



Original research article

# Small hydropower, large obstacle? Exploring land use conflict, Indigenous opposition and acceptance in the Norwegian Arctic

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## ABSTRACT

In this study, we explore Indigenous energy opposition to and acceptance of small hydropower development. In Sápmi (i.e., the traditional homeland of the Indigenous Sámi people), land development poses a major threat to the cultural and material needs of the Sámi people through the loss of pastures essential to Sámi reindeer herding. In contrast to large-scale renewable energy projects such as hydropower, power line and wind power projects, the impact of small hydropower (SHP) development on Indigenous land use has received relatively little attention. We mapped Indigenous opposition to and acceptance of new SHP development in a key region for Sámi reindeer herding in northern Norway from 2010 to 2018. Our results show how the proliferation of SHPs on reindeer pastures caused concern among Sámi reindeer owners and their representatives, who devoted considerable resources to participating in and opposing new SHPs through public hearing processes. In many cases, other actors, such as environmental interests, also opposed. Nevertheless, most cases opposed by Indigenous representatives were licensed (59 %). Considering our results and given the potential for and interest in expanding renewable energy, Indigenous opposition to SHP development warrants greater attention. Our approach provides a larger-scale, larger-N, quantitative view of opposition to SHP development that can complement more qualitative and in-depth approaches.

## 1. Introduction

River regulation and dam construction benefit society by providing renewable energy through hydropowered electricity production [1,2]. It also enables better flood control, water supply, infrastructure, income, and employment (ibid.). There are, however, social and environmental costs associated with modifying the natural environment through hydropower development [2–4], which, along with other personal, project-related or broader institutional and societal factors [5–7], may lead to energy opposition [5,8–10].

Indigenous peoples and ethnic minorities are among the most vulnerable groups to the impacts of low carbon transitions and renewable energy development [11,12], such as hydropower [13]. They are also among the key actors that oppose hydropower development worldwide [8]. In the energy opposition literature, most attention has been devoted to Indigenous peoples and the impacts and injustices caused by large dams [13–19], while less focus has been devoted to

small hydropower (SHP) [3,20], with some exceptions, e.g., [9,21,22]. Part of the reason for the lack of academic attention seems to be the contested view of SHP as a low-impact technology [3,23–25].

Attention to energy opposition can point to areas of energy injustice [8], such as the unfair distribution of costs and benefits, discrimination, nonrecognition and poor decision-making processes [26,27]. For instance, Del Bene et al. [8] explored a global database of dam-related conflicts and found that the repression of activists was a common feature of contentious dams, especially in cases where Indigenous people were involved. Sikor et al. [22] showed through a case study on Indigenous activism and SHP in Nepal how local support for Indigenous rights can be challenging to obtain. Kelly [9] found Indigenous energy opposition in southern Chile, where SHP was placed in culturally significant areas and infringed on Indigenous rights. Energy opposition may also lead to considerable costs through delays, court proceedings and project termination [7]. Understanding energy opposition may thus help enable the realization of renewable energy in socially acceptable

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[28] and socially just [22] ways.

SHP projects are often located in mountainous landscapes where Indigenous people reside [23,29,30]. Norway, a predominantly mountainous country and home to the Indigenous Sámi People, is also a major hydropower producer [31]. Here, land development poses a large threat to the cultural and material needs of the Sámi people through the loss of pastures essential for Sámi reindeer herding [32–36]. Hydropower is a part of this threat to Sámi land use [33,34,37]. By Indigenous Sámi land use, we refer to Sámi reindeer herding and the use of pastures, including the flexible use of seasonal pastures and migrations between them, while also recognizing other Sámi traditional land use such as small-scale farming, fishing and harvesting.

Historically, large hydropower development in Norway has caused injustice and spurred resistance among Sámi reindeer owners [38,39]. In the high-profile case of the Alta River (1968–1982), the Sámi, along with environmental interests, used civil disobedience, hunger strikes, courts, international organizations and Indigenous rights organizations to protest the hydro power project. Their efforts did not prevent the damming of the river but spurred a complete reform of Norwegian policy toward the Sámi people [40]. In 1988, the rights of the Sámi became a part of the Norwegian Constitution [41]. The Sámi Parliament was established in 1989, and in 1990, Norway became the first country to ratify the Convention concerning Indigenous and Tribal Peoples in Independent Countries (i.e., the ILO Convention 169) (ibid.).

Another significant and more recent event in regard to energy justice for Sámi reindeer owners is the Supreme Court of Norway's ruling from October 2021 in the Fosen wind power case. The Supreme Court found that two wind farms in Fosen violated reindeer owners' right to enjoy their culture under Article 27 of the International Covenant on Civil and Political Rights; the license and the expropriation decisions were invalid. The Supreme Court's ruling should lead to increased attention to the obligation of the state to secure the material foundation for Sámi culture when encroachments that conflict with Sámi land use are planned.

Climate mitigation policies have created a boom in SHP development, defined as hydropower plants that are less than or equal to 10 MW (see also Section 2.4) in Norway in later years [42]. In contrast to other types of renewable energy, SHP development seems to have been less contentious. A recent global mapping of energy opposition based on academic and policy literature as well as local media coverage found that in coastal Norway, conflicts have revolved around wind power and transmission lines [5]. SHP development was not mentioned. Moreover, SHP development was left out in recent efforts to map encroachments in areas used for reindeer pastures [33,34]. From this perspective, SHP development comes across as a lesser concern for public/private interests in general and for Indigenous Sámi land use specifically.

In this study, we explore energy opposition in the context of Indigenous Sámi land use and SHP development in a mountain-rich region of northern Norway. Our primary aim is an exploratory, quantitative mapping of Indigenous opposition for an initial understanding of the scope and scale of a potential conflict between Indigenous Sámi land use and SHP. In Norway, a few studies have looked at the effects of SHP on reindeer herding [43,44], but none have, to our knowledge, explored Indigenous Sámi opposition to SHP development. Specifically, we assess whether the lack of public attention and seemingly low conflict level could be explained by i) relatively low levels of SHP development in Sámi areas, ii) SHP development being considered unproblematic by Indigenous actors or iii) Indigenous Sámi opposition to SHP development having “gone under the radar.”

We are also interested in reindeer owners' acceptance of SHP development (not just their opposition) and other actors' stances, such as private landowners, NGOs, public authorities, etc. Opposition to land development by Sámi reindeer owners and their representatives has been known to spark negative public attention and create a perception of Sámi reindeer herding as problematic [45]. A common stereotype is that reindeer owners oppose “everything” in regard to new land

development and that Sámi reindeer herding stands in the way of modern society [46]. The persistence of such stereotypic views is a recognitional justice concern [26]. To provide a more nuanced picture of who opposes land use changes, we explored other actors' opposition, along with reindeer owners' acceptance of SHP proposals. For simplicity, we did not focus on other actors' explicit acceptance (just if they opposed or not).

Finally, we are interested in exploring how the constellation of actors and interests is related to SHP outcomes. Participation and influence are procedural justice issues [26,27]. Indigenous influence in decision-making is a prerequisite for safeguarding Indigenous culture and livelihoods (Section 2.2). The likelihood of being able to influence decision-making also provides an incentive for Sámi participation in decision-making in the first place, while nonparticipation risks being mistaken for Sámi consent [36]. Specifically, we focus on the association between the different actors' opposition and SHP refusal, along with the reasons that the licensing authority gives for refusing new SHP projects. Indigenous influence may also benefit other actors whose interests collide with SHP development when SHP is partly or solely refused due to Indigenous influence and efforts.

We chose a research design based on quantitative data analysis and statistics [47] as a first exploratory step to assessing Indigenous opposition to SHP development in this area. Our focus is on capturing Indigenous opposition on a relatively large scale to match SHP projects' tendency of large-scale spatial fragmentation and proliferation [9,30]. Our approach is less apt at capturing in depth, nuanced and contextual information on Indigenous SHP opposition, which is a strength of, for instance, small-N, comparative case studies [9,10,22]. Instead, we provide insights into the scale of the problem and Indigenous concerns across the multiple cases of SHP in the region.

While the main part of this study is empirical, we also seek to make some methodological advances, specifically using public hearing statements as a quantitative measure of energy opposition. Public hearing statements are commonly used as background information in qualitative analyses. In this study, however, they are a primary source of systematic and quantitative information on actors, their stance in land use development cases and decision-making outcomes. To clarify the contribution of our energy opposition measure to the academic literature, we developed an evaluative framework for linking energy opposition demonstrated through public hearings during SHP licensing processes with the term social acceptability. This framework is further elaborated in Section 2.1.

