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Co-management of protected areas to alleviate conservation conflicts: experiences in Norway

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Abstract: This paper addresses the perceptions of actors of protected areas in Norway about a co-management regime at the local level. The analysis is based on quantitative data from surveys of actors of eight protected areas in northern Norway. The surveys were undertaken just before a change to co-management in 2010. The results show that the two strongest determinants that explain actors' initial support of the governance change as a means to alleviate conflict are (i) the relationship of actors to the protected areas in terms of knowledge of the protected areas and mental models on conservation and (ii) the economic relevance of the areas for them. Traditionally, other sociocultural variables such as indigenous background (Sámi), age, and gender have been considered relevant and were also identified as significant attributes that define preferences for conservation management alternatives. We build on the quantitative findings on actors' perceptions to develop a broader discussion on the relationship of the new management model for protected areas implemented and conflict resolution on land conservation in the country.

Keywords: Co-management, governance, land planning, nature conservation, social-ecological systems

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1. Introduction

The role of local people in management of protected areas has changed over time. The 20th Century reliance in traditional, hierarchical management to secure biodiversity has gained strong criticism (Castro et al. 2006; Zimmerer 2006; Zachrisson 2009). As of today, there is a trend towards decentralization of management rights to communities and the public (Borrini-Feyerabend et al. 2008; Dudley 2008; Fedreheim 2013; Hongslo et al. 2016). This approach gives value to the tacit knowledge of local populations in improving the management of protected areas, and consequently encourages local participation (Reed 2008). This view is formalized in the so-called “Malawi principles” from the Convention on Biological Diversity, which stress that management should be decentralized to the lowest appropriate level (United Nations 1993), and the International Labour Organization (ILO) Convention 169, which states that indigenous people should be taken into account when decisions are made related to their livelihoods (The International Labour Organisation 1991).

Co-management is often used in the literature to describe “shared governance”, when responsibility for management is shared (formally or informally) among government and non-government actors, often local actors (Dudley 2008). The extent of co-management varies depending on the relative power and responsibility distribution between the government and other stakeholders. Previous studies stress a variety of benefits associated to co-management. Most relevant for this study is the capacity of co-management to reduce conflicts by ensuring participatory democracy (Pinkerton 1989). Co-management is believed to relief conflicts between central and local level as it generates increased accountability upwards and increased legitimacy downwards (Hovik and Hongslo 2017). Richards et al. (2004) have pointed to the fact that public trust in decisions is increased if the processes are perceived transparent and considerate of conflicting views. Other benefits related to involving non-government actors in nature management include empowering of non-government actors (Greenwood et al. 1993); increased social learning related to that various actors learn from each other (Blackstock et al. 2007); increased economic and social development of communities (Berkes et al. 1991); promote ecologically sustainable use of the environment, and promote social health and cultural sustainability of the local populations (Berkes et al. 1991). In sum, and through the abovementioned effects of co-management, it has the potential to make protected areas more effective because of their ability to reduce conservation conflict.

Norway’s conservation processes have traditionally been controversial (Daugstad et al. 2006; Fedreheim 2013; Overvåg et al. 2016; Hovik and Hongslo

2017). A governance change in 2010 decentralized the decision-making authority of protected areas to locally and regionally elected politicians through the establishment of national park boards, aiming to reduce conflicts (Fauchald and Gulbrandsen 2012; Fedreheim 2013). These entitled local actors some management responsibilities (Daugstad et al. 2006; Vik et al. 2011; Fauchald and Gulbrandsen 2012), while the rights to make constitutional changes still were vested within the central expert knowledge (Fedreheim 2013). That is, the national park boards hold management responsibilities but lack power to change conservation regulations. Further, these national park boards are required to inform and consult stakeholders through annual meetings with an advisory committee.

In 2016 this decentralization process has been further developed through three pilot experiences. Two national park boards include now property owners, and a third national park board includes business and interest organizations. Hence, Norway is currently in a process of developing management models with stronger representation from local interests. Ultimately, the Norwegian Government aims at reducing the level of conservation conflict by implementing increasing local participation.

Therefore, investigating the perceptions of actors in protected areas about the capacity of co-management to alleviate conflicts at the local level is particularly valuable. Do local stakeholders think co-management of protected areas can reduce conservation conflict? Despite the alleged benefits of co-management, previous results for Norway show that although institutional changes in management of protected areas, conflicts have prolonged (Overvåg et al. 2016). In such context, we aim at exploring whether the local perceptions are supportive of co-management being capable to alleviate conflict, and whether such perceptions differ by sub-groups of stakeholders.

