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Is local always best? Social acceptance of small hydropower projects in Norway

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ABSTRACT

Small-scale development of renewable energy has been identified as one possible solution to meet future energy needs and is well aligned with the general European trend towards further development of community energy projects. Increased local energy production will move energy plants closer to where people live, placing aspects related to social acceptance at the center stage. Until recently, small hydro power (SHP) projects in Norway have been owned by local farmers and others with property rights to rivers. As the profitability of these projects has decreased, international investors have taken interest in SHP projects as part of their long-term investment strategy. In this paper, we study what influences social acceptance of SHP projects in Norway based on interviews and qualitative data from several SHP projects in Norway. We find that community energy projects often are attributed positive qualities when ownership is local. We argue that there is a need to consider more thoroughly how to organize ownership of small-scale renewables in the future, if it is to uphold its position as a popular and viable solution to meet future energy needs.

Keywords

Renewable energy;
Community energy projects;
Local energy production;
Sustainable energy transitions;
Social acceptance;
Ownership

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1 Introduction

In recent years, smaller hydropower plant projects and so called ‘community energy projects’ have gained increased attention in the research and grey literature, most importantly, because such projects have been highlighted as a way to achieve the transition towards a low-carbon energy system [1, 4]. Community energy projects are not necessarily small, but tend to be smaller than many projects developed by commercial actors [5, 6]. Europe has a high potential for, and long tradition of SHP projects [7, 8]. The shift from a few large energy plants to numerous smaller ones is an increasing trend

all over Europe [9, 10]. Developing these projects has been emphasized as an important strategy in terms of producing green energy and helping to develop rural areas [11, 12].

In Norway, most hydro power plants have traditionally been developed for large-scale production. It was mainly after the turn of the millennium and the introduction of the green certificate scheme that SHP projects increased rapidly in number. Today, Norway has installed 257 hydropower plants with a capacity ranging from 10-100 MW, and 715 SHP projects between 1-10 MW. License has been given to an additional 7.5 TWh of

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hydropower production, which is either under development or in the planning stage [9]. The majority of these are SHP projects located in rural areas where, due to effects on nature, landscape and infrastructure, they are often perceived as increasing the strain on the local community.

The term 'community energy' is a somewhat diffuse term often used to denote projects with some degree of local involvement. Two characteristics have been used to identify community energy projects [14]. A process dimension, which refers to who manages the project and who has influence over the process. An outcome dimension, which is concerned with how the outcome of the project is distributed and who benefits from it both in economic and social terms [14]. Different 'community renewables' projects can be categorized according to where they fall on these two dimensions. Generally, it is seen as favorable when the community has some degree of involvement in the project, and the outcome of the project is distributed among the entire community. In addition, it has been demonstrated that having a high degree of local ownership and local control in such projects makes them more adaptable within the local context [15, 16].

Studying social acceptance is crucial to understand what influences decisions concerning local implementation of SHP projects, and the municipalities' role in this process. One of the major drivers for social acceptance is the perceived positive impacts on the local level [17], for instance related to employment rates, local industry, environment and the distribution of local benefits [18].

Relatively little research on social acceptance of renewable energy projects have focused on social acceptance of hydropower plants, compared to, for instance, wind power [19, 20]. In this paper, we address this gap focusing on the social acceptance of SHP projects, based on empirical research of SHP development in Norway.

While most research on renewable energy and social acceptance thus far have zoomed in on inhabitants and the attitudes of people living in proximity to such projects [21], we adopt a broader focus as we also include other actors significant for the social acceptance of SHPs, such as municipalities, environmental organizations, and energy companies. We study projects that has been developed at different periods of time, a factor that has often been overlooked in earlier studies. Our study brings to light considerations of social acceptance that are highly relevant for the development of SHP projects in an international context, in a time characterized by

large changes, also with respect to ownership structures which makes this study object particularly pertinent.

The paper starts by presenting relevant theories of social acceptance and moves on to discuss the status and history of hydropower in Norway. Then we present the cases and the methods used in this paper, before discussing findings and concluding.

2. Theories of Social Acceptance and Renewable Energy

'Social acceptance' has traditionally been used as a barometer to measure public opinions concerning different energy technologies. Social acceptance is often found to be high among the general public, but locating projects closer to home calls for more active standpoints concerning location, aesthetics, and local involvement [2]. This is particularly relevant for SHP projects, which often is located close to habitation contrary to former, large hydro power projects. Thus, the trend towards an increasing number of renewable energy plants all over Europe highlights the importance of studying social acceptance in relation to such developments [22, 23].

To this end, the Not-In-My-Backyard (NIMBY) concept was launched to capture the way in which people tend to feel positively about renewable energy developments in general, but more negative once a project was established close by or in their 'backyard' [24, 25]. Later, this model has proven to be too simplistic, and more nuanced understandings of the relationship between renewable energy projects and public acceptance have since been developed [2, 26].

Prior scholarship aiming to better understand the complexity of local opposition to renewable energy projects, that is, how local acceptance differs from general acceptance, has resulted in a proposition to regard social acceptance as consisting of three dimensions, according to Wüstenhagen, Wolsink and Bürer [2]: 1) Socio political acceptance, which is the most general form of acceptance in society 2) Community acceptance, which refers to the acceptance of specific projects by local stakeholders, inhabitants and local authorities and 3) Market acceptance, which relates to technology and the extent to which the market adopts new technologies.

