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Public perceptions of planning objectives for regional level management of wild reindeer in Norway

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We examined community perceptions of preferred objectives for wild reindeer management in Southern Norway as the former population-based model is being replaced with an area-based, multi-level regional management model spanning large mountain regions. Communally oriented objectives are favoured over economic benefits to landowners. Environmental attitudes discriminate on many of the issues and can be useful factors in sorting out levels of support for proposed management actions and compromises in land use decisions. The regional reindeer plans create a new political context for land use management across large mountain areas which will require better cooperation among municipalities.

Keywords: reindeer management; environmental planning; environmental orientation

1. Introduction

1.1. Wild reindeer as a keystone species in new management regimes

Wild mountain reindeer (*Rangifer tarandus tarandus*) is a wildlife species of significant historical, cultural, economic and ecological importance in Norway. Norway is currently home to the last remaining populations in Europe. The increasing national and international focus on management and conservation of wild reindeer (Kofinas *et al.* 2000; Harris *et al.* 2009; Festa-Bianchet *et al.* 2011; Panzacchi *et al.* 2012) currently affects land use and development options in many mountain communities. A recent policy move transforms the former state driven wildlife management regime into a multi-level regional process involving local communities to a much greater extent, and using wild reindeer as an umbrella species in land use management. Until recently, wild reindeer have been managed through a model based on harvest and population management (Strand *et al.* 2012). This has been an expert driven model involving management at multiple levels and a close interaction between wildlife scientists, landowners and municipalities. The management units have been relatively small, focusing on single herds. Essentially this has been an adaptive approach with the prime goal of maintaining harvestable populations at a desired density (Bråta 2003). Historically, large predator populations have been low with little impact on herds, and reindeer population levels have been actively managed through hunting. Consequently, hunters and hunters' interests have traditionally played a major part in management strategies. However, carnivore populations are rebuilding, and this along with climate

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change and other disturbances, including mortality factors, increases the complexity of future management (Vors and Boyce 2009).

The new regional management plans will span much larger mountain regions and require an array of municipalities (the lowest administrative level) to cooperate around mountain conservation and development issues where the key objective is to maintain sustainable wild reindeer populations. The key feature of the new management regime is that it changes from one of mainly wildlife population management without specific spatial management units (Bråtå 2003) to one that is based on geographically defined regions assumed to include sufficient habitat, and thus initial priority to reindeer over other land use interests across large mountain areas (Hongslo and Lundberg 2012). The new governance situation embedding the rural mountain communities in reindeer regions in Norway more or less span the board in terms of challenges. For example, Hongslo and Lundberg (2012) have shown that that the new management plans have been met with heavy resistance from some stakeholders, perceiving reindeer as a tool used to gain control over rural land use by powerful urban interests. Successful management will require increasing public involvement, mapping and untangling conflicts, dealing with social structures and power imbalances in communities, achieving sufficient agreement over a balance between consumptive and non-consumptive management objectives, more concrete valuing of reindeer resources and its socio-cultural importance, and developing effective planning instruments. It also increases the numbers of policy levels. When complexity increases in environmental governance, policy makers tend to seek more scientific advice to find solutions to policy problems, and they increasingly emphasise public participation as a means to enhance the legitimacy of governance (Rauschmayer, Paavola, and Wittmer 2009). Evolving governance systems is also recognition of the fact that many historical policy failures can be attributed to neglecting cross-scale dynamics (Cash *et al.* 2006).

In this paper we present a study of public perceptions of management objectives and the role of wild reindeer in mountain communities in the Rondane region in Southern Norway, where the wild reindeer has played its part in shaping life and culture for millennia. A regional management plan has been in the making over the past five to six years and is now on the verge of being implemented. The plan is intended to ensure viable reindeer populations as well as facilitating sustainable development of mountain areas. Although much is known about the wild reindeer ecology and habitat requirements, implementation of the plan will bring forth discussions and negotiations about carrying capacities and disparate interpretations of the concept of sustainable development.

Reindeer played a fundamental role in the settlement of the Norwegian mountain regions (Aaris-Sørensen, Mühldorff, and Petersen 2007; Røed 2007). Archeological and genetic research suggests that as the Holocene icecap retreated in Scandinavia around 8–10,000 years ago the wild reindeer was a key food source for the people who colonised these areas (Bang-Andersen 2008). The wild reindeer in Scandinavia today represents the last remains of a resource that sustained former human populations for thousands of years, and has subsequently shaped local culture through millennia. Reindeer are well adapted to cold climates and archeological evidence shows that humans and reindeer were fairly ubiquitous throughout Northern Europe around the time of the end of the last ice age. Reindeer in the Southern Norwegian mountain range were historically grouped into two or three large populations including seasonal migrations along traditional movement corridors (Skogland 1986). Currently the large-scale seasonal movement has ceased, and a total of 23 distinct populations of wild reindeer are now found in fragmented habitats in the same area.

