Understanding the social dynamics of consumer energy choices – some lessons learned from two H2020 projects (ECHOES, SMARTEES)

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Abstract

This paper presents analyses based on data from two H2020 projects coordinated by the author. In ECHOES, energy choices of consumers are studied from a multilevel perspective, including particularly the question, how choices framed as group choices (e.g., choices people living in a particular region, city or country) differ from choices framed as individual choices. Results from a representative multinational survey with more than 18,000 respondents conducted in all EU member states plus Switzerland, Turkey, and Norway are presented. In the survey, an online experiment was conducted manipulating if predictors of energy saving behavior were introduced as a choice with a connection to other people in the region, the country, or the European Union. The analyses show that intentions to support the Energy Transition by energy saving behavior are impacted by the degree a person embraces an environmental identity, the feeling of being morally obliged (personal norms), the feeling of individual efficacy, but also social norms and the degree of identification with the people in the respective geographic entity (municipality, country, EU). Citizens of the different countries differ strongly in the degree they identify with their municipality or the EU in relation to their country and the degree of how strong they perceive the social norms and individual efficacy in their municipality or country in relation to the EU. Whereas identification with the EU is usually rather low in most countries, social norms to save energy are experienced to be stronger on the EU level than on the lower levels. Also, efficacy is perceived to be higher on the EU level. These findings are supplemented by preliminary findings from the SMARTEES project, which studies the diffusion of five types of social innovations in energy (inclusive mobility planning, energy autonomous islands, introducing car-free "superblocks" in cities, city quarter revitalization through energy effectivization, fighting fuel poverty through participatory energy efficiency plans). For this paper, first findings of the ongoing social network analyses in the social innovation cases are presented, outlining who key actors in such innovation cases are – again underlining the important function of communication, interaction and decision-making in groups. Two cases were selected (the Danish "Energy Island" Samsø and the Swedish eco-neighbourhood Augustenborg in Malmö). In both cases, it becomes obvious that successful social energy innovations require the collaboration of a complex network of actors sitting at key positions in the social networks. Long term restructuring of local societies requires individuals that have the ability to engage larger fractions of the diverse network of different actors. Across both projects, this paper makes a strong case for studying consumer-driven energy choices towards energy sufficiency and innovation from a social systems perspective, rather than a technological or overly individualistic perspective.

Introduction

Excessive energy use is one of the key challenges in nowaday's societies leading to both resource exploitation in case of fossil energy carriers and land use dilemma in case of regenerative resources. Access to energy is at the same time an important motor of human development and raising prices for energy carriers are becoming a growing problem in many countries

around the world. Thus, access to affordable and clean energy has been formulated as the 7th goal of the Sustainable Development Goals of the UN (United Nations, 2016). The quick phasing out of fossil energy is also necessary to combat global climate change (Intergovernmental Panel on Climate Change, 2014). In recent years, the perspective of policymakers has shifted from an almost exclusive focus on technological energy efficiency improvements and a shift to regenerative energy production on the one hand to a more consumer-focused approach on the other hand. This is for example very visible in the so-called "winter package" (European Commission, 2016), which gives consumers an active role in the energy system. At the same time, an analysis of EU and Member State policies has shown that the understanding of consumer decision-making is still limited (Klöckner et al., 2018). This paper aims to contribute to a better understanding of the social dynamics in energy decision making, with a special focus on sufficiency behavior.

ENERGY SUFFICIENCY VS. ENERGY EFFICIENCY

Whereas the focus outside and within social science has for a long time been on energy efficiency, thus rather replacing energy-consuming technology with more efficient technology (e.g., oil fired heaters with heat pumps, combustion engine cars by electric cars), recent trends have returned to the topic of energy sufficiency, which is limiting energy consumption by reducing the level of not only energy consumption, but also of the activities behind (Herring, 2006). Whereas energy efficiency does not necessarily require any change in life-styles, energy sufficiency implies reducing energy intensive activities and replacing them with less energy demanding behavior rather than improving the efficiency of the energy used for the activity. As an example, energy efficiency would focus on improving the energy consumption or CO_2 intensity of the energy carrier of air traffic, whereas the sufficiency perspective would question the traveling activity itself. Both projects that feed into this paper focus on energy choices people make. These choices can be either within the domain of energy efficiency (e.g., investments in energy efficient heating technology without having an implication on the level of comfort) or they can be within the domain of sufficiency (e.g., lowering the room temperature, thus making a choice for a life-style that uses less energy because it demands a lower level of energy intensive service to be delivered). Sufficiency is also interesting to look at from a perspective of preventing rebound or negative spill-over effects that have been shown for implementation of many energy-efficient technologies (Gram-Hanssen, Christensen, & Petersen, 2012; Klöckner, Nayum, & Mehmetoglu, 2013). Thus, energy sufficiency is in essence a more fundamental restructuring of choices than energy efficiency, which opens for more substantial effects of spilling over to other domains of life. For this paper, I define energy sufficiency following the discussion in Darby (2007) in a qualitative way: Energy use is sufficient, when a need has been satisfied to an optimal state (not the maximum possible satisfaction), whereby "optimal" is a subjective state. Other definitions have taken a quantitative approach, defining a certain level of energy as sufficient, opening the moral discussion who defines this level and how this relates to individual differences and environmental boundaries. This discussion, as interesting and important it is, is not the focus of this paper. For this paper, sufficiency decisions made by individuals within the energy context are understood as decisions, where the energy use of the person is restricted because they[1] evaluated a lower energy use as satisfying their needs to an optimal degree. More energy use would not increase satisfaction of this need. Thus for this paper, certain types of energy saving are understood as a potential sufficiency behavior (e.g., restricting mobility to a necessary level, restricting room temperature to a level that just satisfies comfort needs, etc.). It has to be indicated though, that the items in the ECHOES survey have not been formulated specifically with the sufficiency perspective in mind and the cases in SMARTEES do not reflect sufficiency to a large degree. Nevertheless, the results may also tell something about sufficiency as a social innovation and how it can be promoted. The social dimension of this process will be the core of the analyses.