Expanding Wüstenhagen, Wolsink and Bürers' [2] three dimensions, Sovacool and Ratan [27] suggest that acceptance depends on the prevalence of nine different factors as presented in table 1. If these nine factors are present, Sovacool and Ratan [27] argue that a market

will be created in which different renewable energy technologies are accepted. In this paper, we build on the work of Sovacool and Ratan [27] to operationalize the original dimensions of Wüstenhagen, Wolsink and Bürer [2] into nine criteria, three corresponding to each of the dimensions and translating them into a Norwegian context, as demonstrated in table 1. The ‘criteria’ and ‘explanation’ columns are developed by Sovacool and Ratan, the ‘translation’ and ‘relevance’ columns by us. To do so, we have investigated the criteria descriptions and tried to translate and develop these criteria into equivalent meaningful criteria in the Norwegian context. For example, with the criteria ‘access to financing’ in the market dimension, we have translated this into a more detailed description regarding the possibility for

local landowners and inhabitants to finance SHP projects.

The socio-political dimension is divided into (i) strong institutional capacity, (ii) political commitment, and lastly, (iii) favorable legal and regulatory frameworks. The market dimension is divided into (iv) competitive installation/production costs, (v) mechanisms for information and feedback, (vi) access to financing. Thus, this operationalization is using the dimensions of Wüstenhagen, Wolsink and Bürer [2], but in greater detail.

Where the dimensions of Wüstenhagen, Wolsink and Bürer are focusing on the willingness to invest in new technologies, Salm, Hille and Wüstenhagen [28] found that for investors, the local embedding of projects made

Table 1. Description and translation of theoretical perspectives into Norwegian context.

	Criteria	Explanation	Translation	Relevance
Social political dimension	Strong instrumental capacity	Countries exhibit institutional support at the national level through ministries or department of energy with specific programs or subsectors dedicated to renewable energy, or have government-sponsored institutes conducting research on renewable energy	To what degree is there an institutional system that supports the development of SHP in place?	The institutional system for developing hydropower and SHP is well established
	Political commitment	Political leaders promote renewable energy and make it a highly visible topic	To what degree have politicians encouraged the development of SHP?	Developing SHP has been part of a national strategy, in particular related to farming
	Favorable legal and regulatory framework	Laws and regulations facilitate easy entry into the renewable market, independent renewable energy producers are granted access to the electricity grid, national interconnection standards exist, and regulatory changes occur in a predictable and transparent manner	Are there laws and regulations facilitating renewable energy production?	Legislation and regulations are well established due to a long-standing hydropower tradition.
Market dimension	Competitive installation/production costs	Renewable energy technology can produce electricity at a competitive rate compared to other sources of supply, driven by government incentives, a large resource endowment, and/or a strong local manufacturing base	Are there well founded and implemented support schemes and financial arrangements for renewable energy producers?	Depending on the time of development, this has changed. This dimension does not intercept the time dimension
	Mechanisms for information and feedback	Investors and users/producers have access to reliable information about renewable energy policies, prices and opportunities	Is there sufficient information available for all actors?	Partially, as this information is provided from different actors representing a variety of interests
	Access to financing	Producers, manufacturers, and users have access to domestic sources of low-cost financing and/or can benefit from specific government financing schemes	How easy is it to finance SHP for local landowners or other locals? How strict are requirements for capital?	The cases in our study have been developed in different periods of time: Access to financing has changed substantially in the cases studied.

Community dimensions	Prolific community/ individual ownership and use	Renewable energy systems tend to be installed, owned and/or used locally	How easy is it for locals or communities to own projects?	The term 'community' does not fit as it is complex and unclear who this encompasses. Ownership is underestimated.
	Participatory project siting	People and communities are involved in the decision to site or permit renewable energy facilities near them	To what extent is locals given the opportunity to influence the license process and including siting of projects?	This relates to the licensing process, but the influence seems to be minimal in practice
	Recognition of externalities or positive public image	Community members are generally aware of the environmental impact of conventional energy and the benefits of renewables, cultivation of a strong public image	Are locals given any information about the positive and negative impacts of the project?	Seems to be influenced by different actors in a way that is not described very well in this dimension. It is a more complex process.

them more interesting for investment. Finally, a community dimension divided into (vii) prolific community/ownership and use, (viii) participatory project siting and (ix) recognition of externalities or positive public image which includes the possibility of community members to be informed of the environmental impact of conventional energy as well as the benefits of renewable energy [3].

For many communities, the promise of increased activity and income can have a significant positive impact on local attitudes towards the projects [3]. Greater participation of local communities in hydropower projects may also actually serve to increase social acceptance [19, 30]. In the model of Sovacool and Ratan [27], ownership only influence the community dimension. Focusing on a Norwegian context, we would, however, analyze how ownership influence social acceptance in general.

Sovacool and Ratan [27] does not seem to be clear about the multiple meanings of 'community' which is not very well defined. In a Norwegian context, 'community' could mean the municipality or the inhabitants. For the purpose of this article, we chose to understand 'community' in a wider sense, including both the municipality and its inhabitants.

3. Hydro Power in Norway

The importance of hydropower for the development of modern society is significant [31, 32]. Hydropower has provided substantial income and secured the foundation for the development of the welfare state in the immediate post-war period. During the 1980s, the last large hydropower plants were developed, albeit with a

high degree of controversy, and the remaining large river systems were preserved through political resolution [34].

With this background, the process of application for license to develop and operate a SHP in Norway is rather extensive and focus on broad involvement where all parties affected by a given project are entitled to have their say. In concrete terms, time is allotted for the consideration of statements concerning the project, submitted by individuals or groups. In addition, those directly affected by the project have the right to appeal the decision after a license has been granted or repealed [30].