Reindeer are subject to many human pressures and disturbances that affect their distribution, population dynamics and general condition (Vistnes and Nellemann 2008; Reimers and Colman 2009). As a migrating species in large herds (up to thousands of animals) it presents a formidable management challenge since it utilises large mountain areas. Impacts to reindeer are usually classified as local, regional and/or functional effects, that is impacts that affect reindeer only in limited locations such as a highway crossing a migration corridor, or across larger areas such as a protected area containing winter as well as summer ranges, or effects on the population ecology and health conditions of a herd (Strand *et al.* 2010). Human activities such as road building, hydroelectric development and second home development often act as barriers to migration corridors between areas that function as winter and summer ranges and calving areas (Berger 2004; Vistnes *et al.* 2004; Berger, Cain, and Berger 2006).

Sustainable management of wild reindeer requires that the management regime can deal with the range of impacts exerted on reindeer, as well as taking into consideration the economic, cultural and social concerns of mountain communities in reindeer areas. After a long history of conflict around wild reindeer management (Nellemann *et al.* 2003) and large fluctuations in the populations due to human disturbance, hunting pressure and occasionally inadequate wildlife inventories, a working group consisting of managers, policy representatives, researchers, landowners and NGOs produced a guide to a more integrated framework for reindeer management (Andersen and Hustad 2004). This document identified the need to increase public awareness and interest in the species, and recommended a stronger focus on land use management, reducing the splitting up of management responsibilities across multiple institutions, management for larger continuous wild reindeer habitats, as well as work to increase non-consumptive benefits such as wildlife experiences in tourism, and market commodities linked to wild reindeer. It also advised elevating the management units from the local to the regional level and defined 10 national reindeer areas. Two of these were later combined into one planning unit. A subsequent parliamentary report (Miljøverndepartementet 2005) stated that the management challenges should be solved by nine regional management plans. The process was initiated in 2007 and was planned to be completed by 2013.

The development of the Rondane plan has been a politically driven process led by a steering council that comprised eight politicians (mostly local mayors) representing the counties and municipalities affected by the plan (an area of approximately 2800 km²). This planning exercise was perceived to be a big step forward in terms of local involvement; however, in reality community interests were mostly ensured through the representation of the relatively small group of politicians. Even though the process lasted for several years, it did not involve regular public meetings or systematic information exchanges with the affected communities. Guided by principles and directions by the steering council, a project group consisting of eight public service members with planning, technical and environmental management skills, have carried out the concrete planning exercise. No scientists participated directly, but the project group utilised multiple existing sources of knowledge on reindeer habitat, agriculture, industry and commerce, recreational interests, and socio-economic factors and trends in the planning area. Potential development strategies were assessed through a scenario process focusing on consequences for wild reindeer, tourism and outdoor recreation, second home development and agriculture. The plan was first appealed by the state (Ministry of Environment) as it was perceived to allow unacceptable amounts of commercial exploitation of reindeer ranges. In mid-2013 the plan was finally approved after major revisions and negotiations between local politicians and state level environmental policy

staff. The next step now waiting is local ratification of an action plan and implementation of the new management regime.

The choice of the planning strategy represents changes in two directions. It is simultaneously a change towards decentralisation and a process of politically driven governance. In the new management model, responsibility is transferred from the state bureaucracy down to regions where politicians from the municipalities are given the task of cooperating in complex wildlife management. The changes in governance structure are also followed by a shift in policy objective. Initially the call for larger-scale management plans (Andersen and Hustad 2004) was motivated by conservation concerns. Government policy later mandated a balance between conservation and utilisation or sustainable use. Following these changes towards decentralised and politicised management that aim for sustainable use of the areas, local communities will be more directly involved in management issues. Consequently, it becomes more important to know how rural communities judge the importance of wild reindeer.

1.2. Public attitudes in co-management regimes

Challenges in Norwegian management of reindeer mirrors an international trend in wildlife management, where former expert driven models with a narrow focus on harvest and population numbers must gradually incorporate wider public interests and participation (Sandström 2012). As co-management models emerge in different forms and with different degrees of devolved power and responsibilities, political agendas and interests are increasingly interwoven with science, and opens up for new sets of problems. Co-management, at least in its ideal form, involves knowledge generation, bridging institutions, social learning, and more adaptive management (Berkes 2009). It also entails combining lay/local knowledge with science and ultimately balancing very different knowledge and value systems. Natural resource and caribou management have demonstrated some success, particularly in areas with indigenous populations (Thomas and Schaefer 1991; Houde 2007). However, working towards politicisation and broader public participation in wildlife management above all means bringing communities' inherent social inequalities, wealth differences and other types of power imbalances into the policy and planning process. Community cohesion and social capital are increasingly seen as critical to achieve the goals of co-management of resources (Cox, Arnold, and Villamayor Tomás 2010). However, the caveat is that community segments may have different incentives and social capital is often built around particular power interest rather than collective action. Utilizing social capital can be an effective strategy for building specific institutions, but may actually constrain public participation (Rydin and Pennington 2000). As Norwegian reindeer management moves from a selected network of experts, managers and landowners to a broader and more open political arena understanding, public perceptions gain more importance.