SOCIAL INFLUENCES ON ENERGY CHOICES

To understand how sufficiency choices are determined and the role social aspects have in this process, the analyses in this paper will focus on which types of social influences drive such choices. For the analyses, a primarily social psychological perspective will be taken, because it had informed the design of the data collections in both projects used here. Social influence has been a part of social psychological action models from the start. The Theory of Planned Behavior (TPB) (Ajzen, 1991) assumes that individual behaviors are determined by intentions to act, which in turn are formed based on people's attitudes (the evaluation if performance of a behavior would be beneficial), perceived behavioral control (the perception if implementation of the behavior would be feasible), and subjective norms (sometimes also referred to as social norms). The latter is a representation of the social influence on behavior, which later has been differentiated into injunctive norms and descriptive norms (Thøgersen, 2006). Injunctive norms are a person's perception of what other people important to them expect from them or would agree with and support. Descriptive norms are a subjective representation of what other people actually do, thus an inference of what is "normal and accepted" behavior by observing other people's actions. More recently, this theoretical tradition has been integrated with the Norm-Activation Theory (Schwartz & Howard, 1981) which has shown, that social influences are often mediated by an internal moral instance, referred to as personal norm. Personal norms are a feeling of moral obligation to perform a certain behavior, for example, energy saving. This personal norm develops partly by reference to a person's individual value system, partly by internalizing (injunctive and descriptive) social norms (Bamberg & Möser, 2007; Klöckner, 2013a; Klöckner & Blöbaum, 2010). Based on these ideas, I expect that descriptive and injunctive social norms to save energy would affect personal norms, and to a lesser degree also intentions.

Perceived behavioral control is another important factor in the TPB. This factor is often understood as being composed of two sub-dimensions: the perceived difficulty of the behavior and perceived efficacy of the behavior (Ajzen, 2006). Whereas the first sub-dimension refers to how much effort needs to be made to realize the behavior, the second sub-dimension deals with the perceived effect an action might have. For this study, I focus on the second sub-dimension, also because it has been shown to be affected by the referenced social group in which a behavior is performed (see next section). I assume that the

perceived efficacy of individual behavior would affect the intention to act. Finally, in line with earlier work (Klöckner, 2013a), I assume that personal norms would affect intentions directly and reduce the impact of social norms on intentions.

IDENTITY AND ENERGY SAVING

Recently, the concept of identity has received more attention in research on environmental behavior and energy saving. With respect to sufficiency, identity might be even more relevant as for energy saving in general, because the focus on "getting just enough" can be or become an important marker for ones identify. Being initially developed in social psychology, Social Identity Theory (Tajfel, 1974, 2010) studies how people construct who they are as a person based on to which social groups they feel they belong (e.g., the no-growth movement). Groups provide their members with a sense of belonging, a feeling of pride and boost people's self-esteem. However, people will also enhance their self-image by increasing the status of their group often at the cost of other groups' status. This idea has recently been transferred to ecological problems like energy use because these inherently are problems that affect groups, not individuals (Fritsche, Barth, Jugert, Masson, & Reese, 2017). The assumption behind this idea is that people behave differently if they perceive themselves as a member of a group than if they act as individuals, especially where the problem is not addressable as an individual and requires actions by a larger group. In their paper, Fritsche et al. (2017) develop a model of collective environmental behavior (SIMPEA) which assumes that if an environmental problem is framed as a collective problem, then individuals will assess their ingroup norms for action (corresponding to the social norms in the previous section) and determine if these norms support action. Furthermore, efficacy will be assessed on a collective level, which might enhance the feeling of being able to make a difference. These effects should be stronger for people with stronger group identification. One way of triggering identification with a group is framing questions in a survey with reference to people living in a defined region. In the ECHOES survey, we experimentally varied the reference frame for the regional identity as the local region (municipality), the country, or the EU to test which regional entity people in different countries identify most with and how that affects perception of social norms and efficacy. An interesting question is what defines as a "group" in this research context. Obviously, the size of groups can vary considerably from small groups like a family or a circle of friends to large groups such as a nation or even the EU. This might have impacts on the size of the effects of group identification. However, research in the line of Fritsche et al. (2017) shows that even large and relatively unspecific groups (such as "people living in Poland" or "students") can stimulate group thinking.