SHP increased considerably at the end of the 1990s through the turn of the millennium for several reasons. Most importantly, Norway was the first country to deregulate energy legislation, allowing for anyone to produce and sell electricity on the national grid. Of equal importance was the agreement concerning electricity certificates in 2011, giving those with plans to develop SHP projects incentives of having operative plants before the deadline of 2021 [35]. Many of these projects were developed and owned by local farmers. There has been an overall positive attitude towards such projects as they have been seen as serving to maintain decentralized habitation and provide valuable income to many small and less profitable farms. However, as the number of SHPs has increased substantially over the last decade, so have the controversies related to the environmental and biological consequences [36] making social acceptance a key issue to explore in relation to SHP projects. However before delving into the way social acceptance plays out in relation to SHP projects in Norway, we will give an overview of the data and research methods.

4. Description of Cases and Research Methods

In this paper, we study what influences social acceptance of SHP projects in Norway. The research question of this paper is addressed through case studies of three municipalities in the region of Vestland, located in the western part of Norway. Our methodology is a combination of different qualitative methods, mainly document analysis and semi-structured interviews.

The county of Vestland was chosen for several reasons. First, the region has the highest density of and largest potential for SHP projects in Norway at the lowest development cost [35, 37 p. 25]. The NVE (The Norwegian Water and Energy Resource Directorate) database shows that there are currently 79 licensed projects in the region of Vestland which have not yet been developed. If and when constructed, these projects would provide 677 GWh of renewable energy [38], but also have a major impact on wildlife and natural landscape, and in turn, community acceptance. If the burdens on the local community increase, without any increased local revenue, this could have a negative impact on social acceptance of SHP.

The numerous SHP projects under construction have led to substantial interest in small hydropower projects. Third, the county has a long-standing agricultural tradition in which farming and local landowners stand at the fore, thus upholding agriculture is deemed important for local as well as regional politics. The familiarity with hydropower and SHP in particular, also provides a favorable environment for studying social acceptance of SHP with easy access to people, municipalities, organizations and companies with relevant experience.

Interviews, document studies and media studies have been the main sources of analysis in this paper. In the three municipalities in Vestland, eight interviews were done with municipal administration, case handlers, local landowners, developers, and owners of SHP projects. In addition, we have interviewed two of the large, regional energy companies as they were involved in some of the first SHP developments in the region. We also interviewed one employee from the county administration and the regional travelling association who has been engaged in hearings of most regional SHP projects. In total, we conducted 12 interviews with key stakeholders and representatives of different groups of people. Interviews are covering private as well as public voices, and a variety of actors. As the purpose of the paper is to study social acceptance of SHP projects in Norway, we consider the interviews to cover a broad specter of

actors, which is of particular interest in this research. A detailed list of interviews is found in the Appendix.

The interviews were carried out over a period of one year, from 2016 to 2017. We met the interviewees in their home or at their workplace. The purpose of the interviews was to understand how the different actors considered social acceptance of SHP projects, and if ownership of SHP projects affected social acceptance. We were also interested in the recent development of large funds investing in renewable energy projects in Norway, and how such investments subsequently affected social acceptance. Could this influence how projects were to be handled by the municipalities and other public and private actors in the future? All interviews were transcribed in verbatim. The quotes used in the paper have been translated by the authors.

To study the formation of social acceptance in these contexts, we also analyzed interviews, municipal hearings, newspaper articles, debates and letters in local newspapers to bring out ways in which local communities have responded to SHP projects. When analyzing data, we have identified official statements, political goals, and developers' accounts of obtaining the necessary financial backing. We have also been interested in how different actors have considered ownership and to what extent they have been involved in the project. We were interested in the attitudes of case handlers and politicians, and others that might influence the outcome of the license procedure. It was important to investigate how they consider ownership, as the attitudes of these vital actors have proven to be important in order to develop local, renewable energy projects [3, 30].

We were interested in statements related to social acceptance, and the nine criteria of Sovacool and Ratan [27] concerning the anticipated implications of ownership, participation in the project process, and the expected outcome in terms of positive and negative implications for the local community. We have summarized the nine criteria and translated them into a Norwegian context, as presented in table 1. In the result section, an overall assessment of the relevance of the criteria based on Wüstenhagen, Wolsink and Bürer and Sovacool and Ratan, and how it is related to the empirical data is included.

5. What Influences Social Acceptance of Small Hydropower Projects in Norway?

We divided the empirical results obtained in this paper based on the nine criteria of Sovacool and Ratan [27] to operationalize the three dimensions and to link the

criteria more closely to our interview and document analyses. The focus of our analysis is to investigate what influences social acceptance of SHP projects in Norway, as operationalized in table 1.

5.1. The socio-political dimension

The focus of the socio-political dimension is directed towards overall acceptance, national laws and regulations concerning SHP projects. Even if SHP is relatively new, large- and small-scale hydropower share most of the legislations, a well-established and thoroughly institutionalized area. With instrumental capacity, political commitment, legal and regulatory frameworks under scrutiny, we find that the long-standing tradition of hydropower in Norway has produced a well-established legal framework as well as political commitment. SHP was not seen as profitable for most of the large energy companies for many years due to lack of water magazines, but nonetheless, some actors did take an interest. This was mainly private investors in the energy sector, looking for a new business potential. A regional energy company also tried to enter the market of SHP but found the competition to be hard, as this quote by an employee in a regional energy company illustrates:

We considered it interesting, so we tried to get long-term property rights to the river as well, but after a while we saw that considering the development... prices rapidly increased. After a while, several so-called 'white-collars' entered the market, this was national actors looking for business potential [...] They secured long-term contracts, and in the worst cases, they got provision based on number of contracts and values. For us, as a regional actor, this had a bad flavor, so we backed out. We must be able to see people in their eyes when we meet them at the grocery store.