Attitudes towards management objectives and perceptions of the importance of reindeer are like other resource issues affected by more general and basic beliefs and attitudes towards the environment (Edgell and Novell 1989; Whittaker, Vaske, and Manfredo 2006; Tarrant, Bright, and Cordell 2008; Kaltenborn *et al.* 2012). In multi-faceted issues spanning different policy scales, understanding human responses, attitudes and social processes on different levels becomes important (Cash *et al.* 2006; Sandström 2012). People's general environmental orientation has in many cases been shown to predict variance in attitudes towards specific development cases, resource conflicts or policy issues (e.g. Rauwald and Moore 2002; Liu, Ouyang, and Miao 2010;

Heberlein 2012), although the direct link between environmental orientation and specific environmentally related behaviour is often weak (Kaiser, Wölfling, and Fuhrer 1999; Bamberg 2003). However, we assume that local reactions to new interventions in reindeer management to some extent are affected by and reflect the community residents' broader environmental orientation and opinions about appropriate uses of the environment.

In theoretical terms, environmental orientation is a collective expression of a set of attitudes towards the environment. Environmental attitudes are fairly stable expressions of how people favour or disfavour the environment in general (Milfont and Duckitt 2010; Heberlein 2012). They comprise emotional and cognitive components, hence express how people feel about the environment as well as what they know or think about it. Environmental attitudes are rooted in more fundamental, individual values and are thought to influence attitudes towards specific objects or actions, such as species conservation or development options in natural areas (e.g. Hunter and Rinner 2004; Milfont and Duckitt 2004; de Groot and Steg 2008). In our case, we expect that environmental orientation is related to how local residents rate the importance of potential management objectives, and that the more environmentally oriented (usually labelled on a scale from ecocentric to anthropocentric) people are, the more they will support conservation related objectives rather than material/utilisation type objectives. We examine four research questions:

- How do residents in the Rondane mountain region in Southeastern Norway perceive and rank a series of potential management objectives for regional scale reindeer management?
- What are the perceptions in terms of a series of roles and functions wild reindeer can play in the development of mountain communities in the study area?
- What are the effects of environmental attitudes on the respondents' ranking of management objectives?
- To what extent do hunters perceive preferred management actions and the role of wild reindeer in the development of mountain communities differently from non-hunters?

2. Methods

2.1. Study area

The Rondane region (Figure 1) covers a rugged mountain area and important reindeer habitat surrounded by multiple communities. The planning unit covers two counties and 14 municipalities and a diverse environment with rugged peaks, alpine tundra, mountain forests, marshlands, grazing areas, farmland, small to medium sized communities (up to approximately 5000 residents, all living outside the protected areas) and important recreational sites. The area is considered rich in natural and cultural heritage. The core of the planning unit is Norway's first national park which was designated in 1962. The park covers 963 km² and encompasses mostly remote alpine environments of low productivity, and including wild reindeer habitat outside the park the study area encompasses 1513 km². The park is managed to minimise human impacts, but it is pressured by high levels of recreational use. Areas adjacent to the park are also part of the habitat that is utilised by the reindeer, but these areas are more heavily impacted by human activities and they are also the source of many of the pressures felt inside the park, such as second home and tourism resorts and livestock production (Haukeland, Daugstad, and Vistad 2011). The management of the Rondane reindeer population has been associated with major conflicts,

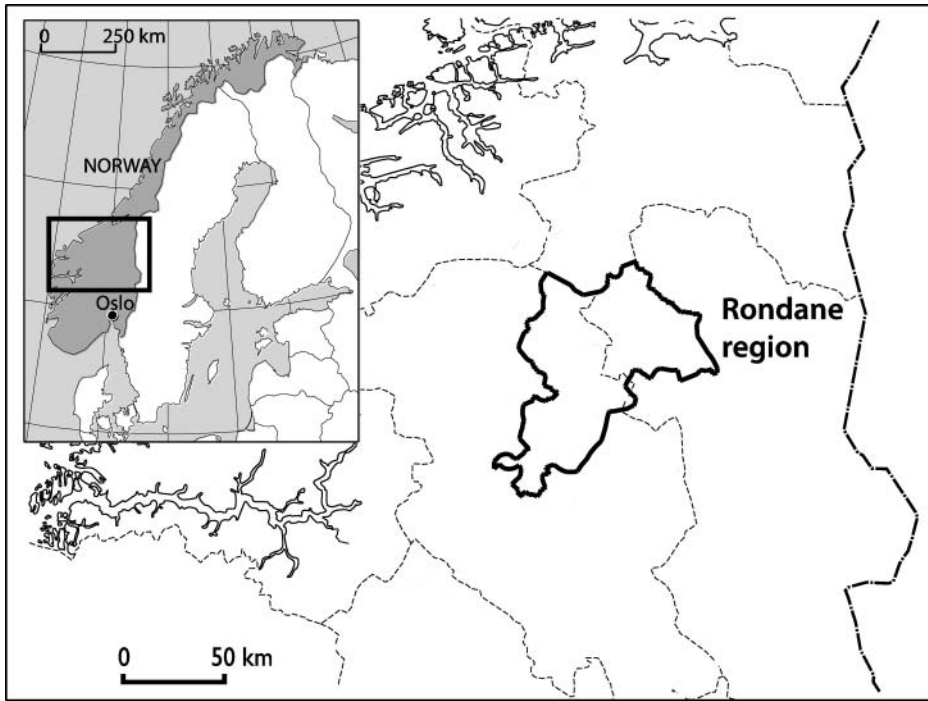


Figure 1. Map of study areas. The Rondane reindeer region.

particularly related to tourism and second home development, road development and road access in the winter season as well as livestock and agricultural activities (Jordhøy 2008a, 2008b).