Another concept of identity that has been studied in relation to energy saving behavior is the environmental identity (Van der Werff, Steg, & Keizer, 2013). This type of identity is not necessarily a social identity, implying belonging to the social group of environmentalists, but may also be closely related to the theoretical concept of individual value orientations (Stern, 2000). A measure of environmental identity was also included in the survey to test, how the self-categorization as being environmentally friendly affects personal norms and intentions.

It needs to be acknowledged though, that intentions (and also personal norms for that matter) do not under all circumstances translate into behavior. Even if intentions are formed and reasonably strong, behavior might still be prevented by other processes, as is for example discussed in Klöckner (2013b).

SOCIAL ENERGY INNOVATIONS AND THEIR DIFFUSION IN LOCAL NETWORKS

The last perspective that is included in this paper moves even further away from the individualist perspective of the psychological action models presented above. Alongside the increasing focus of policymakers on consumers, the concept of social innovations has made its way into the scientific literature and policy documents (Cajaiba-Santana & Change, 2014; Vermeulen, 2002). In the SMARTEES project, social innovation is defined as "a change in social relations, involving new ways of doing, organizing, framing and/or knowing and as transformative when it manages to challenge, alter or replace dominant institutions, both formal and informal. […] Moreover, SMARTEES considers social innovations to effectively respond to social challenges (e.g., energy transitions), by mobilizing people's creativity to develop solutions, make better use of scarce resources and/or promoting an innovative and learning society" (Caiati, Marta, & Quinti, 2019, p. 10). This directly implies a focus on social systems and networks as the unit of analysis, and on how innovations are created and transferred along the connections in these networks. It furthermore implies a focus on the local peculiarities rather than the general perspective covered in a survey, inherently favoring qualitative methods to study the development of such networks. Nevertheless, SMARTEES aims at identifying some more general conclusions on how conditions can be created in which such local social innovations flourish and bear fruits.

RESEARCH QUESTIONS FOR THIS PAPER

Based on the brief review of the research literature presented above, this paper addresses the following research questions:

1. How do descriptive and injunctive social norms affect personal norms and intentions?
2. *How do personal norms and perceived efficacy affect intentions?* An understanding of these relations will contribute to identifying the role of social norms as drivers of potential sufficiency choices.
3. *How does environmental and regional identity affect personal norms and intentions?* This question explores how identities might shape antecedents of sufficiency choices.
4. *How does the regional framing of the regional identity change these effects?* This question relates the reference frame of the social group to the importance of certain determinants of sufficiency choices named above.
5. *How do countries differ in the degree of identification with different geographical levels*?
6. *How do countries differ in the perception of social norms and efficacy on different geographical levels?* This question explores the regional diversity within Europe with respect to the background of the strength of identification.

7. *How do social network configurations contribute to the successful diffusion of social energy innovations?* The final question addresses the more localite network structures that might foster sufficiency cultures in local communities.

The first six questions will be addressed in Study 1 based on data from a large multinational survey conducted in the ECHOES project, whereas the last question will be addressed based in Study 2 with more preliminary qualitative data from the SMARTEES project.

Study 1 – the influence of social norms and identity on energy saving intentions (ECHOES)[2]

The first study included in this paper is an analysis of data from the recently finished representative quantitative survey of residents in all 28 EU countries plus Norway, Switzerland, and Turkey. For this analysis, only selected parts of the survey will be used.

METHODS

For the analyses presented in this paper the following questions have been used, which are not specifically developed from a sufficiency perspective but may include components of sufficiency and thus contribute to understanding possible drivers of such decisions:

1. **Regional identity**: "How much do you see yourself as a citizen of [your municipality, your country, the EU]?" (1= not at all; 5= extremely)
2. **Environmental identity**: "Acting pro-environmentally is an important part of who I am." (1=strongly disagree; 5=strongly agree)
3. **Injunctive social norms**: "Many people in [my municipality, my country, the EU] would support it if I used less energy (e.g., using public transport instead of a personal car, turning off lights when leaving the room, using technical appliances which help to save energy)[3]." (1=strongly disagree; 5=strongly agree)

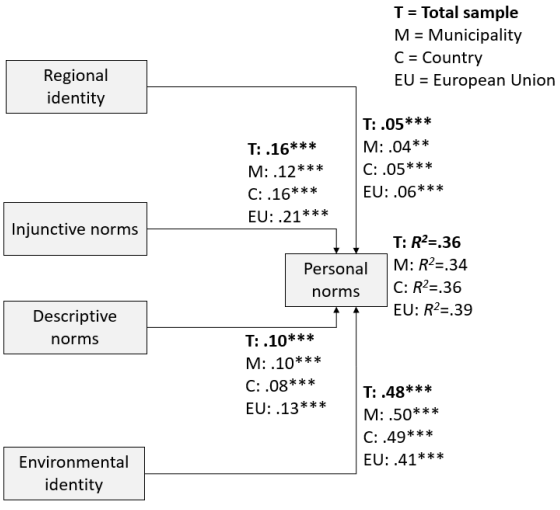

*Figure 1. Influence of social norms and identity on personal norms to save energy. Note: *** p<.001, ** p<.01. * p<.05.*