We use quantitative data on actors of eight protected areas in northern Norway before and after a governance change fostering the devolution of some management responsibility of protected areas to local actors. We first develop an operational characterization of actors of protected areas in Norway based on their relationships to the protected area following the social-ecological systems (SES) framework of Ostrom and colleagues (Ostrom 2007, 2009; Ostrom et al. 2007). This serves as the basis to analyze later quantitatively the a priori support of actors of protected areas to the governance change.

2. Theoretical background and hypotheses

The SES framework developed by Ostrom and colleagues (Ostrom 2007, 2009; Ostrom et al. 2007) constitutes the theoretical background to develop a typology of actors of protected areas in Norway. SES are nested, complex, multilevel systems that combine social and ecological variables (Berkes et al. 1998). The Ostrom framework represents only one of several frameworks, and has at its purpose to “provide a common language for case comparison for organizing the

many variables relevant in the analysis of SES” (Binder et al. 2013, 6). Given that the framework aims at providing a “common language” it provides a common set of variables that are helpful in organizing studies of SES.

The application of the SES framework has gained criticism for focusing too much upon the social factors (Epstein et al. 2013; Vogt et al. 2015). However, we acknowledge the potential in the SES framework to apply it in studies of governance of common-pool resources (Hill et al. 2015). The framework is valuable in identifying the social and institutional drivers of SES outcomes (Epstein et al. 2013; Vogt et al. 2015). In-depth studies on social factors can provide valuable knowledge, as Risvoll et al. (2016) proved in their study of pastoral governance in Norway. They showed how different policy objectives related to preserving biodiversity and maintaining traditional local livelihoods generate spatial dilemmas that are not simple to reconcile, and thus contributes to conflicts between environmentalist interest and farmers. Hence, attributes of actors, the governance system, and the ecological attributes of the context, the resource units, the related ecosystems and the social, economic and political setting (Meinzen-Dick 2007; Ostrom 2007, 2009; Ostrom et al. 2007; Basurto and Ostrom 2009) are relevant variables also in a study of actor’s perceptions on the potential for co-management to reduce conflicts.

We understand each of the eight protected areas under study as a different SES and we operationalize the framework as providing an overview of potentially relevant variables. We define the typologies of actors based on the second-tier variables included in the actors’ block, namely number of actors, socio-economic attributes of actors, history of use, location, leadership and entrepreneurship, norms and social capital, knowledge of SES and mental models, importance of the resource and technology used. We then explore the extent to which the characterization of actors is associated to systematic differences in perception of actors on the capacity of co-management to alleviate conflict. Thus, we make use of the de-composability of the SES framework to focus on the interrelation of the governance system and actors in defining interactions.

Arguably, we use the SES differently to applications using it as a tool to assess the capacity of actors to self-organize. Instead, we aim to contribute to the endeavor of developing cumulative and empirically supported answers to the first of the three questions that Ostrom calls for the use of the SES framework: “What patterns of interactions and outcomes, such as overuse, conflict, collapse, stability, and increasing returns, are likely to result from using a particular set of rules for the governance, ownership, and use of a resource system and specific resource units in a specific technological, socioeconomic, and political environment?” (Ostrom 2009, 15182).

Previous literature addressing the influence of sociocultural variables on actors’ positions regarding conservation in Norway shows the relevance of some of the variables included in the SES framework. Vik et al. (2011) show that as age increases, the older bureaucrats are more in favor of co-management. Similarly, previous findings suggest that reindeer herders diverge in their support of pro-

tected areas. Around half of them believe the traditional management model of protected areas helps safeguard their land but still stress some negative experiences, particularly with management issues, the burden of predators, and concerns for increased tourism and recreation (Holte 2008; Riseth and Holte 2008; Fedreheim 2013; Risvoll et al. 2014). Moreover, researchers claim that the level of education is related to conservation support. Zachrisson (2008) shows that highly educated people support state management. Hypothesis 1 summarizes the conjectures related to actors' sociocultural backgrounds.

H1: Age and Sámi background enhance beliefs in the potential of co-management to decrease conflicts related to protected areas. Higher educational level decreases such support.

Hypothesis 2 focuses on the influence of two key attributes of actors of protected areas on their perceptions of the advantages of co-management: (1) dependence on the area and importance of the resources for livelihood and (2) knowledge among the actors of protected areas and mental models on conservation. Grouping together these variables is done due to their interrelationship. Some actors are mobile whereas others geographically are tied to one area. Those who are mobile are less dependent on the area and can easily operate in various areas. Moreover, as "newcomers" to the protected area they are less informed about the particularities of that protected area or other social dynamics in it. Thus, despite theoretically they are not necessarily related, the reality is that they correlate in the areas investigated.