Protection of the wild reindeer population was the main objective of the national park when it was designated five decades ago. Genetic research shows that the wild reindeer in this area carry very little or no genes from domesticated reindeer, and are generally considered as representing the ‘original’ wild reindeer species that populated the mountains thousands of years ago from the east (Røed 1987, 2007; Røed *et al.* 2008). The population currently numbers around 3400 animals, most of the time divided into a northern (approximately 1100 animals) and a southern herd (approximately 2300 animals), and the northern herd belongs to the study area.

2.2. Sample and data collection

An important objective of this study was to measure attitudes that were representative of the local communities, not only those people with a particular relationship or interest in wild reindeer. Data collection was carried out during the final phases of the planning exercise, but before the respondents had the opportunity to reflect on the outcomes of the plan. In addition, the respondents had no direct part in the planning process other than the ability to voice their opinions to their political constituency. The sample frame was the total number of residents ($n = 18636$) in the five municipalities in the Rondane region, and we defined a required net sample of 500 individuals. Hence, we constructed a weighted sample of 500 respondents (sex and age) that was representative, i.e. had the same socio-demographic distribution, as the population in the study region. Data were

collected using a structured questionnaire and telephone interviews conducted by a data collection agency. The interviewer used a systematic random sampling procedure defined by the sample structure, and performed the interviews until the net sample of 500 respondents was achieved. Two-thirds of the total number of contacts made (67.8%) did not wish to participate in the survey for different reasons (reported, did not have time, not interested, topic of little relevance, no particular reason). Low response rates in surveys have become a trait of social science research over the past decade or so concurrent with the tremendous increase in internet-based surveys which offer a huge potential for experimentation (Lindhjem and Navrud 2011). Online surveys have also become highly attractive to wildlife research as a cost-effective way to measure constituents' positions on a variety of issues. However, they are frequently not representative of the population of interest, may give biased results and potentially invalid conclusions (Duda and Nobile 2010). However, combinations of methods and modes may improve response rates (Dillmann *et al.* 2009). In this case, we considered direct contact via telephone to be the best approach, and an effective response rate of 32.2% is more or less in line with current average response rates on telephone surveys in Scandinavia (Gundersen and Frivold 2008).

The questionnaire covered different topics such as interest in reindeer and wildlife management issues and the role of wild reindeer to the local communities. Questions about management of reindeer, and the role of reindeer in the mountain communities were based both on previous land use and reindeer research in these regions, as well as input from public meetings and interviews with individuals involved with reindeer (managers, hunters, landowners) (e.g. Kofinas *et al.* 2000; Aaris-Sørensen, Mühldorff, and Petersen 2007; Tyler *et al.* 2007).

Environmental orientation was measured using a revised version of the new environmental paradigm (NEP) scale (Dunlap and Van Liere 1978; Dunlap *et al.* 2002; Dunlap 2008). This is a standardised measure of environmental orientation on a more general level that has been used in a large number of contexts (Hawcroft and Milfont 2010). Originally the scale contained two sub-scales: (1) the 'new ecological worldview', implying that humans are part of nature and should use resources wisely and sustainably; and (2) 'the human exemptionalism paradigm', implying that humans rule over the physical world and are exempt from the laws of nature. The original scale contained 15 items. Multiple studies applying this scale over a number of years, as well as reviews have shown that the NEP scale has satisfactory measurement properties, and can predict pro-environmental behaviour (Dunlap *et al.* 2002; Dunlap 2008; Hawcroft and Milfont 2010). Several studies have shown that it is possible to achieve sufficient inter-item reliability and validity with a reduced number of items (Edgell and Nowell 1989; Bjerke, Thrane, and Kleiven 2006; Dunlap 2008; Kaltenborn *et al.* 2012). The revised scale used in this study includes six items measuring both perspectives. In the analysis the pro-human/exemptionalism items are reversed and computed along with the pro-environment items to produce an index that indicates the degree of environmental orientation. A NEP score (degree of environmental orientation) was calculated for each respondent by first recoding the two items that measure pro-human development, so that all six items measure pro-environment views, and then computing an index based on the sum score. The respondents are then divided into three groups of approximately the same size based on a ranking (ntiles) procedure labelled, low, medium, and high ecocentrics (Table 1).

The data were analysed by calculating mean scores for preferred management objectives and perceptions of the role of wild reindeer in local development. Skewness is used as a measure of distribution deviance from means score value. A negative skew indicates that the tail on the left side (lower score values) of the mean score value is

Table 1. Items in the New Environmental Paradigm (NEP) scale and NEP groups.