4. **Descriptive social norms**: "A growing number of people in [my municipality, my country, the EU] try to save energy (e.g., using public transport instead of a personal car, turning off lights when leaving the room, using technical appliances which help to save energy)." (1=strongly disagree; 5=strongly agree)
5. **Personal norm**: "I feel a personal obligation to be energy efficient (e.g., using public transport instead of a personal car, turning off lights when leaving the room, using technical appliances which help to save energy)." (1=strongly disagree; 5=strongly agree)
6. **Perceived individual efficacy**: "As an individual, I can do a lot to support the energy transition." (1=strongly disagree; 5=strongly agree)
7. **Intention**: "I intend to use energy in a way that helps to bring the transition to a renewable energy system." (1=strongly disagree; 5=strongly agree)

For items number 1, 3 and 4, the regional reference frame was experimentally varied: One third of the sample was randomly presented with the name of their municipality in the question, one third with the name of their country and the final third with the EU. It should also be noted, that the items 6 and 7 were phrased more generally as "supporting the Energy Transition" as opposed to the other items which refer to energy saving. The term Energy Transition had been defined in the introduction section of the survey as "the transition to a renewable energy system including individual energy choices". This does only implicitly include energy sufficiency.

The multinational survey collecting the data for this paper was conducted between August and December 2018. The total sample of the survey consists of 18,040 responses from all EU countries plus Norway, Turkey, and Switzerland. The sample was collected by a company running a survey panel. The subsamples in each country are around 600 responses (n=594–624) with the exception of Malta (n=263) and Cyprus (n=251). The sample is representative for each country with respect to gender, age, occupation, and distribution to urban and rural areas.

RESULTS

The influence of social norms and identity on personal norms to save energy

Figure 1 displays the results of four regression analyses where personal norms have been regressed on injunctive social norms, descriptive social norms, the degree a regional identity is embraced (municipality, country or EU), and the degree an environmental identity is embraced. The numbers represent standardized regression weights[4] and explained variance[5] in personal norms; bold numbers are based on the complete sample irrespective of the regional framing, the other numbers represent the results for each of the three subsamples depending on the regional framing.

The results of the analysis show that about 36 % of the inter-individual variation in personal norms can be explained by variation in the predicting factors. The by far strongest influence is environmental identity, meaning that people have environmental protection as part of how they define themselves feel – not very surprisingly – also a stronger personal obligation. Injunc-

tive social norms (what a person thinks other people expect from them) is following in the second place, descriptive norms (what a person perceives others are doing) is in the third place. Regional identification has only a weak influence on personal norms. The framing of the regional reference (municipality, country or EU) has very little impact on the pattern of results. However, it seems that injunctive social norms are the more relevant, the larger the regional reference frame is.

The influence of social norms, identity, personal norms, and individual efficacy on energy saving intentions

Figure 2 displays the results of a similar analysis, but this time with intentions to save energy as the dependent variable and personal norms and individual efficacy included in addition to the predictors included in Figure 1.

The results show that an environmental identity is also the strongest predictor of intentions, followed by personal norms and perceived individual efficacy. Injunctive social norms have a significant effect on intentions, as have descriptive norms, but both effects are considerably weaker than on personal norms. Regional identity is significantly related to intentions to save energy, but this impact is very weak. There appear to be no meaningful differences between the different regional levels.

Variation of the factors in the models depending on the regional frame

The previous two analyses showed that the **structure** of the influences of social norms and identities on personal norms and intentions does not vary much between countries (mostly equal regression weights). It might be, however, that the degree to which each of the factors is embraced depends on the regional frame the factor was measured for (municipality, country, EU). This would express itself in mean differences. Figure 3 displays the deviations from the general mean in the whole sample, depending on the regional framing. As can be seen, intentions, personal norms and environmental identity do not differ, depending on the regional framing. For individual efficacy, small but significant differences appear, indicating that in the EU frame, individual efficacy is regarded significantly higher than in the municipality frame. The same effect occurs,

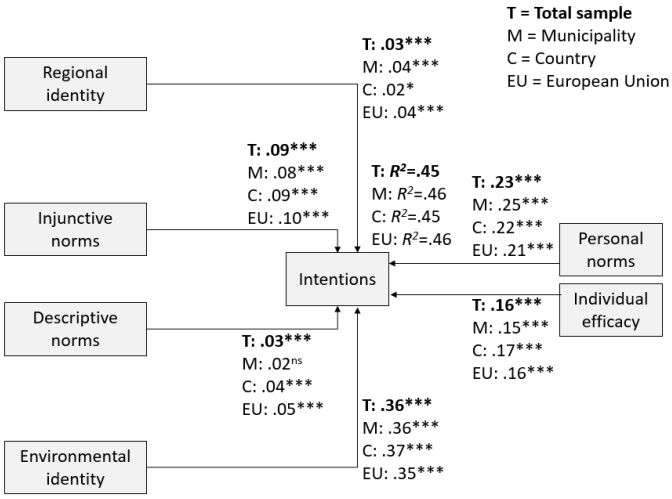

*Figure 2. Influence of social norms, identity, personal norms, and individual efficacy on energy saving intentions. Note: *** p<.001, ** p<.01. * p<.05.*

stronger though, for social norms (both descriptive and injunctive). With respect to regional identification, the highest values are reached for the country level, the lowest at the EU level and medium values for the municipal level.