Literature on self-organization for the management of common-pool natural resources in general, not restricted to protected areas, consistently finds that the degree of dependence of actors on the resource and their knowledge of protected areas and mental models on conservation are important factors in collective action (Ostrom 1990, 2009; Risvoll et al. 2014; Delgado-Serrano and Ramos 2015). Zachrisson (2008) supports these results in the case of Norway's neighboring country, Sweden, showing that actors dependent on protected areas favor co-management. In the case of Norway, Hypothesis 2 summarizes the influence of key SES variables and is the focus of this study.

H2: Higher dependency of actors on an area for their livelihoods as well as stronger knowledge of protected areas and shared mental models on conservation enhance beliefs in the potential of co-management to decrease conflicts related to protected areas.

Last, Hypothesis 3 deals with management of protected areas. Often the aim of co-management is to increase the legitimacy of protected areas and moderate negative attitudes toward conservation. Previous literature in the areas of study in this paper has identified tensions between various actor groups resulting in conflict regarding conservation (Bay-Larsen and Fedreheim 2008; Fedreheim 2013; Risvoll et al. 2014, 2016). These conflicts derive partly from problems of legiti-

macy of the protected areas and conflicts between various actor groups. Some stakeholders defend that co-management is the legitimate means to manage protected areas. Hypothesis 3 investigates actor's perceptions for management models and their capacity to decrease conflicts related to protected areas.

H3: Specific preferences for local management enhance perceptions on the capacity of co-management to decrease conflicts related to protected areas.

3. Methods

This study is based on quantitative primary data on stakeholders of eight protected areas in northern Norway (see Figure 1) gathered between 2007 and 2011. All the areas under consideration in the study present high conservation levels (six national parks, one protected landscape, and a World Heritage Site comprised of protected landscapes and nature reserves). These areas have little human intervention, shaped by glaciers, and vary in terms of the types of ecosystems that are protected, including coastal systems, mountains, fjords, and cultural landscapes. Flora and fauna vary too. Varangerhalvøya protects one of the northernmost deciduous forests in the world, and a calcareous mountain provides good living conditions for rare species identified as endangered. Sjunkhatten is one of the

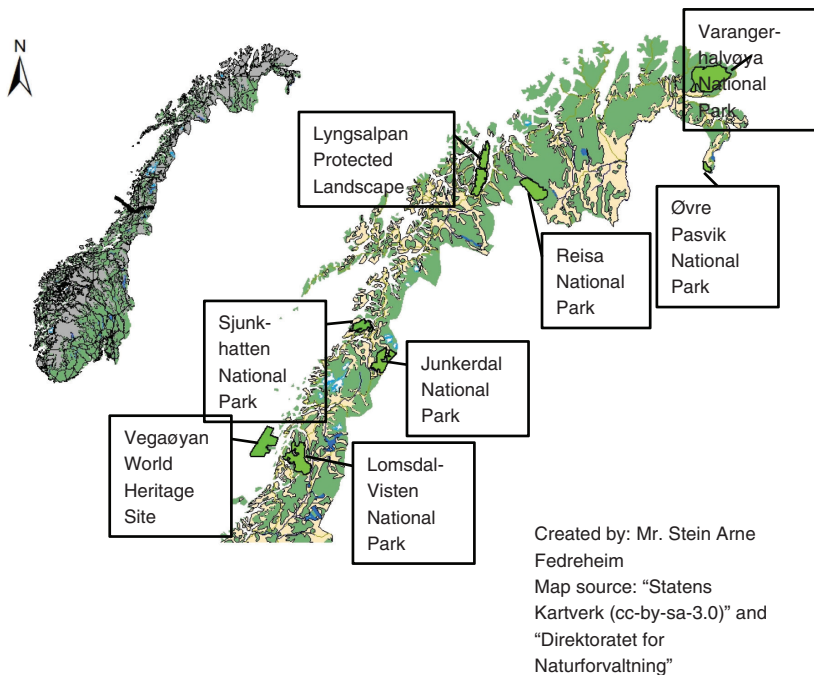


Figure 1: Map showing the case-study areas.

more mountainous parts of these areas, presenting an alpine ecosystem. The sizes of the protected areas also vary, ranging from 119 km² to 1804 km², and they were established from 1970 to 2010.¹ Four of the areas include private property; Lyngsalpan has only private property, while Sjunghatten and Lomsdal-Visten have respectively 65.3% and 47% private property, and Varangerhalvøya has less than 1% private property (Ministry of Environment 2009, 2010).