This was a new situation for many of the local farmers as well. Suddenly, there was an increased interest in securing property rights, even to relatively small rivers, and the contracts they were offered in return was by many seen as a tempting additional income.

In this period, the regional trekking association attempted to raise awareness around the environmental consequences of SHP. The head of the association considered local farmers as occupying a prominent position as landowners with property rights to rivers, which, again, influenced how the association considered projects developed by local farmers:

In the early phase, local landowners developed the [SHP] projects, and we thought we had to consider them as well. I grew up on a farm so I'm familiar with that side of things. We also found out that if we were going to be heard, we had to be balanced. If we said "ok" to some developments, NVE took it more seriously when we strongly opposed others, because we seemed more balanced. After a while, NVE probably noticed this. I think it made it easier to be heard in the important cases.

The regional trekking association cooperated with other organizations to formulate responses to various statements as part of the license process, attempting to exert a stronger influence over the outcome of different projects. When it came to priorities for the association, the generation of local income and profit ranked high, as illustrated in this quote:

I think in cases where local landowners have developed a project, we have been a bit more 'kind' than in cases with larger developers, ... but we have tried, first and foremost, to keep a just and fair process when flagging our objections. In some cases, we have strongly opposed projects developed by local landowners.

The strong position of farmers within the trekking association might be one reason for this. Overall, the regional trekking association seemed to be one of very few voices attempting to moderate the numbers of SHP projects. The trekking association were critical to some of the large, national developers, and the change in ownership that happened recently:

We have been a bit more critical towards some of the large developers, and we see now that Småkraft AS and other developers have been sold to German interest. We don't like that, to be honest. Småkraft AS was owned by the Norwegian government, or Statkraft and other publicly owned energy companies, so it's the government that have sold a very large part of the Norwegian small hydro power plants to German interests in particular, and foreign owners in general.

Overall, the change in ownership highlights the difficulties of Småkraft's own position. Småkraft, initially had several public owners. Due to changes in ownership, the company suddenly got a different position (see e.g. Yttri [35]).

In the following section, we will turn to the market dimension of social acceptance, and how it seems to have influenced social acceptance of SHP in the region.

5.2. The market dimension

The profitability of SHP projects has changed over the last 20 years [39, 40]. The most profitable and accessible projects were developed first (some as early as in the 90s) while the projects that have been developed more recently are less profitable and with competition from other types of renewables, such as wind power.

Access to financing has obviously been a crucial part of the development process of many SHP projects. When banks increased the requirements for capital, some of the smaller projects needed external investors. The difficulty of obtaining a loan is mentioned as one of the motivations behind local actors selling to external investors. Larger investors did not have the same difficulties obtaining a loan, as they had more capital and financial security.

However, at the beginning of the SHP development era, a large part tended to be financed by local landowners. Energy prices were higher and access to financing was easier. A landowner could easily develop his SHP project in cooperation with a couple of other farmers. The project would be profitable almost from start, as illustrated here by one of the local landowners:

We were lucky to get some good years after we started production where electricity production was much higher than expected. When we started planning the project, we did not expect to make any profit the first years.

In the following years, after some time with high electricity prices, the focus on development of SHP increased:

Later, a professional developer tried to make agreements with local farmers to develop small hydro power projects. Their philosophy, well, I liked the initial idea, even if it did not turn out like that - the developers would get a small income and the rest would go to local farmers [...] I thought the idea was good, but later the company dissolved. In a way it is operative, but the company was sold, leaving the local farmers with nothing and the developer with a substantial income.

This landowner was critical of the role NVE played in this, claiming that NVE were pushing local farmers to

develop larger projects and hence, taking on a substantially larger economic risk than they felt comfortable with.

If I were to advise these farmers, I would suggest a more careful development, like we did. But NVE is pushing developers to take advantage of the water and increasing the size of the projects to make the societal benefit of the project as large as possible.

A project that began operation in 2011 illustrates the rather laborious process of starting up a plant in the initial phase, years before even receiving a license. Despite some challenges with respect to financing, the project moved forward. At several of the Small Hydropower Association [Småkraftforeningen] meetings, one farmer was able to make meaningful contact with a representative from a leading local bank, a regular attendee at such meetings arranged by the Small Hydropower Association. For this project, finding this one reliable and knowledgeable point of contact was crucial. For many of the local landowners starting up SHP projects, this networking activity and securing of financial resources was something new and very different from traditional farming. Given the interest of professional investors looking for projects to invest in, it was difficult to get reliable information and build trust in the process.

We had a bit of luck there as well, because I had been at some of these small hydro power meetings, and I noticed a lady from one bank that attended all the meetings. The other banks did not participate, she was really into things. This bank was leading in the area, they really understood it. The other banks came later.

Having local support in terms of financial resources and knowledge was crucial for this developer. As mentioned, many of the developers were local landowners with little experience in the SHP area, having access to local financing was vital in order to develop the project without external investors.

5.3. The community dimension

Norwegian society has traditionally placed high value on rural areas, emphasizing use of the nature and preserving the cultural landscape. These values are perhaps particularly strong in the county of Vestland, as it has a high degree of rural habitation and farming. Thus, the community dimension is thought to be of crucial importance. In Norway thus far, there has not been a strong tradition

of community ownership, that is, of local inhabitants establishing energy projects together, to the same degree as we have seen in several other European countries. The ownership structure of many SHP projects, none the less, have some resemblance with community energy ownership, as the projects often are owned by a group of local landowners based on property rights to the river.