Quantitative measures of energy opposition and decision-making outcomes can inform research on the social acceptability of energy development [48,49], such as antidam movement research [8,50], along with studies of water resource governance [51,52] and energy justice [8]. From the perspectives of the many key actors (e.g., reindeer owners) that are often inundated with requests to participate in land use planning processes and research, using public hearing statements to map opposition as opposed to asking people to participate in surveys or interviews has the benefit of avoiding research fatigue [53–55].

To summarize, our aims are to explore the following:

- i) the level of SHP development in areas used for reindeer pastures
- ii) Indigenous opposition to and acceptance of new SHP projects
- iii) the constellation of actors and interests that oppose new SHP projects and how they are related to SHP outcomes
- iv) the use of public hearing statements as a measure of energy opposition

## 2. Background

In this section, we explain the theoretical underpinnings of using public hearing statements to quantitatively explore energy opposition (Section 2.1). We also provide more background on Indigenous rights and Sámi reindeer herding (Section 2.2), the social and environmental

impacts of SHP (Section 2.3) and SHP licensing in Norway (Section 2.4).

### 2.1. Energy opposition, social acceptability and renewable energy research

Social acceptability has become a major topic in the energy social sciences [56]. Acceptability studies on land use (where a majority of studies look at renewable energy) tend to focus on assessing the degree of acceptability [57]. Studies often identify the reasons for acceptability outcomes and provide suggestions for improving acceptability in the Global North (i.e., Europe, North America and Australia) (ibid.). They tend to be empirical and based on quantitative data (ibid.).

There is a lack of academic consensus on the conceptualization of social acceptability. Different terms, such as local acceptance, social acceptance, and public acceptance, are used, often interchangeably and sometimes in contradictory ways [56,57]. Busse and Siebert [57] critically reviewed acceptability studies in the broader field of land use and provide a definition to harmonize future work on social acceptability. Their definition follows Fournis and Fourtin [56] and establishes social acceptability as the overarching concept that can be assigned to a particular degree from opposition to acceptance or support/engagement. The authors find that acceptability decisions are a result of interactions among actors, the acceptability object and the context and that these decisions can be made at different levels, i.e., at the attitude, action or utilization (e.g., adopting certain technologies) level [57].

Moreover, social acceptability has different dimensions, along with temporal and spatial components. The three different dimensions that have been conceptualized are sociopolitical, market and community acceptability [48,58,59]. People may oppose specific projects but accept or support renewable energy at a general level [59], and attitudes toward renewable energy development can change from, for example, strongly negative at the start of a project to acceptance once finished [6,59]. According to Wolsink [60], social acceptability is multileveled and complex, and understanding the relations between processes of acceptability within and across dimensions becomes necessary to grasp what produces patterns of behavior. Capturing this type of complexity can be done through qualitative research but is beyond the scope of this study.

Here, we use a slightly modified version of Thomassin et al.'s [61] acceptability scale. This scale captures the distinction between attitude and action from Busse and Siebert [57]. Overt acceptance and overt rejection, defined as acceptance or rejection elicited through some form of public action (such as public hearings), are located on opposite ends of an acceptability continuum. At the center of the scale, we find covert acceptance and covert rejection, defined as verbal expressions expressed privately, along with indifference, which is characterized by a lack of any form of verbal expression. Indifference is a term also found in other acceptability assessments [62].

Batel et al. [49] found empirical evidence for acceptance and support as two different constructs, and the scale of Thomassin et al.'s [61] work could be expanded to include a distinction between these two terms. With this modification, the scale includes overt rejection, covert rejection, indifference, covert acceptance or support, overt acceptance or support. We use the term opposition instead of rejection in this study. In our data analysis/literature coding, we do not distinguish between support and acceptance for simplicity, as we are most interested in capturing opposition vs. acceptance/support.

There is no standardized way of quantitatively eliciting social acceptability. Aas et al. [6], for instance, asked about the degree to which people accept/support or not accept/not support in their population survey about the acceptability of power lines. The authors did not separate overt from covert action or use the terms oppose or reject.

A related line of inquiry and a concretization of energy opposition is found in antidam movement research. In Kirchherr et al. [10], the antidam movement champions “the belief that one or more dams must not be constructed due to various environmental and/or social impacts,”

and a successful antidam movement is one in which the project has been suspended or cancelled. Furthermore, the antidam movement can be considered a movement within movements “[...] comprised of geographically and temporally specific campaigns over proposed and existing sites” [50]. Social movement research often tries to understand the ideas, actions and actors involved in movements, along with whether and why they succeed in reaching their goals [10,63–65]. Antidam movement studies are often qualitative case studies focusing on the Global South [15,50,64–68].

#### 2.1.1. Energy opposition, social acceptability and public hearing statements

Public hearing statements provide a systematic overview of key actors' core concerns and are the most easily accessible source of case-specific, large-scale information on opposition to SHP development in Norway. Such statements serve as a major formal avenue of voicing concerns about SHP development (Section 2.4) and other types of land uses. Rights and stakeholders who strongly oppose are likely to participate in public hearings first and foremost, in addition mobilizing other tactics they may use, such as gaining media attention. Public hearings represent a form of public participation defined as “organized processes adopted by elected officials, government agencies, or other public- or private-sector organizations to engage the public in environmental assessment, planning, decision making, management, monitoring, and evaluation” [69].

Opposition can be demonstrated through other formal (e.g., strikes and lawsuits) and informal (e.g., street protests, media activism, social movements, and alliances) means [8], but public hearings and the subsequent discussions and negotiations are still at the core of land use conflicts in developed countries [70].

Our measure of opposition based on public hearing statements captures what Thomassin et al. [61] have called overt rejection and what Busse and Siebert [57] call rejection at the public/action level. It mainly captures aspects of community acceptability [48,58,59] because of the focus on the views of different local actors but also touches on sociopolitical acceptability seeing as the views of public authorities are also included [48]. It represents attitudes toward specific projects and is thus likely more closely connected to future personal behavior toward the project than general attitudes [71] toward SHP development. Nevertheless, these are attitudes at the very early stages of SHP development and the proposal stage and may change, as mentioned above.

Fig. 1 shows our evaluative framework with the link between opposition demonstrated through public hearing statements and the term social acceptability as defined by Thomassin et al. [61] but separating acceptance and support following Batel et al. [49].

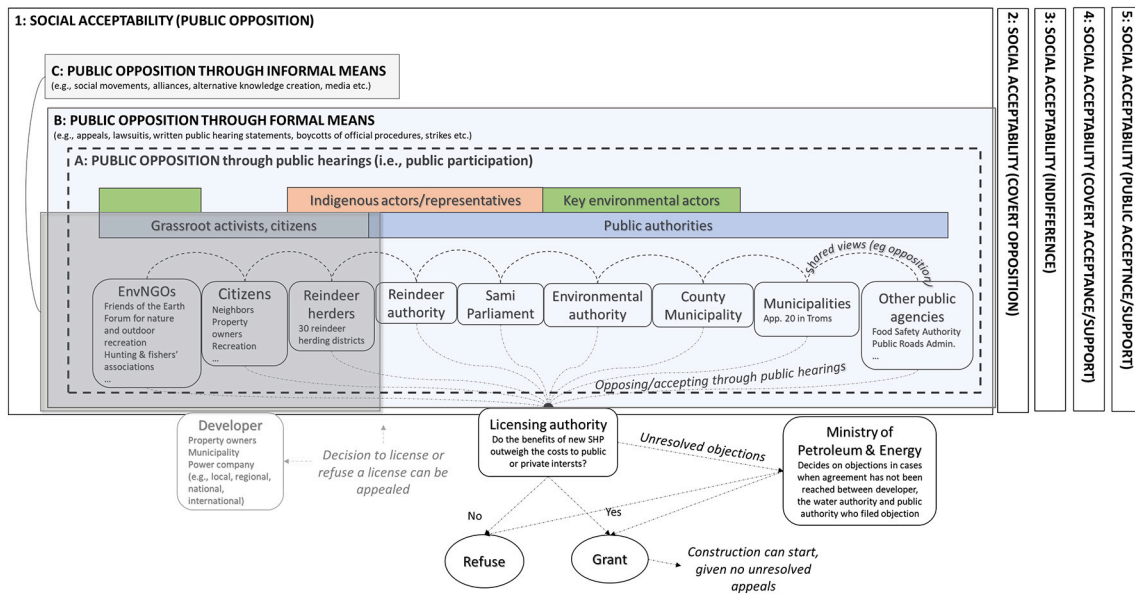
#### 2.1.2. Exploring shared views between actors

In this study, we explore whether actors systematically oppose the same SHP proposals across cases.

Joint opposition in single cases can happen by chance, while statistically significant associations suggest a systematic link between actors across SHP cases. Such systematic joint opposition can, for instance, be explained by actors having shared interests (e.g., safeguarding the environment, Indigenous rights and interests or both).