Quantitative data were obtained by means of two surveys undertaken during fall 2008. Local management was described in the survey as a situation where municipalities and local communities have the management authority, which as argued above, entails co-management. The two surveys shared the same general questions, but actor-specific questions varied for actors who defined themselves as business actors, landowners, or recreationalists. Respondents self-identified as belonging to either of these categories or several of them, answering the corresponding questionnaire. Questions included informant's business activities, their opinions of usage of protected areas, participation in conservation and management planning processes, management of protected areas, nature conservation, and knowledge of the public right of access. This quantitative data allows us to test formally Hypotheses 1–3.

The surveys were developed as part of a larger research project (“Protected areas as resources for coastal and rural business development”) funded by the Norwegian Research Council² in which evaluating participatory conservation processes was one of four goals. 101 interviews with 101 subjects from the eight protected areas were undertaken: 40 tourism operators, 10 farmers, 12 reindeer owners, 3 landowners, 3 politicians, and 33 public authorities (for a detailed overview including a separation into protected areas, see Fedreheim 2013, appendix 2). The interviews covered an array of topics: the informant and his/her role related to the protected area, usage of the area, their participation in conservation planning processes, their work with management plans etc., factors (judicial and social) influencing today's and future use of the area, their opinions of Norwegian conservation policies, and their knowledge of the right of access. These interviews serve as the foundation for the development of the survey. But they also contributed greatly to the broad and deep knowledge of actors in protected areas in Northern Norway which is essential in this paper related to the operational classification of users. Interview data is not used otherwise in this study.

The first survey was paper-based (see Fedreheim 2013, appendix 3) and directed to business actors and landowners. It was distributed among 1529 actors who had been previously mapped out (Fedreheim et al. 2008), and resulted in 324 responses (a response rate of 21.2%) (Rønning and Fedreheim 2009) (numbers in bold in Table 1). The relatively low response rate can be explained mainly by the

¹ Even though some of the parks were established late in the project period, the conservation processes had been going on since 2003 and 2004 for Lomsdal-Visten (established in 2009) and Sjunghatten (established in 2010) national parks respectively. Thus, people were aware of the forthcoming conservation decision.

² Grant no 173070/I10.

Norwegian landowner system in which division of an inheritance in many cases is not undertaken, leaving a property with many owners in both the first and second generation, which has resulted in many absentee owners (Sevatdal 2006). There has been a substantial decrease in the number of farms from around 200,000 in the 1950s to around 50,000 in the early 2000s (Sevatdal 2006), and this decrease is not in proportion with the property units.

The mapping was based on information from public registers, Internet, tourism brochures, municipal administrations, and planning and hearing documents. The resulting list was quality checked by presenting it to business actors, tourist information offices, and local contacts. Phone calls to a high proportion of the business actors followed to check for details and to advertise the upcoming survey (Fedreheim et al. 2008). Apart from the name and contact information, there is no background information to distinguish the sample from the population.

The second survey was Web-based (see Fedreheim 2013, appendix 4) and directed toward recreationalists. It was published through a network of hunting, fishing, conservation, and outdoor recreation organizations (e.g. The Norwegian Association for Outdoor Recreation, <http://www.norskfriluftsliv.no>). Given that Norwegian national parks are open and non-fenced, there is no systematic control of access to these areas, which precluded other data-gathering methods. Therefore, an open Web-based invitation was implemented and resulted in 181 responses (Rønning and Fedreheim 2009). The population in Northern Norway comprises just above 9% (about 480,000 people) of Norway's population (Statistics Norway 2016). The area's density of population is very low, around 4.3/km² compared with 16/km² in Southern Norway (Wikipedia n/a).

Our samples (see Table 2) can be compared with other defined samples for similar populations to see how these relate. Such a comparison is undertaken in Rønning and Fedreheim (2009): appendix B. Sociodemographic variables were then used, making it possible to compare with other samples.

In the rest of the paper, we will refer to business actors as respondents who stated they had a business interest in protected areas. We differentiate between

Table 1: Population of respondents connected to protected area, number of responses, and response rate (adapted from Rønning and Fedreheim 2009).

	Population	Number of responses	Response rate
Varangerhalvøya national park	138	29	21.0%
Øvre Pasvik national park	17	2	11.8%
Reisa national park	20	7	35.0%
Lyngsalpan protected landscape	715	118	16.5%
Sjunkhatten national park	291	65	22.3%
Junkerdal national park	34	7	20.6%
Lomsdal/Visten national park	142	40	28.2%
Vega World Heritage Site	172	56	32.6%
Total	1529	324	21.2%

Table 2: Demographical variables of the two samples (adapted from Rønning and Fedreheim 2009).