Variation of country, municipality and EU identification across 31 countries

The previous analysis has shown that the degree of regional identification on average is strongest for the country level, weaker for the municipal level and weakest for the EU level. The left part of Figure 4 (part A) shows how much stronger the identification is with the country as opposed to the EU[6], whereas the right part of the figure (part B) shows how much stronger the identification with the country is as opposed to the municipal level.[7] The strongest preference for the country over EU can be found for Nordic countries (Norway, Finland, Denmark, Sweden) and Turkey. Citizens in the Czech Republic,

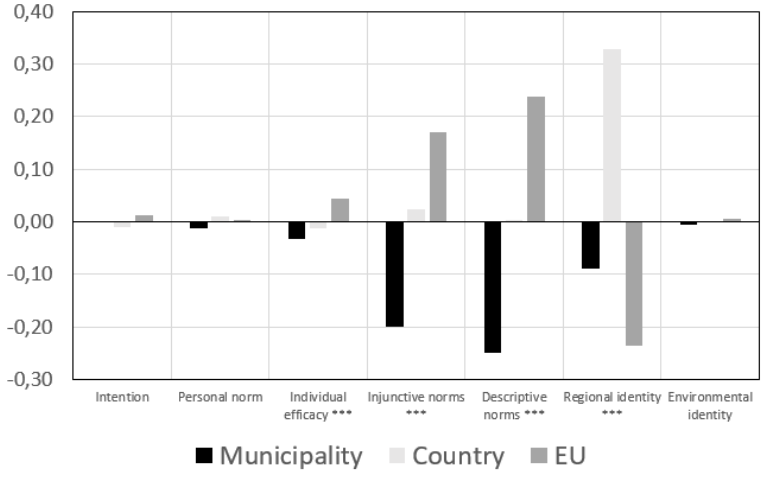

*Figure 3. Deviations from the mean of the total sample in the model factors depending on the regional framing. Note: *** p<.001, ** p<.01. * p<.05 (ANOVA).*

The Netherlands, the UK and Switzerland also prioritize their country strongly over the EU. The strongest relative identification with the EU (however, still weaker than with the own country) can be found mostly in Southern or Eastern European countries (Malta, Hungary, Portugal, Italy, Cyprus, Spain). At least for Hungary this is a surprising result. With respect to the country level as opposed to the municipal level, Denmark, the UK, Finland, Ireland, and Sweden score highest, whereas, in Hungary, Slovakia, Italy, Cyprus, and Croatia respondents identify relatively high with their region in comparison to the country.

Variation of social norms and individual efficacy across 31 countries

The final analysis compares the difference between individual efficacy and the injunctive and descriptive social norms reported for the municipal level as opposed to the EU level (see Figure 5). The higher the number, the stronger efficacy and the stronger social norms are experienced by a country's citizens when framed with the EU as compared to the municipality they live in. In Slovakia, Croatia, Lithuania, and the UK, citizens respond with a much higher efficacy if the reference frame is the EU than if the reference frame is the municipality they live in. At the other end of the list Finland, Denmark, France, and Romania can be found, where municipality framing results in higher efficacy ratings. Citizens in Malta, Hungary, and Slovakia experience the social norms to support the energy transition to be considerably stronger in the EU as compared to their countries, whereas this difference is only small for Sweden, Denmark, Finland, and the Netherlands. Cyprus, Bulgaria, Malta, and Romania score particularly low on municipal descriptive norms as compared to EU, whereas differences are small for Sweden, the Netherlands, Finland, and Switzerland.

DISCUSSION

From the presented results of the first study, the following conclusions can be drawn. Environmental identity, thus if a person conceives it as part of what constitutes them as a person, is an important predictor of the intention to support the Energy Transition and under that umbrella potentially also energy sufficiency. As sufficiency choices were defined earlier in this paper as more radical choices, it can be expected that people with strong environmental identities are more prone to favouring such choices. However, it might also be that sufficiency choices follow different identity patterns that other environmental behavior, a question which would need to be addressed in a study tailored to this type of behavior. The influence of envi-

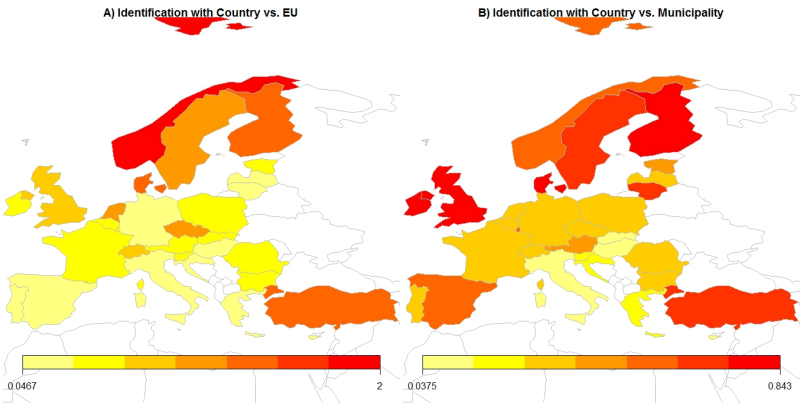

Figure 4. Difference between identification with country and EU (A) or Municipality (B).