	Mean	SD	N
The balance in nature is delicate and easily disturbed.	3.94	1.025	495
Humans abuse nature to a degree that is very serious.	3.38	1.167	497
All the talk about the ecological crisis is heavily exaggerated.	2.96	1.202	491
Animals and plants have the same right as humans to live on this Earth.	4.04	1.042	495
The balance in nature is stable enough to tackle the pressure from human society.	2.64	1.050	494
If we continue on the same course as now we will soon experience an ecological catastrophe.	3.23	1.191	493
Mean for scale	3.49		
Low ecocentrism	2.63		138
Medium ecocentrism	3.43		179
High ecocentrism	4.28		168

Notes: Response format: 1: Completely disagree, 2: Disagree, 3: Neither disagree nor agree, 4: Agree, 5: Absolutely agree.

longer or fatter than the right side. The effects of environmental orientation on preferred management objectives and the role of reindeer were analysed by ONEWAY analysis of variance in SPSS version 19.

3. Results

3.1. Perception of management objectives and the role of reindeer in the local community

When asked about potential management objectives for wild reindeer, objectives addressing healthy ecosystem conditions, educational aspects and the species' contribution to local community development are, on average, ranked above providing meat and economic revenue to landowners (Table 2). On these questions we find that the distribution of the responses are skewed towards the positive end of the scale, i.e. a majority of the

Table 2. Potential management objectives (analysis of variance), mean scores, F-statistics, significance level, standard error, skewness of variable distribution and number of respondents (N).

Management objectives	Means	F	Sign.	Std. Error	Skewness	N
Provide maximum yield of game meat	2.83	1.226	0.294	0.052	0.269	483
Provide maximum economic yield to landowners	2.58	3.350	0.036	0.050	0.341	476
Ensure reindeer populations as an experience opportunity for nature based tourism and recreation	3.74	9.387	0.000	0.050	-0.729	484
Contribute to sustainable local communities	3.97	6.816	0.001	0.02	-0.949	483
Ensure resources for hunting in order to maintain harvesting traditions in the local communities	3.87	1.126	0.325	0.050	-0.661	483
Conserve sustainable populations in order to maintain ecosystems and untrammelled nature in the mountains	4.24	39.367	0.000	0.048	-1.371	484
Use the wild reindeer to increase the public's knowledge about nature in general	3.67	30.048	0.000	0.050	-0.600	483

Notes: Response format: 1: Completely disagree, 2: Disagree, 3: Neither disagree nor agree, 4: Agree, 5: Absolutely agree.

sample agree or strongly agree that these are preferred objectives (ecosystems 78.2%, education 58.7%, community 70%). For the statements suggesting optimal meat harvest and economic yield to landowners (highly unevenly distributed in the community), the sample is skewed towards the lower end of the scale, that is a minority agree or strongly agree with these as important objectives (meat 22.4%, economy 22.5%) (Table 2). Collective goods and benefits from wild reindeer are thus perceived as more important than individual gain. The importance of reindeer in maintaining ecosystems and untrammelled nature in the mountains is ranked on top, followed by the role reindeer can play in developing sustainable communities, increasing the public's knowledge about nature, its contribution to sustainable local communities, and as an experience resource for nature based tourism and recreation. Providing maximum economic yield to landowners is seen to be least important of all options (Table 2). The neutral (neither agree nor disagree) segment of the sample for this set of questions range from 15.7–34.4%.

Wild reindeer management can also be a source of conflict and concern (Table 3). When asked about the role of wild reindeer in the mountain communities the statement that receives the highest level of agreement is 'The municipalities need to cooperate better around wild reindeer management', followed by 'Disagreements about wild reindeer management creates conflicts in the local community', 'Wild reindeer

Table 3. The role of reindeer in local development (analysis of variance), mean scores, F-statistics, significance level, standard error, skewness of variable distribution and number of respondents (N).

Management objectives	Means	F	Sign.	Std. Error	Skewness	N
Wild reindeer conservation is more important than second home development and tourism.	3.35	41.661	0.000	0.058	-0.321	484
Management of wild reindeer should be guiding other kinds of development in the mountains.	3.17	52.868	0.000	0.058	-0.252	484
The concerns and needs of the wild reindeer habitat should take precedence over other land uses in mountain areas where reindeer are present.	3.42	45.592	0.000	0.058	-0.416	480
Wild reindeer management overshadows other important land use management tasks.	3.22	1.559	0.211	0.052	-0.084	475
Disagreements about wild reindeer management creates conflicts in the local community.	3.54	1.233	0.292	0.055	-0.453	469
Wild reindeer concerns is a barrier for other important economic development issues locally.	3.11	15.526	0.000	0.060	-0.003	476
The municipalities need to cooperate better around wild reindeer management.	3.93	4.388	0.013	0.048	-0.812	474
Wild reindeer management across large areas will result in less conflict and better coordination of local interests linked to the mountains.	3.49	7.496	0.001	0.051	-0.528	470
Rights and benefits associated with the use of wild reindeer is very unevenly distributed in the local community.	3.04	4.132	0.017	0.054	-0.081	444

Response format: 1: Completely disagree, 2: Disagree, 3: Neither disagree nor agree, 4: Agree, 5: Absolutely agree.