	Sample 1: Business actors and landowners	Sample 2: Recreationists
Average age	58.6 years	45.3 years
Gender	69.9% men	70.0% men
Marital status	69.2% married/cohabiting	75.1% married/cohabiting
Education	36.7% college/university	80.0% college/university

tourism business operators and *non-tourism business operators*, the latter comprising several types of activities, including reindeer owners, agriculture, fishing, forestry, and other (most operators developed more than one activity type, for example, there is substantial overlap between agriculture and forestry activities). *Landowners* are those who own land included in the protected area but do not make any active use of protected areas (such as having a business or doing outdoor activities in them). In cases where there was an overlap between landowners and business actors, these were coded to be business actors.

In the category *recreationists* we grouped all respondents who reported doing outdoor activities in protected areas and self-reported to have no commercial interest in them. Since these were recruited in a different data collection process, we cannot ascertain that none of them had already responded the first survey for a different protected area. That is, a subject could be a recreationist in Area 1 and a landowner in Area 2, but never have multiple roles for the same area. This coding resulted in four categories of actors for the analysis.

The data is used in statistical analyses based on a series of ordered logistic models. In all models the dependent variable is actors' perceptions on the potential for co-management to reduce conflicts. This is a Likert 5 Scale answer to the question "Local management will contribute to less conflicts between various actor groups" with 1 for "strongly agree" and 5 for "strongly disagree." In this way, a lower value of the variable reflects a perceived reduction in future conflicts as a result of co-management. The set of ordered logit models sheds light on the drivers of the variations in opinions, where the dependent variable is treated as ordinal. Standard interpretation of the ordered logit coefficient is that for a one-unit increase in the predictor, the response variable level is expected to change by its respective regression coefficient in the ordered log-odds scale while the other variables in the model are held constant.

4. Results

4.1. An operational classification of actors

The data suggests that different typologies of actors differ in the relevant attributes that according to the SES framework are relevant in analyzing SESs. Table 3 presents a systematic summary of the attributes of each type of actor in protected

Table 3. Second-tier characteristics of actors relevant in analyzing social-ecological systems.

Characteristic of actors	Landowners	Business actors		Recreationists
		Non-tourism operators	Tourism operators	
A1* Number of actors	Large	Small	Small	Large
A2 Socio-cultural attributes of actors	-	Sámi heritage for reindeer owners	-	More highly educated than the other groups
A3 History of use	No active use; only ownership of land	Active use	Active use	Active use
A4 Location	Rural and urban	Sámi traditional use	Rural and urban	Rural and urban
A5* Leadership/entrepreneurship	-	Rural	Entrepreneurship networks	Lobbying at national level
A6* Norms/social capital	-	Lobbying at national level	Political power	Broad public support
		Group formation driven by economic interests	Lack of previous experience on group organization	Strong social capital
		Tensions between sheep and reindeer owners	Public support for shared norm development	Developed norms on group organization
A7* Knowledge of SES/mental models	Traditional extensive knowledge of SES	Traditional extensive knowledge of SES	Variable knowledge: local vs. external operators	Traditional extensive knowledge
		No concern for conservation objectives	Sustainable development principles	Biodiversity preservation
A8* Importance of resource	Related to land ownership	Commercial	Commercial	Recreational
	Area dependent	Area dependent	Area independent	Area independent
A9 Technology used	Residence dependent	Motorized vehicles	None	None

*Variables that according to the SES framework have a higher relevance in explaining the capacity of actors to develop collective action. Shaded variables are those identified in in-depth interviews as key variables in determining actors' perceptions on the capacity of the new co-management to reduce conflict.

areas in Northern Norway. Variables with an asterisk are the ones with higher relevance in self-organization according to Ostrom (1990).

Different types of actors have different mental models. Recreationists have a general concern for biodiversity preservation and sustainable ecosystems management, tourism operators support the notion of sustainable development, and non-tourism operators, particularly livestock owners, have various concern for species conservation or biodiversity.

Actors also differ in their knowledge of areas. Landowners and farmers consider that international companies lack historical knowledge on the use of protected areas (A3) (Fedreheim 2013). Reindeer owners share a historical view on the use of the areas, and how reindeers migrate across land (Risvoll et al. 2014). Recreationalists' knowledge of areas relates to their use of the areas, and is in general related to trails, paths, open cabins, scenic views etc (Fedreheim and Sandberg 2008).