Joint opposition may be mutually beneficial for the actors involved. For instance, many opposing actors suggest that many interests will be affected by the SHP project and that the likelihood of refusal may increase as a result. This is because according to Norwegian legislation, the benefits of SHP should outweigh the costs to public or private interests.

Knowing the other actors who oppose alongside Indigenous actors may say something about who potential Indigenous allies may be. For conceptual clarity, an ally is defined as “a person or group that provides assistance and support in an ongoing effort, activity, or struggle” [75] or as “someone who helps and supports someone else” [76]. We understand alliance formation to reflect a conscious decision to provide assistance to and support for one another in an ongoing process [75]. It seems to require more commitment than support and can be considered a step



**Fig. 1.** Linking energy opposition elicited through public hearings with social acceptability. Public hearing statements can capture who opposes SHP development (A). Energy opposition drawn from public hearings generally reflects attitudes at early stages of SHP development. Public hearings are one of other formal (B) and informal (C) means through which opposition can be demonstrated. Informal means are usually employed by nongovernmental actors. Opposition, demonstrated through both formal and informal means, can be considered a category at the far end of a social acceptability scale ranging from support to opposition (1–5). Case documents can also indicate whether opposition has resulted in the cancellation or suspension of SHP (the bottom half of the figure) and in which cases different actors have shared views. Section 2.4 provides more detail on SHP licensing processes in Norway and the actors involved. Public hearing statements can also provide information on actors' acceptance or support (5). This is not illustrated in the figure.

further than the support provided through joint opposition explored here.

In energy social science research, network analysis has been used to map actors involved in cases of opposition to energy transitions [5]. Social network theory assumes that relationships among actors in a network are important and have meaning [52] depending on the kinds of ties explored [72]. Mapping the ties between actors can help elucidate interactions that may be overlooked [73], such as pointing to influential actors [74]. For instance, an actor with many ties to other actors (high degree centrality) can be said to have direct influence [52], whereas an actor that connects otherwise unconnected actors (high betweenness centrality) suggests informal power [74]. Ties to many actors, in our case, would point to actors whose views are supported by many other actors across cases as opposed to in an individual case. Connecting unconnected actors may suggest being in a position of connecting actors with different views on SHP, thus having a brokerage function.

## 2.2. Sámi reindeer herding, Indigenous rights & competing land uses

The Sámi are the Indigenous people of northern and middle Fennoscandia [77]. Reindeer (*Rangifer tarandus*) have been important to their culture and livelihood for millennia, and reindeer pastoralism remains central to the Sámi to this day [77]. Reindeer herding is carried out on approximately 40 % of the Norwegian land surface, mainly in northern and central Norway. This area is a part of Sápmi—the traditional homeland of the Sámi people that includes parts of Sweden, Finland and the Kola Peninsula in Russia [41].

The management of Sámi reindeer herding in Norway is divided into six reindeer herding areas. Reindeer herding is further organized into reindeer herding districts, and within each district, reindeer owners belong to *siidas* that collectively herd reindeers. In 2020, there were 3329 registered reindeer owners and 213,753 semidomesticated reindeer in Norway [78].

To utilize the relatively marginal resources of uncultivated lands, reindeer herding requires large seasonal pastures free from land development and other human disturbances. However, the direct, indirect

and cumulative effects of land development (i.e., the combined pressures of past and present land uses) have made reindeer herding challenging in recent decades [33,37]. According to the Conservation of Arctic Flora and Fauna (CAFF) [79], approximately 25–35 % of the reindeer ranges in Sámi areas have been lost due to land development. In Norway and Sweden, similar losses have been documented at the local, regional and national levels [33,35,36,80]. For instance, Tyler et al. [45] found that 71 % of undisturbed pastures in Norway have been lost since the 1900s. Future scenarios suggest that the loss of pasture will continue [35,81].

The Norwegian Sámi reindeer owners have the right of immemorial usage (Norw: “alders tids bruk”) to practice reindeer husbandry [37]. Since the Norwegian Reindeer Herding Act (2007), access to seasonal pastures has been an important material basis for Sámi reindeer owners' culture and livelihoods and should be preserved. Securing natural resources for Sámi livelihoods and culture is also a goal of two of the main acts governing land use in Norway, namely, the Planning and Building Act (2008) and Nature Diversity Act (2009). According to the Norwegian Constitution, “The authorities of the state shall create conditions enabling the Sámi people to preserve and develop its language, culture and way of life” (§ 108).

The right of Indigenous peoples to participate in and influence decision-making is emphasized in numerous international conventions ratified by Norway, such as article 27 of the UN's International Covenant on Civil and Political Rights (ICCPR); ILO Convention 169 articles 6, 7, 14 and 15 and Convention on Biological Diversity (CBD) article 8j. The United Nations Declaration on Indigenous Peoples' Rights [82] states that “Indigenous peoples have the right to participate in decision-making in matters which would affect their rights, through representatives chosen by themselves in accordance with their own procedures, as well as to maintain and develop their own Indigenous decision-making institutions” (Article 18). It also emphasizes good faith consultation and cooperation by states to obtain Indigenous peoples' free, prior and informed consent (Article 19) and the right of Indigenous peoples to “maintain and develop their political, economic and social systems or institutions, to be secure in the enjoyment of their own means of



subsistence and development, and to engage freely in all their traditional and other economic activities” (Article 20). Furthermore, article 27 of the ICCPR protects against measures denying or constricting Sámi reindeer herding. As emphasized by Sámi Rights Commission II, the state cannot consult itself away from the more absolute demands for cultural protection [83].

Despite the range of national and international laws protecting Sámi culture and livelihoods, Sámi customary land use (e.g., access to seasonal pastures) still faces immense challenges of competing land development in Norway [37,41,45]. Insufficient resources devoted to Sámi reindeer owners and their representatives for participating in planning and licensing processes [33,36,41,84], poorly designed participatory processes [85] and lack of influence in such processes [86,87] provide some explanation for the lack of protection.

### 2.3. Small hydropower – social & environmental costs

Small hydropower creates physical barriers through built infrastructure such as roads, dams and pipelines and alters flow regimes, water temperatures, sediment deposition, nutrient cycling and organic matter [4,88], which in turn modify landscapes and contribute to biodiversity loss [89–92]. The resulting changes to natural resources and landscapes may affect human activities such as farming, hunting, fishing, ecotourism and recreation, along with the cultural, spiritual and aesthetic value of landscapes important to local and Indigenous people [8,9,23]. Particular concerns are tied to the social and environmental effects of constructing multiple SHP projects [4,23,93].

The proliferation of SHP development globally has been supported under the assumption that such projects cause less negative socio-ecological impacts than large projects [25]. However, research suggests that the effects may actually be greater relative to the amount of energy produced [25,94]. As of 2018, 82891 smaller dams were in operation or under construction in 150 countries worldwide [25]. If the full potential is realized, this number could triple (ibid.).

The development of SHP projects is concentrated in mountainous regions [23,30]. These are areas with less existing infrastructure, and the effects of hydropower development may be more severe here than in regions that are already developed (ibid.). Mountainous regions are also areas where SHP development may conflict with the Indigenous peoples who live and use areas such as the reindeer herding Sámi [29].

For Sámi reindeer herding, SHP development is challenging for several reasons. The physical barriers along with visual and sound disturbances from SHP development cause problems due to reindeers' avoidance behavior. This in turn leads to indirect pasture loss, increases the risk of collisions between reindeer and traffic, and causes more time to be devoted to herding, herd management, and the movement of reindeer into new areas, causing conflict with the agricultural industry and other land uses [44]. Roads built in conjunction with SHP projects increase traffic from people engaged in outdoor recreation, making the area more attractive for other types of land development, such as the building of secondary homes and cabins that may increase disturbances for reindeer (ibid.). River regulation may also reduce the capacity to cope with climate change as ice on lakes can become unstable, leaving reindeer more vulnerable to drowning.

### 2.4. Small hydropower licensing in Norway

A license from the Norwegian Water Resources and Energy Directorate (i.e., the licensing authority) is required if hydropower development can be damage or disadvantage public or private interests (Water Resource Act § 8), which is generally the case for SHP [95]. A license is only granted if the benefits of the project, such as renewable energy, local value creation, profits to private landowners and tax revenues to municipalities, outweigh the public or private costs (Water Resource Act § 25). Based on the developer's proposal and input from rights and stakeholders during the hearing process, the licensing authority decides

whether to license the project.

The term SHP is used in Norway to refer to hydropower plants of less than or equal to 10 MW [96]. This definition is also used internationally by, for instance, the United Nations Industrial Development Organization [1], although SHP definitions may vary between nation states [9]. Projects with <0.1 MW and 1 MW production capacity are respectively referred to as micro- and minihydropower projects in Norway [96]. It is the municipality that decides to license hydropower of <1 MW. Projects that do not require a license following the Water Resource Act are decided on following the Planning and Building Act, which is also the responsibility of the municipality (ibid.). Our main focus in this study is on SHP plants of 1–10 MW, which are the responsibility of the licensing authority.

