cent of the majority of pioneering municipalities on the field of RES criticize the intransparent funding of renewable heating projects [7]. The economic perspectives for energy cooperatives are small as they lack competencies and time while mostly working voluntarily. • Financial risk aversion due to auctions: Commercial enterprises can plan and bid easily with ten or more projects in order to distribute the risk. If some of these cannot be realized, the losses can be compensated by carried out other projects. Energy cooperatives can often bid with one project only. If it is denied, it might cause risks which endanger their existence.

GERMANY: Barriers to Community Energy Projects

SOCIAL BARRIERS:

- Opponents of renewable energy development complain about e.g. noise, shading, changing landscapes or conservation conflicts. 37 per cent of the German population think that the feed-in tariff surcharge for renewable energies is too high [7]. Critical voices can complicate the development of renewable energy projects within the municipalities. Additional efforts as persuasion and public information are required. Participation of citizens ensures acceptance but the time needed for coordination increases.
- Scarcity of resources. Especially small communities lack staff capacity to collect sufficient data (energy demand, amount of existing buildings and new construction areas or the location of energy producers) which is a requirement for proper planning. Larger communities need to face the challenge to collect big amount of data to ensure a solid basis.
- Broad spectrum of stakeholders within the renewable energy projects. This hinders simple processes of coordination of planning for communities [9].

TECHNOLOGICAL BARRIERS:

- The German electricity grid infrastructure is substantially outdated while there are bureaucratic barriers to grid expansion. Due to lacking grid capacities, growing renewable power generation and lacking flexibility of conventional powerplants, the volume of redispatch is still too high [10].
- Lack of experience in strategic district heating planning within the communities.
- Technology is changing at a fast rate.
- Lack of suitable objects/sites: e.g. photovoltaic energy cooperatives have difficulties to identify suitable rooftop areas while the few left are often not available due to competition [11].
- Solar heat produces most energy when needed least. Innovative storages needed.

LEGAL BARRIERS:

- Complicated legal framework, lack of sufficient community energy strategies. Legislation should encourage investments. The KAGB (Investment Code) and regulations of Bafin (Federal Financial Supervisory Authority) hinder the investments taken by energy cooperatives immensely.
- 46 per cent of the majority of pioneering municipalities on the field of RES see a great danger in the bidding of energy projects [7].
- 53 per cent of the majority of pioneering municipalities on the field of RES see a danger in the obligatory direct marketing [7].
- 84 per cent of the majority of pioneering municipalities on the field of RES see a barrier in the instability of frame conditions (changing fast) [7] which bring along lack of investment security.
- The bureaucratic barriers for communities are high: If a municipality aims at becoming an energy provider, there are many legal frameworks to be considered (municipalities in Germany are facing restrictions with economic activities due to the subsidiarity principle).
- Renewable energies do not have a priority when it comes to construction projects in the German building code. If municipalities want to support renewable energy projects, they need to adapt their land use planning.

ENVIRONMENTAL BARRIERS:

- Ongoing conflict between renewable energy projects and strict natural reserve obligations, mostly discussed in regard of wind power as well as biomass energy.

References

- [1] Umweltbundesamt, Primärenergieimporte und Versorgungssicherheit, 2017, available: https://www.umweltbundesamt.de/sites/default/files/medien/384/bilder/dateien/3_tab_primaerenergieimp-versorgungssich_2018-02-14.pdf
- [2] Berlin Energy Transition Dialogue press office, The German Energy Transition, 2016, available: https://www.energiewende2018.com/wp-content/uploads/2016/03/BETD2016_Press_Factsheet_Layout_1603.pdf
- [3] Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit: Klimaschutzplan 2050, 2016, available from: https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Klimaschutz/klimaschutzplan_2050_bf.pdf
- [4] Bundesministerium für Wirtschaft und Energie, Energiedaten: Gesamtausgabe, 2018, available from: <https://www.bmwi.de/Redaktion/DE/Artikel/Energie/energiedaten-gesamtausgabe.html>
- [5] Renewable Energies Agency, Stromerzeugung nach Energieträgern in den Bundesländern, 2018, available from: <https://www.unendlich-viel-energie.de/mediathek/grafiken/grafik-stromerzeugung-erneuerbare-bundeslaender-2016>
- [6] Renewable Energies Agency, Bundesländervergleich Erneuerbare Energien 2017 - Gruppenergebnisse, 2017, available from: <https://www.unendlich-viel-energie.de/mediathek/grafiken/grafiken-zum-bundeslaendervergleich-erneuerbare-energien-2017-gruppenergebnisse>
- [7] Renewable Energies Agency, Hemmnisse und Triebfedern der regionalen Energiewende aus Sicht von Energie-Kommunen, 2014, available from: <https://www.unendlich-viel-energie.de/mediathek/grafiken/hemmnisse-und-triefedern-der-regionalen-energiewende-aus-sicht-von-energie-kommunen-2014>
- [8] The Beam, Has Germany proven that auction schemes can work for community energy?, 2018, available from: <https://medium.com/thebeammagazine/has-germany-proven-that-auction-schemes-can-work-for-community-energy-b8d4cddef619>
- [9] Renewable Energies Agency, Stakeholders in a municipality, 2016, available from: <https://www.unendlich-viel-energie.de/media-library/charts-and-data/stakeholders-in-a-municipality>
- [10] Renewable Energies Agency, Entwicklung des Redispatchvolumens in Deutschland, 2017, available from: <https://www.unendlich-viel-energie.de/mediathek/grafiken/entwicklung-des-redispatchvolumens-in-deutschland>
- [11] Leuphana Universität Lüneburg: Marktrealität von Bürgerenergie und mögliche Auswirkungen von regulatorischen Eingriffen, 2014, available from: http://www.umweltinstitut.org/fileadmin/Mediapool/Downloads/01_Themen/02_Energie-und-Klima/Energiewende/Leuphana_Universit%C3%A4t_L%C3%BCneburg_Ausschreibungsmodell.pdf



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