Additionally, protected areas have different importance for the four types of actors in this study (see A8 in Table 3). Tourism and non-tourism operators use protected areas commercially; their economic activity is tightly related to them, although in a different way for each of them. Sheep and reindeer owners use the protected areas for grazing, and the fact that these areas are protected secures the outfield pastures from developments. On the other hand, the protection decision might lead to more visitors, which can affect the pasture negatively (Jystad 2007; Riseth 2007; Holte 2008; Riseth and Holte 2008). For tourism operators, the protected area is a quality signal to consumers (tourists), as offering experiences in "wild" nature increases tourists' satisfaction. On the contrary, the use of protected areas by recreationalists, including hunters, fishers, harvesters, hikers, and skiers, is not related to the activities that generate their income. Still, the use of nature for recreational purposes has a strong tradition in Norway.

Whether actors can switch to other land areas if needed influences the relevance of protected areas for them (A8 in Table 3). Threats to protected areas have greater impacts for non-tourism operators and landowners than for the other groups of actors due to their lower spatial mobility. Sheep and reindeer owners have little capacity to move to new areas if their spot of operation decreases in quality, which makes them more vulnerable for developments and changes. Tourism operators are more area independent than non-tourism operators and can, if conservation values are deteriorated, move their activities to another area. Yet, for those who have physical structures close to the protected areas, mobility is more difficult. Area dependence is also low for recreationalists, as they can travel to other places and have similar experiences. However, even actors with mobility possibilities will be affected if there are fewer protected areas and/or less wildlife altogether.

4.2. An empirical analysis of a priori perceptions of actors

Just by checking the mean value for each group of the dependent variable on perceptions on the capacity of local management to reduce conflict, we observe

substantial variations in opinion among actor groups. Variations range from an optimistic 2.2 average for landowners to a more pessimistic 3.1 for recreationalists, with business operators occupying an intermediate position with an average of 2.6 (2.8 for tourism operators and 2.5 for non-tourism operators).

Table 4 presents the results of the different models tested. The p-values of the likelihood ratio chi-square show that the model as a whole is statistically significant, as compared to a model with no predictors. The small p-value suggests that at least one of the regression coefficients in the model is not equal to zero.

Model 1 includes four sociocultural variables (under A2 in Table 3) included in Hypothesis 1 namely the education level of actors, their Sámi heritage, gender, and age. In addition, it includes two dummy variables for the types of actors, one for landowner actors and one for business actors, where, as in all models in Table 4, recreationalists is the omitted group for the type of actor. Thus the dummy variable coefficients allow for testing whether there are significant changes in

Table 4: Ordered logistic models of agreement of actors on the capacity of co-management to reduce conflicts based on actor characteristics.

Characteristic	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Sámi	0.293 (0.346)	0.321 (0.349)	0.335 (0.348)	0.335 (0.357)	0.315 (0.357)	0.348 (0.350)	0.367 (0.350)
Education	0.324* (0.078)	0.319* (0.078)	0.312* (0.078)	0.319* (0.078)	0.311* (0.078)	0.323* (0.079)	0.316* (0.079)
Gender	-0.222 (0.196)	-0.238 (0.198)	-0.264 (0.199)	-0.242 (0.199)	-0.258 (0.200)	-0.229 (0.198)	-0.254 (0.200)
Age	-0.008 (0.007)	-0.009 (0.007)	-0.007 (0.007)	-0.009 (0.007)	-0.007 (0.007)	-0.009 (0.007)	-0.008 (0.007)
Landowner	-0.995* (0.267)	-0.996* (0.267)	-1.053* (0.268)	-0.991* (0.269)	-1.061* (0.267)	-1.058* (0.275)	-1.125* (0.277)
Business actor	-0.578* (0.249)	-	-	-	-	-	-
Tourism businesses	-	-0.396 (0.377)	-0.339 (0.383)	-0.391 (0.377)	-0.348 (0.385)	-0.404 (0.376)	-0.344 (0.381)
Non-tourism businesses	-	-0.688* (0.302)	-0.648* (0.303)	-0.688* (0.302)	-0.647* (0.303)	-0.743* (0.308)	-0.709* (0.309)
Local	-	-	-0.922* (0.186)	-	-0.926* (0.186)	-	-0.928* (0.186)
Area participation	-	-	-	0.034 (0.196)	-0.052 (0.198)	-	-
Area private	-	-	-	-	-	0.190 (0.205)	0.218 (0.206)
Observations	399	399	399	399	399	399	399
Prob>chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

*indicates 1% level of significance; standard errors are in parentheses. The independent variable in Models 1–7 was rated on a 1–5 scale (1 for strongly agree to 5 for strongly disagree) on whether the respondent agrees that co-management will reduce conflicts over protected areas. The omitted variable for actors' types is "Recreationalists".

average responses relative to the recreationalists. Business actors are the only actors who have commercial interests in the areas (A8 in Table 3). Therefore, addressing whether there are statistically significant differences in their beliefs in the potential of the new co-management regime to alleviate conflicts addresses Hypothesis 2.