As part of every licensing process, NVE arranges a public meeting open to all, providing information about the project. In theory, these meetings could also be used as an arena for the community to take part in participatory project siting and discussion concerning the design of projects. Surprisingly, we found no signs of such processes during these meetings.

According to the municipal administration, the meetings have typically been dominated by several developers. Judging by the scale of the projects presented, the administration had expected more local citizens at these meetings, considering the overall public engagement regarding SHP projects. The municipal case handler interpreted the lack of engagement in the NVE facilitated public meetings as evidence of the public's tacit acceptance of the project. When asked if they thought some of the local inhabitants might find it difficult to state their honest opinion in a meeting where developers might be neighbors and other locals, the municipal case handler confirmed that this could also be the case:

I think there are people present that are not tough enough to handle the strain that voicing opposition may be, because as I have said before, the attitude has overall been positive. Some have already had their projects developed, and do not want to make difficulties for others.

One employee in a large, national energy company claimed that the municipality treated large developers less favorable than local developers. When raising this point, he referred to a specific case where two similar projects were applied for: one by local landowners and the other by a large energy company. The employee describes what happened:

When [the company] tries to do the same a little further south in the same area, there are substantial local protest. Opposition almost everywhere you turn. It shows that technically it's the same intervention, but when [the company] applies, it's received in a completely different way than when a local landowner is applying for exactly the same.

My experience is that this is how it works. And there's nothing strange about it, really. One sees resources still being local, and the income going to the local landowner, and not a large company with headquarters in Oslo.

The energy company employee believed the same for environmental organizations, as they, on the one hand, were concerned about preserving nature, but also seemed to scrutinize where the resources were placed. According to the energy company employee, his impression was that environmental organizations tended to be less critical towards the impact on nature and landscape if a local landowner was the developer, and on the other hand, being more critical towards national and international owners.

Objectively, the projects might be similar in terms of environmental impact, but when it comes to the way in which municipalities and local stakeholders consider SHP project ownership, it seems influence the outcome. Important actors with interests in a project might try to moderate the negative side of a projects as a strategy to ensure local support. Thus, recognition of externalities or a positive public image is relevant, but in some cases dominated by important, local actors.

In one of the municipalities with a high share of farming, the general acceptance of SHP projects was high, as stated by the municipal city manager:

We could start by saying that politically, the basic attitude was positive. The consequences will have to be quite severe before the politicians says no. That's my general experience. In the county administration we have been more reserved and tried to consider the aspects we were supposed to consider, but overall, we have been run over.

When mentioning 'The different aspects we were supposed to consider' the city manager refers to a list of 6-7 bullet points approved by the municipal politicians as criteria to judge SHP by. This list was only applicable to this municipality and only when handling SHP projects. One of the criteria was 'ownership of the project', which was given substantial emphasis by municipal politicians. In practice, the environmental impacts of a project were given less emphasis when the owner of the project was local.

The reason behind the focus on ownership, by politicians, is somewhat unclear but seems to be related to the distribution of resources. According to the administration

in this municipality, politicians expected more local benefits from locally owned projects. This might also relate to many of them being farmers, and that SHP development might also be seen as contributing to creating stability and securing the longevity of some farms. The expectations related to SHP is expressed in a statement concerning one of the projects in the municipality where it is emphasized that the project is assumed to strengthen local trade and contributing to sustain habitation and local activity.

Local owners seem to be preferred by various actors. This is no surprise given the emphasis on the advantages of local ownership. In the longer run, it is however difficult to predict how this preference will affect the local communities hosting these projects.

5.4. Summary of findings

We have observed some sort of ‘race’ in the field of SHP, particularly in the years after the turn of the millennium. Some of the large, national energy companies influenced the development by selling out their own projects [35]. When banks became more restrictive in the financing of projects, it was indeed challenging for some of the local landowners to develop their own project, opening the door for international investors that were looking for secure, long-term investments.

One of the municipalities, a rural community with high degree of agriculture and rural development as well as good hydropower resources incorporated ‘ownership’ in their criteria of how to consider hydropower projects. This seems to be rooted in arguments that local ownership is important to keep values in the local community, and that it will give an important contribution to farming.

Overall, we have seen that the general and socio-political acceptance of SHP projects and other renewables tends to be high, relating to the dimensions of Wüstenhagen, Wolsink and Bürer [2], Sovacool and Ratan [27]. Still, in relation to specific projects, different opinions are expressed, revealing a more complex picture. How different voices and interests are included in the planning process seems to depend on the importance of specific actors, like farmers, in each local community. For instance, the strong position of farming in some municipalities seems to indirectly have affected how SHP projects are treated and considered both by the municipality and the public. This tendency is evident in political considerations when the political body is primarily populated with farmers. Additionally, the ways in which the perceived benefits and disadvantages of

projects have been distributed is also influencing the social acceptance of projects [2]. This is particularly interesting in relation to SHP projects and ownership, where we see that what is expected of a project seems to closely relate to ownership. In other words, when a project has local owners, the expectation and assumption is that it will benefit the local community more than in the case of international owners.