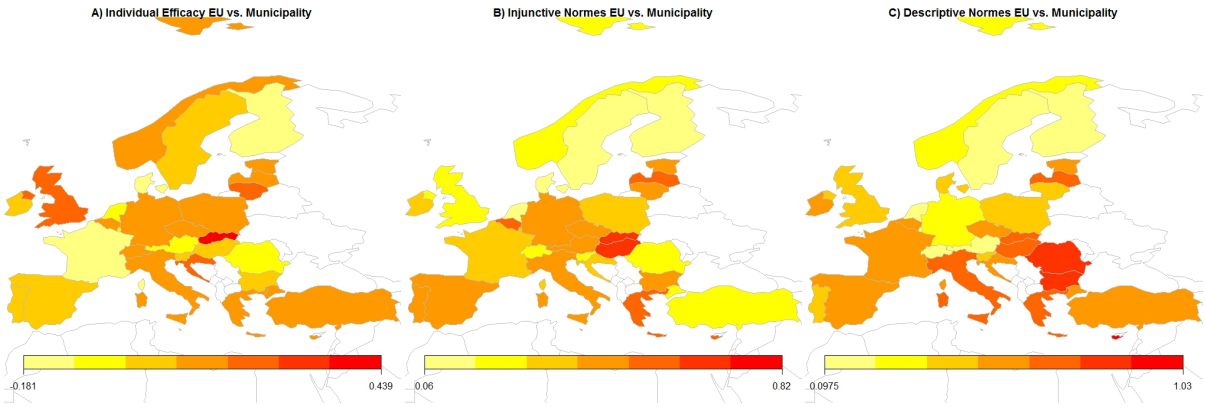

Figure 5. Difference between EU and municipality framing for perceived individual efficacy (A), injunctive social norms (B), and descriptive social norms (C).

ronmental identity goes partly via generating a feeling of moral obligation to save energy (personal norm), which is a second important factor triggering intention. Also the individual efficacy, thus the feeling of being able to contribute, is of importance for the intention to act, which goes in line with the theory of planned behavior (Ajzen, 1991). Social norms have a rather limited *direct* influence on intentions when personal norms are also included in the model, most of their influence is mediated by personal norms, which is in line with findings by Klöckner (2013a). What is interesting in the findings is, that – though small – the degree of identification with a region (be it a municipality, a country, or the EU) positively affects both personal norms and intentions (when all other factors are controlled), indicating that the feeling of belonging to a larger social group might strengthen the feeling of being obliged to contribute to energy saving, which might benefit the group. This thought can be transferred to sufficiency choices, where the "greater good" as motivation is even more prominent. What is finally interesting to note is that the identification with the country is in all countries higher than with the municipality people live in and with the EU (which scores lowest in all countries). However, there is rather a strong variation between the countries *to which degree* the country identification is stronger. Nordic countries and Turkey score highest on identifying strongly with the country relative to the EU, whereas Southern European countries score their country and the EU more evenly. Whereas this result is not surprising for Norway and Turkey (and also Switzerland) which are not Member States of the EU, it seems to be more than just an effect of EU membership, if also the other Nordic countries are taken into account. On a side-note: it is interesting that the UK in the middle of the Brexit negotiations has no particularly strong difference between the national and the EU identification. Although citizens in many countries do not identify strongly as being European Union citizens, they score higher on efficacy and social norms, when triggered with the EU as compared to the country or especially municipality. This seems to indicate that the respondents regard the solution of energy issues as an international challenge, where both social pressure but also the ability to act are perceived to be higher due to a larger group of people included.

Study 2 – Diffusion of social energy innovation in social networks (SMARTEES)[8]

The data presented so far is based on a large quantitative survey. However, it is only based on one point in time and does not say anything about the dynamics of social influence on energy sufficiency over time and how people influence each other in social networks. Furthermore, the localite specificities of social innovation processes are not well captured in a trans-national survey. Therefore, the following – still preliminary – qualitative analyses of a selection of cases of social energy innovation studied in the SMARTEES project will be presented to shed some light on the social dynamics of such processes.

METHODS

Since SMARTEES is still in an early stage, the empirical work is not very mature. The preliminary analyses of two selected cases of social energy innovations are based on a project report which describes the SMARTEES cases based on a comparative document study published as a SMARTEES deliverable (Caiati et al., 2019). Two of the ten SMARTEES cases were selected for this paper as they prototypically show some of the features that characterize the social influence processes that occur in instances of successful social energy innovations over time:

1. The first case is an energy-autonomous island, namely the island **Samsø** in Denmark, which through a process lasting more than 20 years developed from an economically and demographically struggling rural island to a thriving energy innovation hub, producing and investing in regenerative energy and creating a community-driven local energy transition which also is a social transition.
2. The second case is a "city quarter revitalization through energy effectivization", namely **Augustenborg** in **Malmö**. Here a collaboration between many societal actors in a struggling city quarter stimulated the transition to a more liveable but at the same time more energy efficient local society.

The analyses presented in the following are based on the study of newspaper articles, scientific publications about the case, legal and financial documents, internal working papers provided by the case representatives, and initial interviews with key persons in the cases. These sources were compiled into case descriptions (Caiati et al., 2019), parts of which are condensed here into a preliminary and rather descriptive analysis of social networks which developed in the cases and an analysis of how the interactions in them contributed to the success of the social energy innovation.