An impact assessment (IA) of the new SHP project is a requirement following the new regulations of 2017 (Regulation regarding Impact Assessments 2017, § 7 and Appendix II). The need for an IA used to be assessed on a case-by-case basis. An IA should identify and describe the interests that can be affected, including Sámi livelihoods and culture (Regulation regarding Impact Assessments 2017, § 21). In 2012, the licensing authority started new procedures that involved assessing multiple SHP proposals collectively in the same geographical area to speed up decision-making and ensure a more holistic assessment of impacts [97].

Rights and stakeholders, along with the general public, can participate in SHP licensing processes through public hearings. During the hearing process, the licensing authority must present the SHP proposals to all national, regional and local authorities; other relevant regulatory agencies; private organizations and other concerned parties for comments (Planning and Building Act § 5–2, Table 1). The licensing authority must publicly announce the proposal and make it available for public inspection (Planning and Building Act § 5–2).

In addition to the opportunity to make a public statement, municipalities, county municipalities, the Sámi Parliament and other affected

**Table 1**  
Key actors involved in public hearing processes concerning small hydropower development in Norway in Sámi reindeer herding areas.

Actors	Description
Regional environmental authority	The county governor is the state's representative at the county level. The county governor is in charge of environmental issues (incl. landscape and recreation).
County municipality	The democratically elected body at the regional level with responsibilities for cultural heritage and environment/recreation.
Environmental & recreation organizations	Nongovernmental organizations (NGOs) such as the Forum for Nature and Outdoor Recreation, Friends of the Earth, hunting and fishing organizations, and recreational councils.
Regional reindeer authority	Prior to 2014, regional councils were in charge of the management of reindeer herding. Regional councils were appointed by the Sámi Parliament and county municipality. Among the members of these councils were active reindeer owners and the secretary was a reindeer herding agronomist. In 2014, the county governor took over management responsibility for reindeer herding. The concerns raised by the county governor on behalf of reindeer herding in this period are coded under the regional reindeer authority.
Sámi Parliament	The democratically elected body of the Sámi people in Norway holds the right to consult, can make comments and has the opportunity to object in matters concerning Sámi cultural heritage or commercial activity such as reindeer herding (PBL § 5–4).
Reindeer herding districts	The management of Sámi reindeer herding in Norway is divided into reindeer herding areas (six in total). These areas are further divided into reindeer herding districts and within each district, reindeer herding is carried out in smaller groups called siidas.

governmental agencies, such as the regional environmental authority and the regional reindeer authority, can object to SHP proposals. In the case of an objection, the licensing authority and the public authority that objected should discuss if changes can be made to the project proposal so that the objection can be withdrawn. If they cannot reach an agreement, the Ministry of Petroleum and Energy has the final say.

State authorities have an obligation to consult the Sámi Parliament and the reindeer herding industry in matters that will affect Sámi interests. This agreement on the Procedures for Consultations between State Authorities and the Sámi Parliament was formalized in 2005 and was a follow-up of ILO Convention 169 [41]. In June 2021, the Norwegian Parliament set the obligations and rights of consultation statutory by adopting a bill on changes to the Sami Act (Draft resolution and bill 2020–2021). In cases where the Sámi Parliament has a right to object after the Planning and Building Act, there is no right to be consulted (Sámi Act § 4–1) as the right to object safeguards the same concerns as the obligation to consult [112].

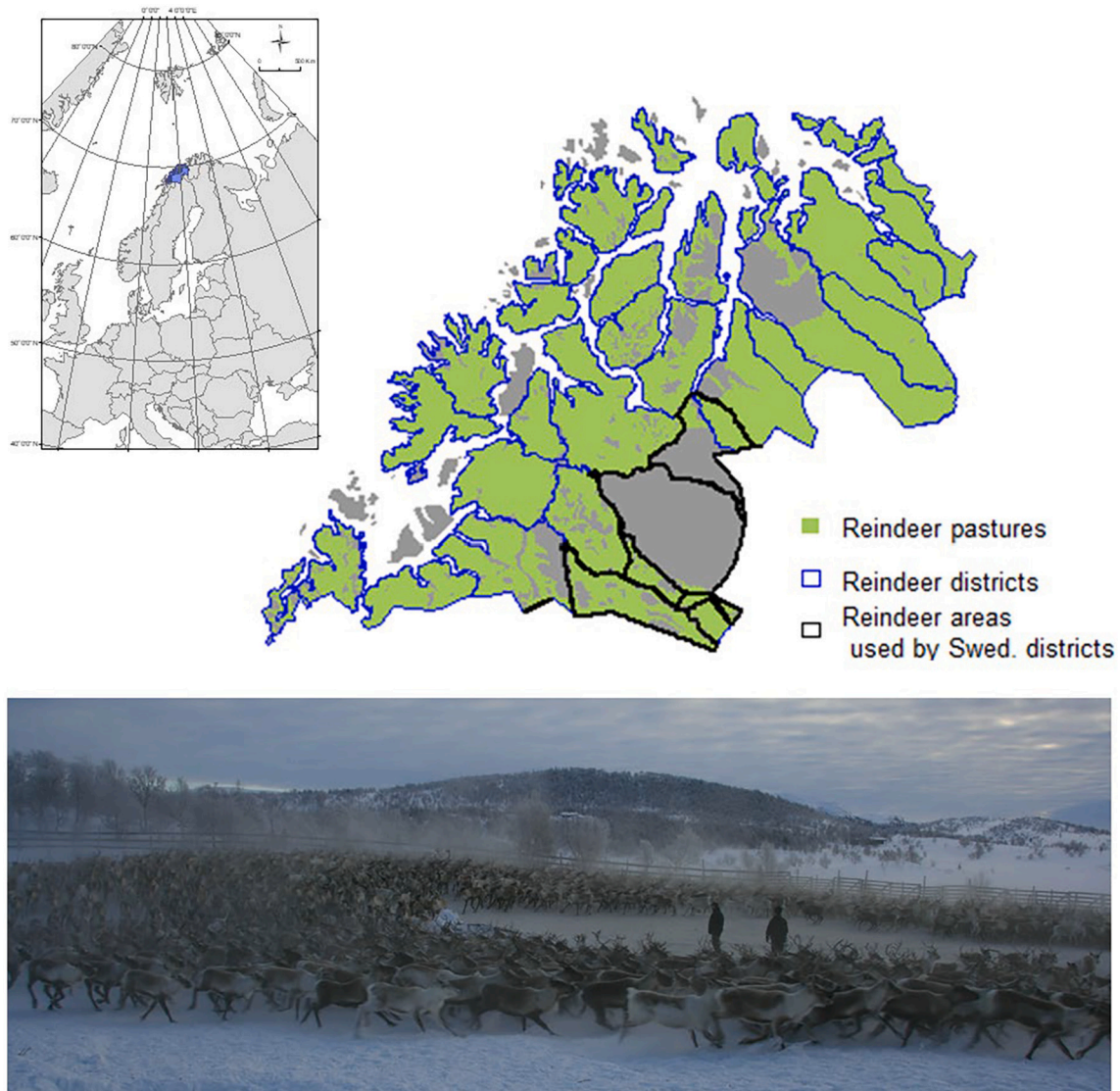
Rights and stakeholders also have the opportunity to appeal to the licensing authority's decision to grant or refuse an SHP license. In this study, we do not focus on the decision-making process after the licensing

authority has made its decision (i.e., the appeal process).