management across large areas will result in less conflict and better coordination of local interests linked to the mountains', and 'Concerns and needs of reindeer should take precedence over other land uses'. The distribution of responses for all of these statements are skewed towards the positive end of the scale, that is a majority agree or strongly agree with these statements (need for cooperation 67.7%, disagreements in community 54.2%, large-scale management 54.3%, concerns of reindeer 52.7%). There was somewhat less agreement about the role reindeer plays relative to commercial development of the mountain regions, and whether or not reindeer interests act as a barrier to economic development. The statements that reindeer interests should take precedence over other land uses, and that wild reindeer conservation is more important than second home tourism receive some support. It elicits mean scores slightly above the neutral part of the scale, and a majority either agree or strongly agree (precedence 52.7%, more important than second homes 47.2). Wild reindeer management is on the average seen to be only marginally overshadowing other land use management tasks. Likewise, there is no clear perception that rights and benefits associated with wild reindeer are very unevenly distributed in the local community (Table 3), as the average score for all statements lies between 'neither disagree nor agree' and 'agree'. The neutral segment (neither agree nor disagree) for this set of questions range from 22.2–41.1%.

3.2. *Hunters and non-hunters*

Approximately one-quarter of the sample (23.3%) were hunters and three-quarters (76.7%) reported that they did not participate in hunting of reindeer. We found significant differences among hunters and non-hunters in perceptions of preferred management objectives for three out of seven types of management objectives. Although neither group are much in favour of providing maximum economic yield to landowners, non-hunters are more supportive than hunters ($F = 4.531$, $\text{Sig.} = 0.034$). Hunters are more in favour than non-hunters of ensuring resources for hunting in order to maintain harvesting traditions in the local communities ($F = 27.934$, $\text{Sig.} < 0.001$), as well as conserving sustainable populations in order to maintain ecosystems and untrammled nature in the mountains ($F = 6.552$, $\text{Sig.} = 0.011$). With regard to the role of reindeer in local development, hunters are more supportive than non-hunters of three out of the nine statements; Wild reindeer conservation is more important than second home development ($F = 10.583$, $\text{Sig.} = 0.001$), 'Management of wild reindeer should be guiding other kinds of development in the mountains' ($F = 8.197$, $\text{Sig.} = 0.004$), and 'The concerns and needs of the reindeer habitat should take precedence over other land uses in mountain areas where reindeer are present' ($F = 7.217$, $\text{Sig.} = 0.007$).

Recreational activity levels can be an indication of involvement with local surroundings and are sometimes thought to correlate with environmental interest and attitudes towards management. We therefore tested for potential effects of activity levels on preferred management actions and perceptions of the role of reindeer by asking how many times the respondent had participated in outdoor recreational activities in the near surroundings during the past year (never, 1–5 times, 6–10 times, 10–20 times, more than 20 times). Overall, activity level was not a good predictor, as it differentiated significantly for only two out of seven management objectives. Lower levels of recreational activity correlated with support for providing maximum yield of game meat ($F = 3.271$, $\text{Sig.} = 0.006$) and providing maximum economic yield to landowners ($F = 3.832$, $\text{Sig.} = 0.002$). Likewise, recreational activity level discriminated for only two out of nine aspects of the role of reindeer in local communities; 'Disagreements about wild reindeer management creates

conflicts in the local community' ($F = 2.893$, $\text{Sig.} = 0.014$), and 'Wild reindeer concerns is a barrier for other important economic development issues locally' ($F = 2.233$, $\text{Sig.} = 0.05$). Here, higher levels of recreational activity were associated with increasing support for the statements.

3.3. *Effects of environmental orientation*

Average measures give a certain impression of how the residents in these mountain communities rate different management objectives and the local importance of wild reindeer. However, a segmentation based on the residents' degree of environmental orientation provides more differentiated information about how the communities view the wild reindeer along dimensions of conservation and development. We find that the degree of environmental orientation discriminates significantly for five of the seven management objectives (Table 2). Degree of environmental orientation does not discriminate for the view of reindeer as a hunting resource or as a source of meat. For items dealing with conserving populations, educational and experiential aspects, and community development, the general pattern is that increasing environmental orientation is associated with increasing support for these objectives. In terms of economic profit for the landowners, increasing environmental orientation is associated with less support for these objectives.

The degree of environmental orientation is also important for the perspective on wild reindeer as an element in the life and development of the mountain communities. Here we find that environmental orientation discriminates for seven out of nine statements (Table 3). Degree of environmental orientation has no significant effect on statements, suggesting that disagreements about reindeer management create local conflicts or that reindeer management overshadows other salient land use issues. Support for conservation related arguments, i.e. that wild reindeer are more important than second home development and tourism, that reindeer management should guide other commercial development, and that reindeer habitat needs should take precedence over other land uses, is associated with increasing environmental orientation. Increasing environmental orientation is also associated with the view that reindeer related benefits are unevenly distributed locally, and that municipalities need to cooperate better. The perception is that management across larger areas will lead to less conflicts and improved coordination among various interests, although the residents with a moderately high environmental orientation agree less than those with a high and low environmental orientation on this particular topic. Increasing environmental orientation is negatively correlated with the view that wild reindeer concerns constitute a barrier to economic development (Table 3).