Our analysis shows that the overall *socio-political acceptance* for small hydropower in Norway is substantial. Both regulations, legislation and support schemes are well established. When it comes to market and community acceptance, the picture is a more complicated. In terms of *market acceptance* and financing in particular, the profitability forecast of the SHP sector is not as good as it was some years ago. The most profitable projects were developed first, leaving later projects with more stringent financial requirements. When considering *community acceptance*, we see that the operationalization by Sovacool and Ratan [27] is only partially relevant to the SHP projects studied here. The term ‘community’ in this respect remains somewhat unclear and the model by Sovacool and Ratan [27] does not seem to fit the Norwegian system very well on this point. Sovacool and Ratan describes ‘community acceptance’ as to what degree projects are invested or undertaken by local stakeholders, in addition to how costs and benefits are shared. For this term to have greater relevance in a Norwegian context, a more detailed understanding is needed. Thus, the complex and multifaceted community structure of actors and interest does not fit very well with the community dimension presented in table 1, and warrants further scrutiny in order to establish if this is a phenomenon particular to small rural municipalities, like those typical for SHP developments, or whether this could also be a challenge elsewhere.

6. Conclusion and Policy Implications

This paper investigates what factors influence social acceptance of SHP projects in Norway, building upon nine dimensions of social acceptance as developed by Sovacool and Ratan [27]. We have studied the role of ownership in social acceptance of SHP projects, and the ways in which municipalities and other actors voice their opinions and considerations concerning SHP projects.

The analysis shows that there was little debate and contestation in the public meetings arranged by NVE as

part of the licensing process, and overall little public participation apart from those directly involved in the project. One could assume that these hearings would be deliberative arenas for debate and protest. Our analysis shows, on the contrary, that these meetings were dominated by project developers, mostly local farmers, and that they left little room for the open expression of opinions, giving a somewhat biased impression of general high acceptance in the local community where those who disagree might choose not to participate in the meeting or somewhat feel slight social pressure to support such developments.

Looking further into the community dimension, we see that considering the major changes taking place in the area of SHP developments, especially the influx of foreign capital and investments, one might have reason to be concerned about the social acceptance of SHP in the future. The growing investment of external actors in SHP in Norway is likely to influence the future acceptance of such plants, as municipalities seem to attribute certain qualities to SHP based on ownership.

The valuation of local ownership seems to be linked to the level of income and activity in the local community, so that local owners are regarded as offering more value in terms of income and activity back to the local community. However, in the longer run, municipalities may have to take the shifting ownership of SHP projects into consideration, including how this will subsequently influence returns for the local community and the consequences. So far, there is little practical experience with this.

On the basis of our analysis it becomes evident that the question of who makes up the community, is not something clearly discerned from the model of Sovacool and Ratan [27]. Our analysis reveals that 'community' in the context of this study, has different meanings, ranging from administration, politicians, inhabitants and/or the village itself. A greater level of detail would bring the community's multiple identities into better focus.

The temporal dimension is also not very well articulated in the Sovacool and Ratan model. Our analysis, however, show the importance of studying development of renewable energy projects, such as SHP, as they change character over time, raise new concerns and issues important to the social acceptance dynamics. We have seen that the conditions for projects developed at different periods of time have differed substantially, as changes in energy prices, financial opportunities and the overall discussion concerning SHP have changed over

time. The temporal dimension has gained increasing importance lately, as more focus has been directed towards SHP projects being sold to international investors, because of low income and high expenses.

A third shortcoming of the model is the underestimation of the role of ownership for social acceptance. Our research shows ownership to be of utmost importance in assessing SHP projects and for the role and support they will get in future energy systems. Thus, we would like to stress the importance of not thinking about social acceptance as something that is created at specific point in time, but as something that must be continuously constituted and seen as an ongoing process [21]. This implies that social acceptance is under constant change, varying as a function of the project process itself. Consequently, it should not be studied as a static process where local communities and local inhabitants are seen as being 'affected', and the developers and policy makers as those 'affecting' [18, 41]. It is also pertinent to notice that the identity of the developer is not neutral, but also potentially influencing the way communities and inhabitants may be given room to actively take part in the process (see, also Batel [42]) as result of how such processes are being 'orchestrated' and shaped by local actors and issues [43].

In this article we have argued that local ownership of small hydropower projects is valued highly among the municipality actors. This is also relevant in an international context, with an increasingly number of renewable community projects being developed. We have also found the model of Sovacool and Ratan [27] to be useful in studying the development of SHP projects in Norway, but with some shortcomings concerning the ability to capture the different conditions for projects developed at different periods of time and the importance of ownership in SHP projects. Thus, the importance of ownership in relation to transitions to low carbon solutions should be given further attention in future research on social acceptability, participation and public engagement with renewable energy.