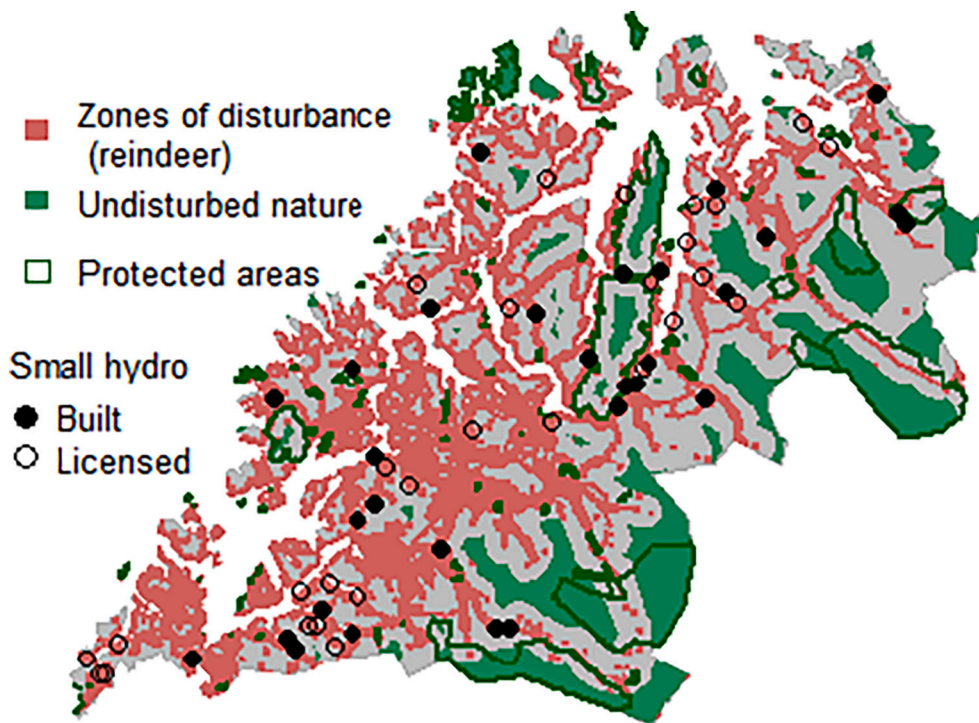
### 3. Methods and material

#### 3.1. Study area

Our study area is the administrative unit of Troms County, situated in the northern part of Norway above the Arctic Circle (Fig. 2). The region is 25,877 km<sup>2</sup>, an area roughly the size of Denmark. Troms recently merged with another county and became Troms and Finnmark County, but we retain the old administrative unit for the purpose of this analysis. Troms County is a key area for Sámi reindeer herding, as 70 % of the county is utilized for this purpose as pastures or migratory routes (Fig. 2). The most pressure from competing land uses is found in the southern and middle sections of the region (Fig. 3). Reindeer herding in Troms is both nomadic, with long migrations between summer and winter pastures, and relatively stationary or with shorter migrations [33]. Troms County is also a traditional grazing area for Sámi reindeer owners on the Swedish side with summer pastures in the interior parts of the region (ibid.). In total, there are 14 districts in the Troms reindeer



**Fig. 2.** Study area & Sámi reindeer herding. The first map (top left) shows the location of Troms County (blue). The second map shows areas used for reindeer pastures in Troms, along with the division of the region into administrative units called reindeer herding districts. Areas used by Swedish reindeer districts are also shown (data were retrieved from [kilden.nibio.no](http://kilden.nibio.no)). Gray areas show the base map. The picture (bottom) shows a reindeer herd in a corral (Photo: Bård-Jørgen Bårdsen).



**Fig. 3.** Small hydropower & other competing land uses: The figure shows small hydropower development in Troms as of April 2021, along with zones of disturbance for reindeer (i.e., areas influenced by types of competing land uses other than SHP) based on the work of Riseth and Johansen [33]. Encroachment-free areas (i.e., areas 5 km or more away from larger encroachments), along with areas protected following the Nature Diversity Act (2009), are included to show correspondence between areas of high conservation value and undisturbed areas important for reindeer herding. See Table D1 in Appendix D for further details about the spatial layers. Gray areas show the base map.

herding area, 12 districts from the West-Finnmark reindeer herding area in the northern parts of Troms and four Swedish Sámi districts (ibid.).

### 3.2. SHP development on reindeer pastures

We combined reindeer owners' maps over seasonal pastures (fall, fall/early winter, winter, spring and summer pastures) and looked at the overlap between these pastures and built, proposed and potential SHP development. See Table D1 in Appendix D for a description of the data used.

### 3.3. Document analysis

Case documents on SHP licensing processes are made available by the licensing authority online (nve.no). We searched for all new SHP proposals made in Troms County, focusing on the eight-year period from January 2010 to September 2018.

When coding the documents, we focused on i) who explicitly opposed the SHP proposal, ii) whether the proposal was licensed or not and iii) the licensing authority's reasons for SHP rejection. Actors who opposed a given SHP proposal were given a value of 1, while actors who were positive or had not made a statement were given a value of 0.<sup>1</sup> In a separate file, we recorded which reindeer herding districts had filed a public hearing statement in the different SHP cases and recorded whether they opposed or accepted the SHP proposal.

We concentrated on documents in which the licensing authority provides a detailed background on the decision regarding the SHP proposal. Here, they summarize concerns raised during the public hearing, state which public or private interests they anticipate will be affected by the SHP proposal, and determine whether they find the benefits of the project to outweigh the costs. When we required

<sup>1</sup> In retrospect, we could have separated actors who were explicitly positive, those who accepted and those who did not make a statement to capture positive views of SHP, which is an underresearched area [3]. Additionally, in some cases, nonparticipation can be a form of protest [98].

additional information for our coding scheme, we looked at the full hearing statements.

In regard to coding the reasons for refusing SHP, we generally followed the licensing authority, who separated between landscape types, "wilderness" (i.e., encroachment-free, see Table D1) areas, biodiversity, experiential values, outdoor recreational interests, cultural heritage, reindeer herding, drinking water, other commercial activities, tourism, and financial costs (i.e., whether they deem the costs of the project to be too great for the project to be economically feasible). We made one exception and combined landscape, "wilderness" areas, biodiversity and experiential values into one category called the environment. We did this for simplicity, as our main focus was on distinguishing between Indigenous (i.e., reindeer herding) and other public or private interests.

One person (the corresponding author) was responsible for coding since coding manifest as opposed to latent content is more about identification than subjective interpretation [51]. The coding was, however, inspected multiple times for accuracy.

To demonstrate our coding scheme and show examples of SHP projects with different levels of conflict with reindeer herding, we present five SHP cases from the data in detail in the supplementary material (Appendix B).

### 3.4. Statistical analyses

We explored the links between the different actors' opposition to SHP (joint opposition) and between opposition and licensing using single-variable analysis (i.e., the odds ratio (OR) and Fisher's exact test).

To investigate which actors jointly opposed, if any, we calculated the association between the opposition of the different actors in terms of the OR. The OR was defined as the odds of actor X opposing SHP given that actor Y opposed compared to the odds of actor X opposing given that actor Y did not oppose. Thus, the OR gives the increase in the odds of actor X opposing, given that actor Y also opposes.

Similarly, we used the OR to investigate the association between the outcome of the licensing process and opposition. We calculated the OR between the odds of a license being refused when an actor opposed compared to the odds of a license being refused without opposition from



the actor. Thus, this OR gives the increase in the odds of a license being refused when the actor opposes it.

We decided not to correct for multiple comparisons, as this may result in type II errors (i.e., not finding an association that is present) [99]. Instead, we report the confidence intervals and p values of all comparisons (Appendix C).

Statistical analyses were performed using the software program R ver. 3.5.1 [100]. We used the base package *stats* to calculate odds ratios, p values (Fisher's exact) and confidence intervals. We used the package *igraph* (1.2.5) for the network plot and network measures.

## 4. Results

### 4.1. SHP development on reindeer pastures

There were 30 SHP plants in operation in Troms as of April 2021. Many were located in areas used for reindeer pastures (18 plants; Table 2). Construction had not yet started for an additional 28 licensed projects. Fifteen of these were located on reindeer pastures (Table 2). Thus, if licensed projects were built, this would almost double the number of SHP plants on reindeer pastures in the near future. Based on assessments made by the licensing authority in 2004, the potential for additional SHP development on reindeer pastures is considerable, with an estimated 162 potential projects within the most favorable price range [101] (Table 2; see Table D1 for more information about these data). Upon visually inspecting Fig. 3 it seems that SHP is largely placed within or in close proximity of areas disturbed by other types of land development and in buffer areas to protected areas. Protected areas themselves seem to be avoided.

### 4.2. Document search

Our search returned 110 SHP proposals, of which 47 were licensed, 33 were refused and 30 were withdrawn by the applicant by the time of the search. Eight of the licensed proposals had unresolved appeals. Two licensed and seven refused proposals could not be included in the analysis due to missing information, which left us with a final sample of 71 SHP proposals, of which 26 (36 %) had been refused. See Appendix A Table A1 for a list of the SHP cases.

### 4.3. Opposition to and acceptance of new SHP projects

The actors that opposed most frequently were environment and

**Table 2**

The status of SHP development in Troms in April 2021 along with an estimate of the potential for SHP development in the same region from 2004.

	Total number of SHP plants	Number of SHP plants on reindeer pastures	% SHP plants on reindeer pastures of total
Built or under construction	30 <sup>a</sup>	18	60
Licensed but not yet built	28 <sup>b</sup>	15	54
Ongoing licensing/appeal process	0	0	0
Refused	35 <sup>c</sup>	15	43
Potential (<3 NOK per kWh) for SHP <sup>d</sup>	285	162	57
Potential (>3 NOK per kWh) for SHP <sup>d</sup>	438	307	70

<sup>a</sup> The plants were built from 1910 to 2021.