RESULTS

Samsø (DK)

Samsø is a smaller Danish island with about 3,700 inhabitants. For hundreds of years, agriculture was the main occupation on the island, which had hundreds of operating windmills 300 years ago. The Islanders are said to have a strong local identity. However, in the 1990s the island's economy and social structure were challenged by the closing of cornerstone industry like the island's slaughterhouse and the trend of young people moving away to the mainland. At this time, Samsø was 100 % depending on imported oil and coal for the production of energy. Consequently, three strongly engaged and innovative citizens developed the idea to restructure the island's energy system towards 100 % regenerative energy sources (see Figure 6). They formed (and still are) the core of the activities on Samsø, now professionalizing their activities. Supported by the local municipality, they won a smaller grant by the Danish government and started implementing their plan. However, the real social network activities were just to start. With the grant the plan was developed, and first the Energy and Environment Office (1997) and the Samsø energy company (1998) were founded (later in 2005 merging into the Samsø energy academy), which strategically involved representatives of the municipality, the farmers' organizations (which also could draw on their experience with cooperative production structures through experience with organic farming cooperatives), the business council (which could represent and develop the necessary technical know-how), and civil islanders' organizations, representing the public and potential investors. Initially, an external energy provider wanted to engage, but the island-

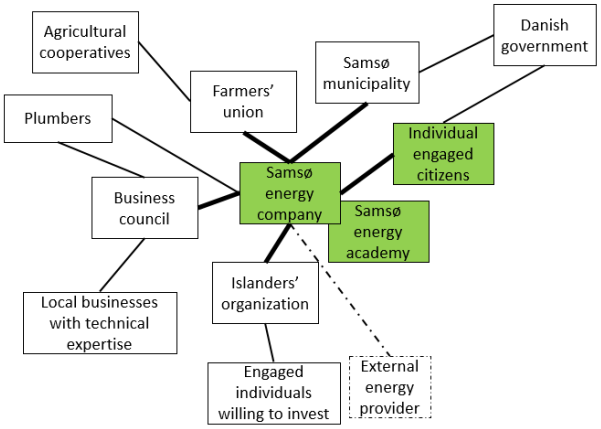

Figure 6. A rough sketch of the social network on Samsø, DK.

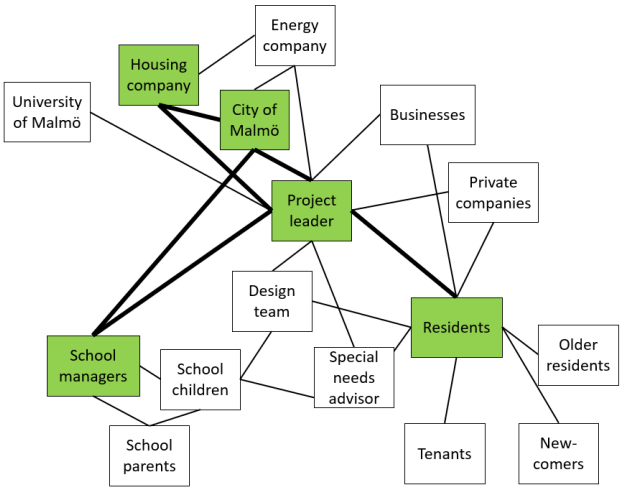

Figure 7. A rough sketch of the social network active in Augustenborg, Malmö.

ers decided to keep the company local, so the bond to that company was cut. One of the local individuals took the role of a social mediator, navigating in a climate characterized by strong mutual respect for alternative ideas, but also a certain scepticism for innovations and the fear of negative implications of fundamental changes. The mediator proved to be very skilled in using informal local networks and recruiting allies for important meetings so that the plans were finally accepted and Samsø became energy autonomous by community-driven (and financed) actions. As a conclusion, this case shows the importance of having charismatic and socially skilled persons at key positions in the social network, who know the local "assumptions and language." Furthermore, Samsø shows that representing all relevant stakeholder groups early on, taking them and their concerns seriously, and develop plans fitting the local culture is necessary. This development was partly the result of strategic planning, partly just developing coincidentally.

Augustenborg, Malmö (SE)

Augustenborg is a part of the city of Malmö in southern Sweden. Most of the 1,800 apartments in the area are rented from one housing company and are located in multi-family homes constructed in the 1950s. In the 1970s, the initially well-balanced social structure in the neighborhood declined, changing also the tenant structure towards unemployed and residents with an immigration background. During that time also the building infrastructure suffered and the area was repeatedly hit by flooding from overflowing sewage and drainage systems. In the 1990s, a regeneration project started, which evolved into the eco-neighbourhood (ekostaden) Augustenborg project, which addressed both environmental and social issues. For the brief review in this paper, the focus will be on the social networking processes involved.

Figure 7 displays an attempt to sketch the network of the most relevant stakeholders in Augustenborg based on the case description. Initiated by the city of Malmö, the housing company owning almost all apartments in the area and an energy company, the project quickly developed into a participatory action, involving many relevant stakeholders in the area. A key role fell on the charismatic project leader who was hired as a coordinator for the area, but also a school manager and some individuals in the Malmö city council became important drivers of the process together with the building company (indicated by the green rectangles in the figure). In case of Augustenborg, the stakeholder involvement was part of the planned process. Through these key people, local residents, businesses, companies, and schools were involved in the planning of the restructuring activities and especially residents became very active. Newcomers and older residents with their special perspectives were represented as well as school children and their parents. The University of Malmö accompanied the project with their input. It showed that large proportions of the locals were at one point or another involved in the process, even if the continuous engagement of larger groups was difficult to achieve. A conclusion from the Malmö case could be underlining the importance of a small team of dedicated actors placed at strategically important social nodes (like schools) for the success of such social innovation processes over a longer time.