4. Discussion

The general community view suggests that wild reindeer is a management challenge and a source of conflict, but also that the reindeer populations are valuable, and that reindeer interests should guide economic exploitation of mountain resources. There is a perception that communities and municipalities need to cooperate better around management, but there is also some ambiguity about making real priorities and no clear consensus on whether wild reindeer issues should be prioritised over other economic interests and development issues.

This tension reflects the conflict between policy levels, i.e. between the municipalities in the steering committee for the regional plans and the county governor. This may reflect a typical feature of devolved management systems set up to handle multi-scale society-

environment tasks, namely lack of communication through the process, lack of trust and different interpretations of the goals (Armitage *et al.* 2009; Bergseng and Vatn 2009).

The municipalities are divided on the question of protection or development of reindeer areas. The study did not go into this in any depth, but we suspect that different groups in and outside the communities (farmers, landowners, urban citizens with second homes in the study area, and business entrepreneurs) have different attitudes towards reindeer and planning priorities. However, we did include differences between hunters and non-hunters, since hunting is a key part of local culture in these communities. In some respects, hunters seem to attach more importance to reindeer as a resource for sustainable development than non-hunters, and they are not merely concerned about securing a resource for hunting. This mirrors findings in a recent study of large and small game hunters which showed that Norwegian hunters see themselves as important stewards of wildlife (Kaltenborn, Andersen, and Linnell 2013). Hunters as a group share important social capital. Traditionally, they have had a significant influence on the management regime, and the new governance model needs to recognise their knowledge and socio-cultural importance in the communities.

Overall, collectively oriented management objectives such as using wild reindeer for educational purposes, and maintaining mountain ecosystems and sustainable local communities, are more likely to receive community support than management strategies aimed at enhancing economic benefits to landowners, e.g. those individuals who possess hunting rights, for example, through larger harvest quotas or higher prizes on permits. Although reindeer interests appear to have relatively strong support in these communities, the degree of environmental orientation varies as it does in any community and policy situation; favouring wildlife over alternative land uses will always create some tension. The positive attitudes towards diverse and partly non-consumptive uses of reindeer in supporting local livelihoods, maintaining local traditions, increasing environmental awareness and supporting tourism, show that the species can play an important role in land use planning. On the other hand, it is far from certain that reindeer management can actually strengthen community cohesion. Approximately half of the community residents had positive views of the aspects of management examined here, the other half less so. For the time being, the market for wildlife based tourism is either limited and/or underdeveloped, and expectations might be more idealistic than realistic in terms of revenue. Community cohesion is usually linked to social capital (Pretty 2003; Pretty and Smith 2004), and while the latter was not the subject of this study, the history of former management, the distribution of land and hunting rights, as well as the variability in the general public's interest in wildlife management, suggests that networks and social capital associated with reindeer do not include a cross-section of the communities. One implication is the need to put more emphasis on education and raising the awareness of potential benefits from reindeer conservation locally. As future management increasingly will be shaped by elected politicians, there will be a great need for capacity building with inputs from scientists and environmental professionals.

Furthermore, the new plans emphasise reindeer conservation balanced against sustainable development, the latter being a term most can agree to, but one that conceals multiple interpretations. As research has shown, more collaborative forms of governance require a considerable amount of negotiations and discussions to reach shared understandings of goals, strategies and responsibilities, and often lead to increased conflicts in decision making (Reed *et al.* 2009; Crona and Parker 2012; Davies and White 2012). In the Rondane region there is a long way to go for reaching agreement on acceptable levels of second home development, tourism and trail development, logging,

grazing of livestock, road development and winter access, as well as off-road motorised access.

This study represents a snapshot of public perceptions of reindeer and potential management objectives during the final stages of shaping the plan before implementation. Insights on public perceptions and attitudes can be valuable in different stages of the planning processes. First, land use planning with a wildlife conservation focus across large areas will in most cases require a stakeholder analysis and identification of key issues to be negotiated and resolved. Processes like these tend to be consensus oriented in the sense that it is an overarching goal to achieve compromises that all interest groups can live with over time. In a start-up phase, a deeper understanding of socio-cultural aspects such as attachment to place, meanings attributed to the landscape and its resources, knowledge about the ecology of the area, how traditions have influenced today's use of the landscape, attitudes towards management options and to what extent stakeholders trust those in power, can be vital for getting the planning process on track. In a development phase, a good understanding of public perceptions and attitudes can be particularly important for evaluating priorities in action plans where concrete trade-offs are made. In the implementation phase, there will always be a need for active communication with stakeholders. Some stakeholders will inevitably be less satisfied than others with the outcomes and priorities of the plan, and a baseline understanding of public attitudes can greatly help to understand underlying reasons for disagreements and point to ways for reconciling differences and find ways to increase the sense of involvement and ownership.