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References

1. Bauwens, T. and P. Devine-Wright, *Positive energies? An empirical study of community energy participation and attitudes to renewable energy*. *Energy Policy*, 2018. **118**: p. **612-625**. <https://doi.org/10.1016/j.enpol.2018.03.062>
2. Wüstenhagen, R., M. Wolsink, and M.J. Bürer, *Social acceptance of renewable energy innovation: An introduction to the concept*. *Energy Policy*, 2007. **35**: p. **2683-2691**. <https://doi.org/10.1016/j.enpol.2006.12.001>
3. Rygg, B.J., *Wind power-An assault on local landscapes or an opportunity for modernization?* *Energy Policy*, 2012. **48**: p. **167-175**. <https://doi.org/10.1016/j.enpol.2012.05.004>
4. Seyfang, G., J.J. Park, and A. Smith, *A thousand flowers blooming? An examination of community energy in the UK*. *Energy Policy*, 2013. **61**: p. **977-989**. <https://doi.org/10.1016/j.enpol.2013.06.030>
5. Gorrone-Albizu, L., K. Sperling, and S. Djørup, *The past, present and uncertain future of community energy in Denmark: Critically reviewing and conceptualising citizen ownership*. *Energy Research & Social Science*, 2019. **57**. <https://doi.org/10.1016/j.erss.2019.101231>
6. Veelen, B.v. and C. Haggett, *Uncommon Ground: The Role of Different Place Attachments in Explaining Community Renewable Energy Projects*. *Sociologia Ruralis*, 2017. **57(S1)**: p. **533-554**. <https://doi.org/10.1111/soru.12128>
7. *Multi-level Governance*, ed. I. Bache and M. Flinders. 2004: Oxford University Press.
8. Manzano-Agugliaro, F., et al., *An overview of research and energy evolution for small hydropower in Europe*. *Renewable and Sustainable Energy Reviews*, 2017. **75**: p. **476-489**. <https://doi.org/10.1016/j.rser.2016.11.013>
9. NVE, *Hydro power in Norway*. 2019 19.6.2019]; Available from: <https://www.nve.no/energiforsyning/vannkraft/>.
10. Ferreira, A.C., et al., *Application of a cost-benefit model to evaluate the investment viability of the small-scale cogeneration systems in the Portuguese context*. *International journal of Sustainable Energy Planning and Management*, 2021. **30**: p. **21-42**. <https://doi.org/10.5278/ijsepm.5400>
11. European Small Hydropower Association. *Small Hydropower Roadmap. Condensed research data for EU-27*. 2012 19.6.2019]; Available from: http://www.5toi.eu/wp-content/uploads/2016/11/HYDROPOWER-Roadmap_FINAL_Public.pdf.
12. Bishoge, O.K., G.G. Kombe, and B.N. Mvile, *Community Participation in the Renewable Energy Sector in Tanzania*. *International journal of Sustainable Energy Planning and Management*, 2020. **28**: p. **121-134**. <https://doi.org/10.5278/ijsepm.4477>
13. Statkraft. *Facts about hydropower*. 2019 [cited 2019 21.6.2019]; Available from: <https://www.statkraft.com/energy-sources/hydropower/facts-about-hydropower/>.
14. Walker, G. and P. Devine-Wright, *Community renewable energy: What should it mean?* *Energy Policy*, 2008. **36**: p. **497-500**. <https://doi.org/10.1016/j.enpol.2007.10.019>
15. Hicks, J. and N. Ison, *An exploration of boundaries of "community" in community renewable energy projects: Navigating between motivations and context*. *Energy Policy*, 2018. **113**: p. **523-534**. <https://doi.org/10.1016/j.enpol.2017.10.031>
16. Seyfang, G. and N. Longhurst, *Desperately seeking niches: Grassroots innovations and niche development in the community currency field*. *Global Environmental Change*, 2013. **23(5)**: p. **881-891**. <https://doi.org/10.1016/j.gloenvcha.2013.02.007>
17. Azarova, V., et al., *Designing local renewable energy communities to increase social acceptance: Evidence from a choice experiment in Austria, Germany, Italy and Switzerland*. *Energy Policy*, 2019. **132**: p. **1176-1183**. <https://doi.org/10.1016/j.enpol.2019.06.067>
18. Batel, S., *Research on the social acceptance of renewable energy technologies: Past, present and future*. *Energy Research & Social Science*, 2020. **68**. <https://doi.org/10.1016/j.erss.2020.101544>
19. Tabi, A. and R. Wüstenhagen, *Keep it local and fish-friendly: Social acceptance of hydropower projects in Switzerland*. *Renewable and Sustainable Energy Reviews*, 2017. **68**: p. **763-773**. <https://doi.org/10.1016/j.rser.2016.10.006>
20. European Commission. *Special Eurobarometer 409, Climate change report*. 2014 29.1.2021]; Available from: https://ec.europa.eu/commfrontoffice/publicopinion/archives/ebs/ebs_409_en.pdf.
21. Wolsink, M., *Social acceptance revisited: gaps, questionable trends, and an auspicious perspective*. *Energy Research & Social Science*, 2018. **46**: p. **287-295**. <https://doi.org/10.1016/j.erss.2018.07.034>
22. Wirth, T.v., L. Gislason, and R. Seidl, *Distributed energy systems on a neighborhood scale: Reviewing drivers of and barriers to social acceptance*. *Renewable and Sustainable Energy Reviews*, 2018. **82**: p. **2618-2628**. <https://doi.org/10.1016/j.rser.2017.09.086>
23. Selvakumaran, S. and E.O. Ahlgren, *Understanding the local energy transitions process: a systematic review*. *International journal of Sustainable Energy Planning and Management*, 2017. **14**: p. **57-78**. <https://doi.org/10.5278/ijsepm.2017.14.5>