This simple model shows some initial results that are robust in all other specifications (see column 1 of Table 4). First, subjects with higher education are significantly more pessimistic about co-management. Second, a Sámi background, gender, and age are not statistically significant after controlling for the type of actor by including the dummy variables. Notice that all reindeer herders have a Sámi background, since this is a prerequisite by law for being a reindeer owner. Therefore, the Sámi background would be significant if reindeer herders had specific perceptions. This is not supported by the data. Results show, though, a negative and significant coefficient of landowners and business actors, meaning that these two groups are more optimistic about the potential of the new co-management model to reduce conflict than recreationalists. In sum, we find only partial support of Hypothesis 1.

Model 2 disentangles different business activities, considering separately tourism and non-tourism operators (see column 2 of Table 4). These two subgroups differ in their knowledge of the SES and mental models (A7 in Table 3) and area mobility (A8 in Table 3). Table 4 shows that tourism operators do not have a statistically different opinion on the capacity of the new co-management model to reduce conflict than recreationalists. This finding is also robust to the additional control variables included in Models 3–7. This suggests that the similar mental models of tourism operators and recreationalists and their mobility capacity influence their similar perceptions of the new co-management model to a larger extent than their differences in commercial vs. recreational uses or in their knowledge of the SES. Significant differences in perceptions exist, though, between recreationalists and business actors and with landowners. The latter two are more optimistic about the potential of the new co-management model to reduce conflict. This might derive from their low mobility as discussed below. This provides support for Hypothesis 2.

Model 3 controls for respondents' perceptions on whether management of protected areas should reduce conflicts at the local level (including municipality, landowners, and others included in the new co-management model in Norway), testing for the relevance of Hypothesis 3 (see column 3 of Table 4). The variable *Local* is a dummy variable taking value 1 for those who chose local communities as an answer to the question "Who should manage protected areas?" (among a choice of state/county governor, county municipality, Sámi parliament, municipality, local communities, or affected landowners) and is negative and significant in Model 3. Thus, results support Hypothesis 3. Additionally, this supports that even after accounting for whether an actor thinks protected areas should be managed at the local level, non-tourism operators and landowners are more optimistic

about the capacity of the new co-management model to reduce conflict than are recreationalists.

Next, as a robustness check, Models 4–7 address potential differences in perceptions arising from which area(s) are relevant for an actor (see columns 4–7). In particular, Models 4 and 5 explore the influence of whether participation processes have occurred in an area. The dummy variable “area participation” takes value 1 for the protected areas Varangerhalvøya, Junkerdal, Sjunkhatten and Lomsdal-Visten, and 0 for the rest. In these areas participatory conservation planning processes were undertaken, stemming from including local actors in working groups in Junkerdal and Varangerhalvøya, to actively engaging local actors in planning in Sjunkhatten and Lomsdal-Visten. Models 6 and 7 explore whether the areas contain private land or not. The dummy variable “area private” takes value 1 for Varangerhalvøya, Sjunkhatten, Lomsdal-Visten and Lyngsalpan, and 0 for the rest (the distribution is presented earlier). The coefficients for the dummies “area participation” and “area private” are insignificant in all models and including them does not vary the sign or significance of any of the other variables when compared with Models 2 and 3.

5. Discussion

The results show that different actors had different levels of confidence on the capacity of the new co-management models to alleviate tensions regarding area conservation. The relevance of the dummy variables for types of actors supports previous field research informing the SES framework. This finding supports the relevance of knowledge of the SES and mental models (A7 in Table 3), and importance of the resource (A8 in Table 3) in the perception of actors about self-organization. After controlling for these two variables, other cultural differences in Table 4 are non-significant in actors’ perceptions (note that A2 in Table 3, capturing sociocultural attributes, does not have an asterisk, reflecting lower relevance according to the SES framework).

The fact that education turned out to be a significant variable, points to recreationists and business actors aligning well with the traditional central state paradigm (Hovik and Hongslo 2017). This finding is in line with previous evidence in Sweden suggesting that those favouring state management were men, younger people and highly educated (Zachrisson 2008). Yet, such critical perception seems not to be justifiable by lower performance of the co-managed boards. Recent research concludes that the local actors in the national park boards fulfil the obligations vested in the conservation regulations (Hovik and Hongslo 2017). Moreover, conservation regulations and environmental legislation were not altered through the governance changes, leaving the new national park boards to manage the same regulations as the state management did before them (Fedreheim 2013). Further, Overvåg et al. (2016) concludes that authority over land use remain the same after the governance changes. Adding these factors together, there seem to be “sufficient restrictions” put upon local actors in co-management to ensure compliance with the conservation regulations.