<sup>b</sup> The licenses were granted from 2010 to 2020.

<sup>c</sup> Refused from 2009 to 2020.

<sup>d</sup> 2004 estimate of SHP potential. Previously built SHP plants were excluded from the analysis.

recreation organizations (ENGOS), followed by Indigenous representatives, i.e., reindeer districts, the Sámi Parliament, and the reindeer authority (Fig. 4a). Interestingly, ENGOS and reindeer owners, the two actors that opposed the highest proportion of SHP proposals, were both grassroots organizations/citizens (Fig. 4a).

Indigenous representatives opposed a relatively large number of SHP proposals (46 of the 71 proposals, i.e., 65 %), and reindeer owners opposed more SHP proposals than other citizens as a group (Fig. 4a). This suggests that reindeer owners are among the groups most impacted by SHP development.

New SHP projects seemed to affect some reindeer herding districts more than others and often the larger districts (Fig. 4b). For instance, two of the largest reindeer herding districts were involved in 10 SHP proposals each during the study period. Nevertheless, even though the new SHP project was located in a reindeer herding district, it was not necessarily opposed by reindeer owners. Fig. 4b shows the variability in reindeer herding district opposition and how some reindeer districts, namely, Mauken-Tromsdalen, Hjertind, Fávrosorda, Spalca and Reinøy, opposed all or almost all SHP proposals, while others, such as Grovfjord, Gielas and Lakselv-Lyngsdal, accepted all or almost all proposals. There may be several reasons for this variability, as mentioned in the introduction. Low perceived impact is one. For instance, the Cokolat and Birtavarre reindeer herding district writes in their public hearing statement in the Hanskejohka case that:

*“This power plant can be considered allowed. Given the knowledge that reindeer owners have of the placement it looks at present that the negative influence will be modest. This assumes that an on-site inspection with the developer is carried out where the reindeer owners can see how the power plant and its infrastructure are placed in the terrain.”*

In a different SHP case, the Grovfjord reindeer herding district issued the following statement:

*“The Grovfjord reindeer herding district is, based on the information that we currently have, not opposed to the construction of the power plants Røreiva, Segeleiva, Øvre Foldvik, Nedre Foldvik og Dudal. This assumes that the plans are implemented and it is especially important that the pipeline is buried.”*

Other actors also opposed, namely, citizens, the environmental authority, the county municipality, the municipality and other public agencies (Fig. 4a). The latter opposed few cases, however.

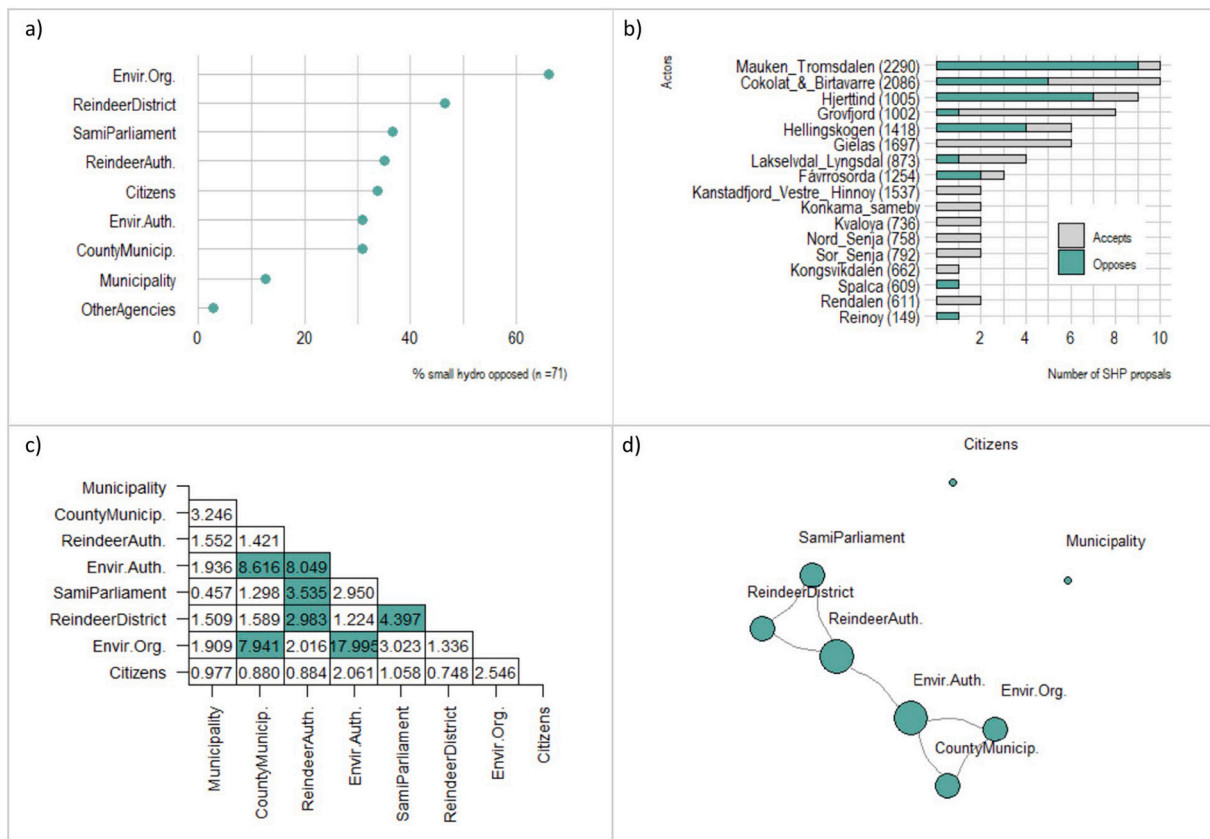
### 4.4. Actors who jointly opposed new SHP projects

Key actors representing Indigenous interests, namely, reindeer districts, the Sami Parliament and the reindeer authority, jointly opposed new SHP projects (Fig. 4c & d). Similarly, key actors representing environmental interests, namely, ENGOS, the county municipality and the environmental authority, also jointly opposed. Thus, these groups seem to have shared concerns across multiple SHP cases. The only actors who jointly opposed these groups were the environmental authority and reindeer authority. The closest associations (the highest ORs) were found between the environmental representatives and between the environmental authority and reindeer authority (Fig. 4c).

The environmental authority and reindeer authority were linked to the most actors (i.e., three links each; Fig. 4d). They also connect other unconnected actors representing Indigenous (the Sami Parliament and reindeer districts) and environmental (the County Parliament and ENGOS) interests (Fig. 4d). This suggests that these actors hold a central position in the network of actors engaged in SHP development.

Reindeer owners jointly opposed with the Sámi Parliament and the reindeer authority, suggesting that their concerns were backed by these public authorities. There were, however, ten SHP proposals that reindeer owners opposed, but none of their representatives opposed them. One such case is the Elneselva SHP project. In this case, both the reindeer authority and the Sámi Parliament accepted the proposal, while the





**Fig. 4.** Actors who oppose (a–b) and jointly oppose (c–d) new SHP development. Figure a shows the percentage of SHP proposals opposed by the different actors, while Figure b shows the number of SHP proposals opposed and accepted by the affected reindeer herding districts. The size of the reindeer district is noted in parentheses (km<sup>2</sup>). Figure c (the matrix) shows the strength of the association (odds ratios) between the various actors' views on SHP. An OR of larger than 1 indicates a positive association between actors' opposition, an OR of less than one indicates a negative association and an OR of 1 indicates no association. For example, the odds of the environmental authority opposing were 8.6 times higher when the county municipality also opposed and vice versa. Green cells denote statistically significant associations (see Table C1 for p values and confidence intervals). Figure d (the network plot) visualizes associations between the actors. Statistically significant links, referred to as joint opposition, are marked with a line. The size of a node (i.e., a green circle) indicates the number of links (i.e., the larger the node is, the more links to other actors there are).

Helligskogen reindeer herding district opposed it. The actors' views are summed up by the licensing authority as follows:

*“The Sami Parliament has no objections to the project since no automatically protected S ami cultural heritage sites were recorded during the on-site inspection.”*

*“The reindeer authority in Troms recommends licensing an adjusted project with intake at contour of 220. It assumes that the construction period is decided on together with the reindeer herding district and that the district can use the road to the intake at no charge. Furthermore, restrictions must be placed on the use of the road, which should be returned to a state so that only terrain vehicles can use it once the power plant is in operation.”*

*“The Helligskogen reindeer herding district opposes the construction of the power plant in Stordalen/Elnesdalen, also with the intake at contour 220, because the area is used as summer pastures for male reindeer. The reindeer herding district expresses strong disagreement with the assessment that the impact on reindeer herding is considered small. Lack of assessment of cumulative effects of already carried out and planned encroachments makes it necessary for the reindeer herding district to demand a new impact assessment carried out by people with reindeer herding expertise, where one must be an active reindeer owner.”*

Because of the few SHP proposals opposed by the Public Roads Administration and Food Safety Authority (other agencies, Fig. 4a), we left these out from the statistical analyses of joint opposition and the

association between opposition and licensing.