DISCUSSION

The two very rough and still preliminary analyses of social networks behind two social innovations with an energy component show some important similarities: Both cases can be classified as social innovations with respect to the definition of social energy innovations given in the introduction, as they challenged the established ways of doing or thinking, established new structures of decision making and living and changed not only energy use but also social cohesion and participation in their population. Both cases were successful, because they involved important stakeholders early on in the process, and because the assigned skillful and dedicated individuals to the key positions in the network (in both cases at least one person was professionally working with the network for the years of the project). Initially, this key person might engage by coincidence, but in both cases the decision was made to engage them more professionally. In diffusion of innovation theory (Rogers, 2003), the role of such individuals who often are considerably more innovative than the rest of the population is outlined. However,

Rogers also points out, that such innovators will have the most impact on the local population if they sit well-connected at the nodes of the social network.

General discussion and conclusions

If we take both studies together, that have been presented in this paper, a number of conclusions can be drawn. First of all, it becomes clear that people's energy decisions (including but not restricted to sufficiency choices) are affected by complex social networks of mutual influence. What other people do and expect is important for people and influences their personal norms and intentions to act in support of the Energy Transition (which might or might not include sufficiency actions). There is a certain potential in framing energy behavior as a collective action in line with the SIMPEA model (Fritsche et al., 2017), as has been shown in the first study. Interestingly, the analyses show that in most countries, the EU level is perceived as the unit with the (relative to the country or municipality) strongest social norms to act and highest efficacy, but the EU is also the level people across most countries identify the least with. This is a challenge for unlocking the potential of collective action at the EU level. Thus, one task would be to increase identification with the EU, which seems demanding in times of Brexit and anti-EU tendencies in many other European countries. Another option would be to increase the level of perceived social norms and efficacy on the local level, maybe by linking to local to the global.

The social network analyses of the cases indicate the importance of professionalizing the key roles in local networks of social energy innovation, e.g. by municipalities creating temporary positions for such people. Both cases have succeeded because of a combination of dedicated individuals who have for a certain amount of time been employed to drive the process and strong volunteers at neuralgic points of the networks. Furthermore, the two cases show the importance of connecting to local cultures and traditions and building on local knowledge and expertise. This also includes taking into use unorthodox communication means or places by initiators or drivers of such processes, like the kitchen meetings that were common on Samsø.

Both studies show clearly the potential of the perspective on social processes to drive future energy developments in the European Union and beyond. We need to understand how collectives of people make decisions and how that differs from the often unrealistic assumption of rational and economic individuals. This might get us a long way further than the still prevailing assumption that consumers just need more information and the right economic incentives to shift their behavior which is reflected in most policy documents (Klöckner et al., 2018). However, for the case of sufficiency, this understanding of complex social processes (and even shifts of culture not addressed in this paper) will be even more important due to the more radical changes they imply.

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Endnotes

1. In this paper, "them" and "their" are used as gender-neutral pronouns to avoid "him" and "her."
2. ECHOES is a research project (2016–2019) funded under the H2020 LCE31 call. It studies the energy choices of citizens in three technology foci (electric mobility, smart energy technology, energy in buildings) from three theoretical perspectives: the micro-level focussing on decisions of individuals in social contexts, the meso-level focussing on energy cultures (which are not included in the survey data), and the macro-level, focussing on energy choices of formal social units. One of the main empirical works in ECHOES is the large survey which is the basis for the work in this paper. The survey focused primarily on the individual perspective.
3. From a perspective on energy sufficiency it needs to be pointed out that some of the examples listed here better fit under a definition of energy efficacy than sufficiency. This is due to that ECHOES and the ECHOES survey were not designed with a focus on energy sufficiency but broader on aspects of the energy transition.
4. A standardized regression weight quantifies the strength of the relation between two variables controlled for all other variables included in the same model. It can vary between -1, indicating a perfect negative relation (+1 standard deviation change in one variable would result in -1 standard deviation change in the other) and +1, indicating a perfect positive correlation (+1 standard deviation change in one variable would result in +1 standard deviation change in the other). O indicated no relationship between the two variables.
5. R^2 indicates the degree to which variation in the dependent variable of a regression analysis is predicted by all independent variables included in the analysis.
6. The difference between the country identification score and the EU identification score was calculated for this figure.
7. The difference between the country identification score and the municipal identification score was calculated for this figure.
8. SMARTEES is also a research project (2018–2021) funded under the H2020 LCE31 call. In this project, the conditions under which five types of social energy innovations (inclusive mobility planning, energy-autonomous islands, introducing car-free "superblocks" in cities, city quarter revitalization through energy effectivization, fighting fuel poverty through participatory energy efficiency plans) spread in local communities are studied. Combining a case-study approach with agent-based modeling (Axelrod, 2006), social innovation theory , and a policy scenario study, the project will construct a simulation tool to assist political decision-making.

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