Additionally, our results support that the main differences between actors on their perceptions on the potential of the new co-management model to reduce conflict, derives from two main attributes: (i) the knowledge of the SES and mental models and (ii) the importance of the resource to them. These seem to be more relevant than the specific processes occurring at the areas where they are stakeholders. In particular, being an actor of an area where participatory processes have been implemented does not affect their assessment of the capacity of this new model to reduce conflict. Additionally, actors of areas having private property do not perceive co-management significantly different as opposed to the rest.³ However, these results should be taken carefully, given the limited number of areas under consideration in this study. Future research comprising a larger number of protected areas could explore the robustness of this finding.

It is remarkable to observe that the most optimistic group of actors on the capacity of the new model to reduce conflict are non-tourism business operators. This heterogeneous group includes sheep and reindeer owners. These two groups of users have historically had tense relationships with each other that could be (unintentionally) strengthened by the new co-management model. This is because reindeer husbandry is the only commercial activity that has been traditionally invited to sit on the national park board as a follow-up of the ILO Convention 169. Thus, sheep owners are not represented for their activities; neither are small-scale tourism operators or groups with conservation or outdoor interests (Fedreheim 2011; Fedreheim and Sandberg 2011). Groups not represented on the board must use the professional advisory committee as their only arena for influence in the new co-management. But as mentioned in the introduction a pilot implemented in 2016 include local actors in national park boards, thus expanding the extent of participation at the local level, and bringing in these actors that were not included at the time.

6. Concluding remarks

This study addresses the variability on actors' perceptions on the potential for co-management to reduce conflicts in protected areas in Northern Norway. By differentiating four actor groups, we disentangle differences in perceptions relevant for the evaluation of co-management programs.

³ The latest finding could result from the combination of two facts. First, the similarities of the wilderness and remoteness of the areas under consideration in this study, reflecting the reality of conservation in Northern Norway, may determine similar uses and some shared unobservable attributes of actors in the different areas. Second, actors are stakeholders in several areas simultaneously, and their perceptions may be affected by their experiences in multiple areas. Similarly, some actors are area independent and might take into consideration the circumstances in all of the potential sites they could use. As first presented in Table 3, landowners and non-tourism operators are area dependent as opposed to the rest of actors, who have no impediment to move their use to a different area. The two area-dependent actors are significantly more optimistic in the capacity of co-management to alleviate conflict, probably related to their knowledge of the areas. Being familiar with the conservation values of a particular area could enhance the beliefs in one's capacity to manage and make decisions related to the area.

One surprising result of this study is that we do not find evidence supporting that whether respondents had taken part in participatory processes in protected areas affected actors' perceptions on the potential for co-management to reduce conflicts. This questions the relevance of public policies emphasizing local actors' participation in conservation processes as a policy tool to reduce conflicts. However, for policy development, it is important to disentangle between the possibility to participate and actual participation, and both of these options are important to accommodate for. It is possible that having the option to participate is more relevant than the actual participation in local conservation in affecting subjects' perceptions. Future research could disentangle these two effects to inform whether indeed broader participation of local actors is desirable, or if offering the option to participate generates already the desired changes in subjects' perceptions.

An interesting finding in discussing the potential of the recent pilots in governance change is the fact that there is no differences in the perceptions on the potential for co-management to reduce conflicts between landowners and others. Landowners are now represented in the national park boards and have decision-making power, while other interests are represented in an advisory committee without decision-making power. This could lead to conjecture that there might be an improvement in landowners' perceptions on the potential for co-management, and a worsening in others' perceptions in the pilot protected areas. The policy experiment of separating out one actor group to make decisions at the expense of others will be interesting to follow in the future. One important question is whether this policy will contribute to more conflicts between actor groups.

Future research should further address the role of the attributes of protected areas in mediating the perceptions of actors on the capacity of community-based management to alleviate conflict between conservation objectives and the well-being of local communities. Data in this paper include a fairly homogeneous group of areas in ecological terms and relatively close to each other. The attributes of areas that we have controlled for in this study include the previous implementation of participatory processes in an area and the inclusion of private land. Other attributes referring to the ecological characteristics of areas of potential interest according to previous field researchers (Ostrom 2009) are the size of the area, its productivity, the predictability of the system dynamics, and the mobility of the resources. All of these remain to be explored in future research.

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