24. Horst, D.v.d., *NIMBY or not? Exploring the relevance of location and the politics of voiced opinions in renewable energy siting controversies*. *Energy Policy*, 2007. **35(5)**: p. **2705-2714**. <https://doi.org/10.1016/j.enpol.2006.12.012>
25. Wolsink, M., *Wind power and the NIMBY-myth: institutional capacity and the limited significance of public support*. *Renewable Energy*, 2000. **21(1)**: p. **49-64**. [https://doi.org/10.1016/S0960-1481\(99\)00130-5](https://doi.org/10.1016/S0960-1481(99)00130-5)
26. Ryghaug, M., T.M. Skjølvold, and S. Heidenreich, *Creating energy citizenship through material participation*. *Social Studies of Science*, 2018: p. **1-21**. <https://doi.org/10.1177%2F0306312718770286>
27. Sovacool, B.K. and P.L. Ratan, *Conceptualizing the acceptance of wind and solar electricity*. *Renewable and Sustainable Energy Reviews*, 2012. **16**: p. **5268-5279**. <https://doi.org/10.1016/j.rser.2012.04.048>
28. Salm, S., S.L. Hille, and R. Wüstenhagen, *What are retail investors' risk-return preferences towards renewable energy projects? A choice experiment in Germany*. *Energy Policy*, 2016. **97**: p. **310-320**. <https://doi.org/10.1016/j.enpol.2016.07.042>
29. Larsen, S.V., et al. *Integrating social consequences in EIA of renewable energy projects: 11 recommendations*. 2017; Available from: <https://vbn.aau.dk/en/publications/integrating-social-consequences-in-eia-of-renewable-energy-projec>.
30. Rygg, B.J., *Paving the way for heat. Local government policies for developing bioenergy in Norway*. *International journal of Sustainable Energy Planning and Management*, 2014. **04**: p. **57-70**. <https://doi.org/10.5278/ijsepm.2014.4.6>
31. Sternberg, R., *Hydropower's future, the environment, and global electricity systems*. *Renewable and Sustainable Energy Reviews*, 2010. **14**: p. **713-723**. <https://doi.org/10.1016/j.rser.2009.08.016>
32. Angell, S.I., *Heimfallsinstituttet i norsk vasskraftforvaltning. Plan*, 2014. **46(3-04)**: p. **34-40**.
33. Angell, S.I., *Repatriation in Norwegian hydro power management [Heimfallsinstituttet i norsk vasskraftforvaltning]. Plan*, 2014. **46(03-04)**: p. **3-40**.
34. Karlstrøm, H. and M. Ryghaug, *Public attitudes towards renewable energy technologies in Norway. The role of party preferences*. *Energy Policy*, 2014. **67**: p. **656-663**. <https://doi.org/10.1016/j.enpol.2013.11.049>
35. Yttri, G., *Local hope, global ambition. The emergence of small hydropower in Norway after year 2000. [Lokal von, global ambisjon. Framveksten av småkraftverk i Noreg etter 2000]* Heimen, 2018. **2(55)**: p. **135-156**. <https://doi.org/10.18261/issn.1894-3195-2018-02-04>
36. Bakken, T.H., et al., *Demonstrating a new framework for the comparison of environmental impacts from small- and large-scale hydropower and wind power projects*. *Journal of Environmental Management*, 2017. **140**: p. **93-101**. <https://doi.org/10.1016/j.jenvman.2014.01.050>
37. NVE, *Assessment of the potential for small hydropower in Norway. Assumptions, description of methods and results. [Beregning av potensial for små kraftverk i Norge. Forutsetninger, metodebeskrivelse og resultater]*. 2004 6.10.2019]; Available from: http://publikasjoner.nve.no/rapport/2004/rapport2004_19.pdf.
38. NVE, *New energy: Final permissions and development. Fourth quarter 2020 [Ny kraft: Endelige tillatelser og utbygging. Fjerde kvartal 2020]*. 2021 10.2.2021]; Available from: <https://webfileservice.nve.no/API/PublishedFiles/Download/b61a5621-9aad-44b7-8e8a-e322bcbe9dbb/201202014/3420898>.
39. Sataøen, H.L., O.A. Brekke, and S.I. Angell, *Climate friendly, friendly to the environment and a catalyst for rural development? Moving forces for small scale hydro power in the Hardanger-region [Distriktsvenleg, miljøvenleg og klimavenleg? Drivkrefter i utviklinga av småkraft i Hardanger]*. *Tidsskrift for utmarksforskning*, 2017. **1**: p. **68-82** <https://brage.nina.no/nina-xmlui/handle/11250/2447039>.
40. Saha, P. and J. Idsø, *New hydropower development in Norway: Municipalities' attitude, involvement and perceived barriers*. *Renewable and Sustainable Energy Reviews*, 2016. **61**: p. **235-244**. <https://doi.org/10.1016/j.rser.2016.03.050>
41. Aaen, S.B., S. Kerndrup, and I. Lyhne, *Beyond public acceptance of energy infrastructure: How citizens make sense and form reactions by enacting networks of entities in infrastructure development*. *Energy Policy*, 2016. **96**: p. **576-586**. <https://doi.org/10.1016/j.enpol.2016.06.031>
42. Batel, S., *A critical discussion of research on the acceptance of renewable energy generation and associated infrastructure and an agenda for the future*. *Journal of Environmental Policy and Planning*, 2017. **20(3)**: p. **356-369**. <https://doi.org/10.1080/1523908X.2017.1417120>
43. Skjølvold, T.M., et al., *Orchestrating households as collectives of participation in the distributed energy transition: New empirical and conceptual insights*. *Energy Research & Social Science*, 2018. **46**: p. **252-261**. <https://doi.org/10.1016/j.erss.2018.07.035>
44. Østergaard PA, Johannsen RM, Lund H, Mathiesen BV. Latest Developments in 4th generation district heating and smart energy systems. *Int J Sustain Energy Plan Manag* 2021;31. <http://doi.org/10.5278/ijsepm.6432>

Appendix

List of interviews

Number	Date	Title	Organization
1	28.6.2017	Farmer and co-owner SHP	
2	4.5.2017	Local landowner	SHP
3	13.12.2016	Ass. Director Large, public energy company	
4	16.11.2016	Ass. Director	Large, public energy company
5	16.11.2016	Municipal chief exe.	Municipality
6	16.11.2016	Case handler	Municipality
7	13.1.2017	Municipal chief exe.	Municipality
8	16.12.2016	Case handler	Municipality
9	Not dated	CEO	SHP
10	24.5.2017	Leader	Regional organization
11	23.5.2017	Farmer and co-owner	SHP
12	27.4.2017	County director	County administration