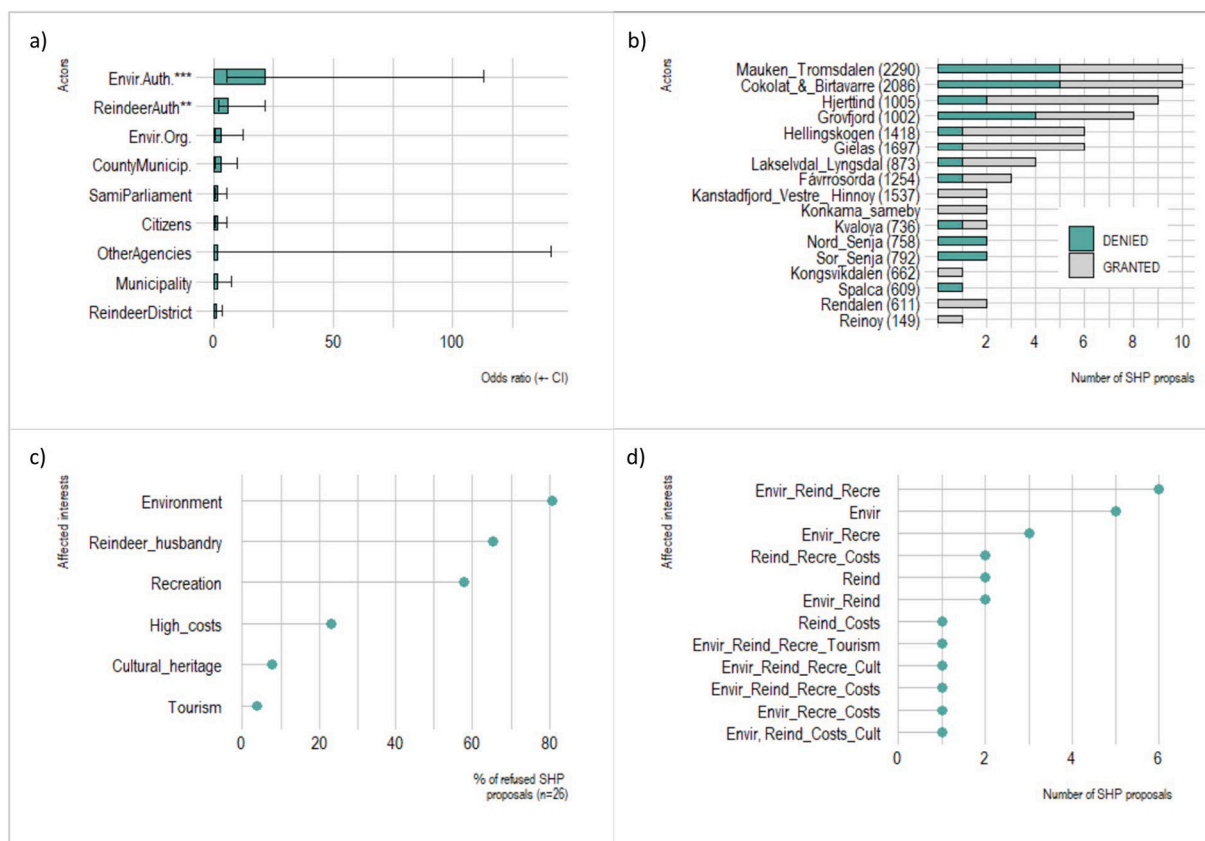
#### 4.5. Influential actors and interests

The odds of refusing an SHP license significantly increased in cases where the environmental authority and reindeer authority opposed (environmental authority: OR = 21.06, p value = 0.000; reindeer authority: OR = 6.20, p value = 0.001; Fig. 5a and Table C2). Thus, the odds of a refused SHP license were 6 and 21 times higher when the reindeer authority and environmental authority opposed, respectively, compared with when they did not.

Despite the apparent influence of the reindeer authority, SHP proposals opposed by Indigenous representatives were nevertheless licensed. Of the 46 cases opposed by one or more representatives of reindeer herding, a total of 19 (41 %) SHP proposals were refused, while 27 (59 %) were granted.

In contrast to the above, SHP proposals accepted by reindeer owners sometimes refused a license (e.g., the Nord-Senja and S r-Senja reindeer districts). This becomes evident when comparing Figs. 4b and 5b. The Nord-Senja and S r-Senja reindeer districts both accepted the two SHP proposals in their districts, but in both cases, all the SHP proposals were refused.

In their decision to refuse SHP, the licensing authority placed weight on the environment in the highest proportion of cases, followed by reindeer herding, recreation, high costs, cultural heritage, and tourism (Fig. 5c). The combined consideration for the environment, reindeer



**Fig. 5.** Influential actors (a–b) and interests (c–d). Figure a shows the association (odds ratio – OR) between opposition and outcomes (i.e., whether the SHP proposal was licensed or not). In this case, the OR is defined as the ratio between the odds of a license being refused when an actor opposed it and the odds of a license being refused without the actor opposing. The OR gives the increase in the odds of license refusal when an actor opposes (see also Table C2 for OR estimates, p values and confidence intervals). Statistically significant estimates are indicated with asterisks (\*\* $P \leq 0.001$ , \*\*\* $P \leq 0.0001$ ). Figure b shows the number of SHP proposals in the different reindeer herding districts that were denied and licensed. Figures c and d show the reasons for the refusal of small hydropower projects. The former shows the proportion of refused cases where consideration for different interests gave grounds for refusal. The latter shows the same data only as counts and by which types of combinations of the different interests gave grounds for refusal.

herding, and recreation served as grounds for refusal in most cases, followed by sole considerations for the environment and the combined consideration of the environment and recreation (Fig. 5d). Reindeer herding was the sole reason for the refusal in two cases (ibid.). No projects were refused solely out of consideration for other public interests apart from reindeer herding and the environment (ibid.). In sum, reindeer herding was part of or the reason for the refusal of 17 of a total of 26 SHP proposals (65%; Fig. 5c).

There seems to be a positive association between the number of actors that opposed and refused SHP (Fig. C1).

## 5. Discussion

### 5.1. SHP proliferation and Indigenous opposition

As SHP development is booming in many mountainous regions worldwide [30], there is a need to understand the ecological and social impacts of such development, including the opportunity for Indigenous people to oppose and influence such changes.

Limited public attention to SHP [5] has left an impression of SHP development as relatively unproblematic for Indigenous Sámi land use. In this study, we looked more closely at this assumption. Specifically, we looked at whether the perceived low conflict level could be due to i) low levels of SHP development, ii) a perception of SHP as a low impact technology and thus as more acceptable to Indigenous representatives than perhaps other forms of renewable energy [5], or iii) whether Indigenous representatives have been opposing SHP development

without much public attention.

Our results show SHP to be proliferating in areas used for reindeer pastures and that there is Indigenous opposition to such development. We found 33 SHP plants licensed, built or under construction in areas used for reindeer pasture in our study region. We also found that SHP projects caused concern among Sámi reindeer owners and their representatives who opposed a majority (65%,  $N = 46$  out of 71) of the SHP proposals made in the study region over the eight-year study period. Reindeer owners also opposed a higher proportion of these cases than other citizens, serving as another indication that reindeer owners are among the groups most impacted by new SHP projects. This points to concerns of distributional justice [26].

The prolific nature of SHP has the potential to generate a large caseload. A key concern in Sápmi with respect to procedural justice are capacity constraints, as reindeer and their representatives are called on to participate in a myriad of research and land use planning processes [35,36,85,102]. As we have seen, SHP development adds to this pressure. The number of SHP cases in which individual reindeer herding districts and their representatives participate seems substantial. For instance, the Mauken-Tromsdalen and Cokolat and Birtavarre reindeer herding districts were involved in 10 different SHP cases each over the course of the study period, and this is just the initial hearing. Depending on how the case develops, reindeer owners may be required to participate in additional hearings, on-site inspections and dialog with the developer throughout the project period. Another example of how the volume of planning and licensing processes can become untenable for Sámi reindeer herding communities when carried out on a single project

basis can be found in Österlin and Raito [36].

Based on the above, pressure from SHP development on Sámi reindeer herding warrants further inspection. From what we show in Section 2.2, SHP development adds to the already considerable cumulative pressure from multiple competing land uses on the landscape and “planscape,” a term used by Österlin and Raito to describe the myriad of planning and appeal processes that Sámi reindeer owners need to engage in to protect their pastures against different industrial sectors' desires to use the land [36].