The findings in this study emphasise the need to understand social groups and differential preferences in order to maintain local motivation for the enduring efforts required in collaborative decision making. New ideas spread rapidly where there is high social capital (Pretty and Smith 2004; Bodin and Crona 2009) and research can help define the social dynamics that drive the support for and opposition against new governance forms. This is particularly relevant in this multi-level policy process where the state level sees the plan as a final blueprint for management, while the local and regional level institutions see the plan as a basis for negotiating appropriate use and limits of acceptable change (Hongslo and Lundberg 2012). This discrepancy indicates that the planning authorities seriously underestimate the task of the new governance model and the realities of more collaborative and adaptive management. Unless effective stakeholder forums are established, policy at different institutional levels will not be bridged, and local interests will lose motivation over time.

While expectations have been high from conservationists as well as developers, it is questionable whether or not the new governance system has involved stakeholders constructively. The study indicates the need for improved coordination in land use planning among municipalities, but a more adaptive and collaborate governance model needs quality stakeholder involvement that uses scientific information, has real influence on decisions, treats affected residents fairly, and promotes communication and learning (Chase, Decker, and Lauber 2004). In this case, public participation has been limited to a small group of local politicians, no scientists have been actively involved, the scientific information has been selected by and used at the discretion of managers and agency staff, and there have been no regular feedback or communication channels to the public in terms of public meetings, newsletters or through other channels before the draft plan was finished.

Rural Norway is, like many parts of rural Europe, transforming into amenity destinations for urban populations where agriculture and traditional industries decline and local communities struggle to maintain sustainable economies (Daugstad,

Rønningen, and Skar 2006; Perlik 2006; Hammer 2008). Although certain land use traditions have been sustained, the communities are challenged in maintaining public services and finding new sources of revenue linked to natural resources management. Hydropower development and second home and resort development provide modern sources of income for rural municipalities, but increasingly conflict with an expansion in protected areas, as well as reindeer interests (Kaltenborn, Andersen, and Nellemann 2007; Nellemann *et al.* 2010). Nature-based tourism also struggles in a high-cost environment and competitive market and is gradually exploring how to use wild reindeer in their marketing and product development in ways that are compatible with conservation. However, as yet there is little evidence that the species is a significant attraction for nature-based tourism.

Prior to the recent policy move, reindeer population management, including the main objective of utilising reindeer for harvest, caused minimal conflict and was not seen to threaten rural values or lifestyles to any significant extent (Bråtå 2003). However, this is already changing as reindeer is being used as an umbrella species for broader conservation objectives. History shows that when centralisation and urbanisation tap rural regions of economic, social and cultural diversity, symbols or elements of nature often play a part in the resulting discourses and policy debates. In Norway this has been particularly prominent in terms of large carnivore re-establishment and conservation, protected area governance and second home development, where attempts to set the rules by state institutions are frequently seen as an infringement on rural rights (Skogen 2003; Kaltenborn *et al.* 2008; Skogen and Thrane 2008; Blekesaune and Rønningen 2010). The changing role of reindeer may well play a more controversial and prominent role in this dynamic, since the species is assigned a broader conservation role and defines a more complex policy situation, linking international conservation interests and pressures with local level management.

5. Conclusions

The last remaining populations of wild mountain reindeer in Europe are vulnerable to the rapid expansion of road building, second homes, tourism resorts and agricultural activities (Nellemann *et al.* 2010; Panzacchi *et al.* 2012). There is national and international recognition that this situation requires new conservation measures and policies (Nellemann *et al.* 2003; Forbes and Kumpula 2009).

The new institutional context of multi-level governance, partly decentralised management, and increased public participation poses new management challenges and requires public awareness locally as well as constructive cooperation across regions. The partly decentralised model of natural resources management in Norway hinges on broad public support to maintain legitimacy (Falleth and Hovik 2009). This will also apply to the regional plans for reindeer management. The new management regime acknowledges that the ecological requirements transcend smaller administrative units such as municipalities. However, sufficient public support for the plans will also require that the management regime is socially, economically and culturally sustainable. Since regional level management plans will be superimposed on the existing municipality level planning regime, the lack of legally binding mechanisms between the two planning scales creates uncertainties about the powers of the higher level plans. In order to avoid stalemating, finding ways of involving rural communities more actively in the planning processes will be crucial.

When reindeer management moves from population-level management to spatial planning, power is transferred from the scientific bureaucracy to politicians at regional and local levels. Efforts aimed at raising awareness and knowledge among elected officials of reindeer ecology and public attitudes towards wildlife will be crucial. As reindeer management advances on the local political agenda, the opinions of local residents will carry more weight, and it becomes important to identify social networks and monitor patterns and changes in public perceptions through research. The environmental attitudes of segments of community residents varies considerably and this also affects the attitudes towards wild reindeer management and what is perceived as legitimate use of this resource.

Wildlife conservation is increasingly challenged to produce research-based knowledge about the ecology, range requirements and social values of reindeer to support their concerns about the societal importance and vulnerability of the species (Salafsky *et al.* 2002; Thirgood and Redpath 2008). It is predictable that reindeer conservation interests will also be expected to produce increasingly detailed and localised scientific evidence to document their concerns as the scope of planning for wildlife management and conservation expands.

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