### 5.2. Indigenous influence & SHP development

A majority of cases with Indigenous opposition were licensed (59 %, N: 27 out of 46). With this in mind, Indigenous influence seems rather limited, and the potential realization of 27 projects considered unacceptable in the eyes of Indigenous representatives seems significant. Similarly, Lie et al. [81] found that Sámi representatives were unable to limit the construction of cabins in areas used for reindeer herding in Norway by participating in land use planning. Most of the planning processes resulted in compromises that led to a significant amount of new cabin building. In our case, adjustments may have been made to make the proposals more acceptable at later stages, and we cannot rule this possibility out.

We found indications of Indigenous influence. Reindeer herding was a part of or the sole reason behind refusing 17 of the 26 refused SHP proposals, and the reindeer authority's opposition was associated with SHP refusal, together with the environmental authority. From our analyses, it is difficult to assess the relative contributions of the different actors and interests to SHP refusal. In many cases, it seems that the refusal of SHP could be attributed to the combined consideration of multiple interests, along with the joint opposition of the environment and the reindeer authority. Difficulty in determining how the licensing authority weights different interests has also been pointed out by others [97,103].

The strong role of the regional authorities does seem to provide some protection for Sámi land use rights. Other authors have emphasized the importance of public authorities at the regional level in Norway for safeguarding Indigenous interests [86,104]. On the other hand, our results demonstrate that Sámi reindeer owners are not always backed by their representatives. We found that SHP proposals may be considered unacceptable for reindeer owners but acceptable to their representatives. Reindeer owners may have a different view and knowledge of what constitutes unacceptable impact than their representatives. They may also be less willing to accept uncertainty and risks. Public authorities have rules and procedures that they are bound by, which may also make their assessment differ from citizens. The Norwegian Auditor General has pointed out unclear practices for when regional authorities should object and that objections are practiced differently in similar energy licensing cases [97].

Not only was there a discrepancy between reindeer owners' opposition and their representatives. The same was the case for ENGOs and public authorities tasked with safeguarding the environment. They opposed many more cases than public agencies. ENGOs may adopt a tactic whereby they oppose in large numbers to defend the view that all SHP development has some form of environmental impact and that this is considered unacceptable.

### 5.3. Indigenous energy acceptance & joint opposition

The persistence of stereotypical views (e.g., reindeer owners oppose all land development) of reindeer owners is a recognitional justice concern [26]. It shows a lack of respect and can lead to discrimination. For instance, a study from the southern part of Norwegian Sápmi found that experiences with negative attitudes from people outside Sámi reindeer herding and from media are widespread in Sámi communities in this region, along with exposure to discrimination and criminal acts

due to ethnicity [105]. Moreover, Norwegian authorities' lack of knowledge of reindeer herding has been shown to result in negative discrimination and reduced quality of life for reindeer owners [105].

Our results also show how Indigenous opposition is more nuanced than current stereotypical views of reindeer owners being against all land development. We show that while reindeer owners oppose some SHP cases, they also explicitly accept others, and interestingly, reindeer districts seem to differ in their acceptance of SHP. Such variability can be attributed to different factors, e.g., perceived project impacts, renewable energy views, trust in the actors involved, such as the developer and the licensing authority, or knowledge of and influence over the decision-making process [5,6].

Indigenous actors are furthermore not alone in regard to SHP opposition. Other societal actors, such as environmental organizations, private landowners, people engaged in outdoor recreation, municipalities, and other sectoral agencies, also oppose and sometimes oppose the same cases as Indigenous representatives. Such joint opposition may be mutually beneficial for those involved.

Indigenous representatives' opposition was related across SHP cases, which suggests shared interests/concerns and shared benefits of SHP refusal. The same was the case for environmental representatives. Moreover, Indigenous and environmental interests (and benefits from refused SHP) seemed to be coupled across SHP cases through reindeer and environmental authorities' opposition. The coupling of reindeer and environmental authorities' concerns may be related to a shared concern for the environment, albeit for different reasons (i.e., protecting the material basis for Sámi reindeer herding and environmental protection). We should caution that this link may also partly be related to these roles being served by the same public authority after 2014, namely, the county governor (Table 1).

Others have described how the coupling of Indigenous people and environmental interests can help counter the power and influence of industrial actors [14,22,86,106], and attention to the importance of partnering with and supporting Indigenous peoples is increasingly perceived as an integral part of conservation strategies [107–110]. Indigenous peoples also recognize the benefits of creating multiactor and multiscale alliances to safeguard their traditional land against development [14,15,22].

### 5.4. Assessing social acceptability using public hearing statements and the way forward

Using quantitative content analysis of public hearing statements and other SHP licensing documents, we mapped SHP opposition and acceptance/support, along with SHP outcomes across actors, interests and 71 SHP cases. We have shown how this approach can capture the scope and scale of Indigenous opposition and acceptance and can as such provide perspectives that complement the more qualitative studies on SHP projects and Indigenous peoples. We found informative qualitative descriptions of the societal impacts that Sámi reindeer herding communities are experiencing and acknowledge that our analysis could also have included an even more in depth, qualitative coding of public hearing and licensing documents to provide more context and detail to our quantitative analyses.

We want to be cautious of making policy recommendations at this stage. Our study was largely exploratory and has helped identify areas for further research, which are summarized in bullet points below.

- In light of our results, it is puzzling that SHP development and Indigenous land use have gained so little media and academic attention. Since our energy opposition measure only captures attitudes at the proposal stage of SHP development, one explanation could be that attitudes became more positive at later stages. The developer and licensing authority could, for instance, have succeeded in accommodating concerns raised in the public hearing statements and, as such, lowered the conflict level.



Another explanation for the lack of attention could be that Sámi reindeer owners and their representatives have devoted most efforts to perceived high-impact, large-scale land use changes (e.g., wind power and transmission lines [5]).

Follow-up studies could aim to capture the temporal dimension of social acceptability from, for instance, short interviews with reindeer owners, along with the developers' views. The latter tend to be ignored in regard to assessing the social impact of hydropower [3], and this study is no exception.

- We focused on mapping energy opposition, which is the category at the far end of Thomassin et al.'s [61] acceptability scale (Section 2.1.1). Our aim was an energy opposition measure that captures all actors who actively oppose SHP development, and we believe that our measure comes close to this.

We did not explore other formal or informal ways of demonstrating energy opposition. We also did not focus on capturing the other degrees of acceptability, namely, covert rejection, indifference and covert acceptance/support and overt acceptance/support, apart from mapping reindeer owners' overt acceptance/support, and in the latter case, we did not separate acceptance from active support.

Public hearings do not seem apt at demonstrating indifference to, covert rejection of and covert acceptance/support for land development, and we are unfamiliar with how common it is to use public hearings as a way of demonstrating overt acceptance/support. People who are indifferent do not take action [61]. Covert rejection and covert acceptance are, per definition, not revealed through public hearings because filing a public hearing statement is a form of public action. The main actors who overtly accept/support are likely to be developers, and their support is demonstrated by initiating SHP projects (i.e., support demonstrated at the utilization level following the definition of Busse and Siebert [57]). Other supporters could be municipalities [111] and citizens who have favorable attitudes toward renewable energy development.

Follow-up studies could explore the different degrees of social acceptability, along with capturing the other formal and informal ways of opposing or supporting SHP. Follow-up studies could also explore acceptance elicited through public hearing statements by actors other than reindeer owners.

- Further investigations into what constitutes acceptable and unacceptable SHP projects for Sámi reindeer herding seem warranted, along with reasons for the discrepancy between reindeer owners' opposition and their representatives. Such knowledge may help the licensing authority identify contentious projects at an early stage, potentially even before the proposal is sent out for hearing. Reducing the number of SHP proposals would in turn put some of the pressure on Indigenous representatives.
- Since actors' public hearing statements are directly related to individual SHP proposals, the spatial dimension of public opposition and SHP could be explored further and at even larger scales (e.g., nationwide). This may allow for the statistical identification of properties that make some SHP projects more contentious than others (e.g., the presence of reindeer pastures, migration routes, calving grounds, earlier encroachments, certain environmental characteristics, proximity to protected sites, etc.). It may also allow for the statistical analysis of what factors influence the outcomes of decision-making processes while accounting for confounding factors. An example of this is the analysis of wind power licensing in Norway of Inderberg et al. [111].

## 6. Conclusion

In this study, we have seen how SHP development adds to the already extensive cumulative pressure from new land development on Sámi reindeer herding. It seems unlikely that this pressure will be reduced in coming years because of the large number of licensed but not yet realized SHP proposals and the potential for additional SHP, along with high

societal demands for renewable energy. More research should be devoted to understanding SHP impacts in an Indigenous Sámi context and ways to transition to a green future in a socially acceptable and socially just way.

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.erss.2022.102888>.

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