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1 PUBLIC perceptions of planning objectives for regional level management of
2 wild reindeer in Norway

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26 ABSTRACT

27

28 We examined community perceptions of preferred objectives for wild reindeer management
29 in Southern Norway as the former population-based model is being replaced with an area-
30 based, multi-level regional management model spanning large mountain regions.

31 Communally oriented objectives are favored over economic benefits to land owners.

32 Environmental attitudes discriminate on many of the issues and can be useful factor in sorting
33 out levels of support for proposed management actions and compromises in land use

34 decisions. The regional reindeer plans create a new political context for land use management
35 across large mountain areas which will require better cooperation among municipalities.

36

37 INTRODUCTION

38 *1.1 Wild reindeer as a keystone species in new management regimes*

39 Wild mountain reindeer (*Rangifer tarandus tarandus*) is a wildlife species of
40 significant historical, cultural, economic and ecological importance in Norway. Norway is
41 currently home to the last remaining populations in Europe. The increasing national and
42 international focus on management and conservation of wild reindeer (Festa-Bianchet 2011;
43 Harris, Thirgood, Hopcraft, Cromsight and Berger. 2009; Kofinas, Osherenko, Klein and
44 Forbes 2000; Panzacchi, Van Moorter, Jordhøy and Strand 2012) currently affects land use
45 and development options in many mountain communities. A recent policy move transforms
46 the former state driven wildlife management regime into a multi-level regional process
47 involving local communities to a much greater extent, and using wild reindeer as an umbrella
48 species in land use management. Until recently, wild reindeer have been managed through a
49 model based on harvest and population management (Strand, Nilsen, Solberg and Linnell
50 2012). This has been an expert driven model involving management at multiple levels and a
51 close interaction between wildlife scientists, land owners and municipalities. The
52 management units have been relatively small and focusing single herds. Essentially this has
53 been an adaptive approach with the prime goal of maintaining harvestable populations at a
54 desired density (Bråtå 2003). Historically, large predator populations have been low with little
55 impact on herds, and reindeer population levels have been actively managed through hunting.
56 Consequently hunters and hunters' interests have traditionally played a major part in
57 management strategies. However, carnivore populations are rebuilding, and this along with
58 climate change and other disturbance- and mortality factors increases the complexity of future
59 management (Vors and Boyce 2009).

60 The new regional management plans will span much larger mountain regions and
61 require an array of municipalities (the lowest administrative level) to cooperate around
62 mountain conservation and development issues where the key objective is to maintain
63 sustainable wild reindeer populations. The key feature of the new management regime is that
64 it changes from one of mainly wildlife population management without specific spatial
65 management units (Bråtå 2003) to one that is based on geographically defined regions
66 assumed to include sufficient habitat, and thus initial priority to reindeer over other land use
67 interests across large mountain areas (Hongslo and Lundberg 2012). The new governance
68 situation embedding the rural mountain communities in reindeer regions in Norway more or
69 less span the board in terms of challenges. For example, Hongslo and Lundberg (2012) show
70 that that the new management plans are met with heavy resistance from some stakeholders
71 perceiving reindeer as a tool used to gain control over rural land use by powerful urban
72 interests. Successful management will require increasing public involvement, mapping and
73 untangling conflicts, dealing with social structures and power imbalances in communities,
74 achieving sufficient agreement over a balance between consumptive and non-consumptive
75 management objectives, more concrete valuing of reindeer resources and its socio-cultural
76 importance, and developing effective planning instruments. It also increases the numbers of
77 policy levels. When complexity increases in environmental governance, policy makers tend to
78 seek for more scientific advice to find solutions to policy problems, and they increasingly
79 emphasize public participation as a means to enhance the legitimacy of governance
80 (Rauschmayer, Paavola and Wittmer, 2009). Evolving governance systems is also a
81 recognition of the fact that many historical policy failures can be attributed to neglecting
82 cross-scale dynamics (Cash, Adger, Berkes, Garden, Lebel, Olsson, Pritchard and Young
83 2006).

84 In this paper we present a study of public perceptions of management objectives and
85 the role of wild reindeer in mountain communities in the Rondane region in Southern
86 Norway, where the wild reindeer has played its part in shaping life and culture for millennia.
87 A regional management plan has been in the making over the past 5-6 years and is now on the
88 verge of being implemented. The plan is intended to ensure viable reindeer populations as
89 well as facilitating sustainable development of mountain areas. Although much is known
90 about the wild reindeer ecology and habitat requirements, implementation of the plan will
91 bring forth discussions and negotiations about carrying capacities and disparate interpretations
92 of the concept of sustainable development.

93 Reindeer played a fundamental role in the settlement of the Norwegian mountain
94 regions (Aaris-Sørensen, Mühldorff and Petersen 2007; Røed 2007). Archeological and
95 genetic research suggests that as the Holocene icecap retreated in Scandinavia around 8 –
96 10 000 years ago the wild reindeer was a key food source for the people who colonized these
97 areas (Bang-Andersen 2008). The wild reindeer in Scandinavia of today represents the last
98 remains of a resource that sustained former human populations for thousands of years, and
99 subsequently has shaped local culture through millennia. Reindeer are well adapted to cold
100 climates and archeological evidence shows that humans and reindeer were fairly ubiquitous
101 throughout Northern Europe around the time of the end of the last ice age. Reindeer in
102 Southern Norwegian mountain range were historically grouped into two or three large
103 populations including seasonal migrations along traditional movement corridors (Skogland
104 1986). Currently the large scale seasonal movement has ceased, and altogether 23 distinct
105 populations of wild reindeer are now found in fragmented habitats in the same area.

106 Reindeer are subject to many human pressures and disturbances that affect their
107 distribution, population dynamics and general condition (Reimers and Colman 2009; Vistnes
108 and Nellemann 2008). As a migrating species in large herds (up to thousands of animals) it

109 presents a formidable management challenge since it utilizes large mountain areas. Impacts to
110 reindeer are usually classified as local-, regional, and/or functional effects, that is impacts that
111 affect reindeer only in limited locations like a highway crossing a migration corridor, or
112 across larger areas such as a protected area containing winter as well as summer ranges, or
113 effects on the population ecology and health conditions of a herd (Strand, Gundersen,
114 Panzacchi, Andersen, Falldorf, Andersen, Van Moorter, Jordhøy and Fangel 2010). Human
115 activities like road building, hydroelectric development, and second home development often
116 act as barriers to migration corridors between areas that function as winter and summer ranges
117 and calving areas (Berger 2004, Berger, Cain and Berger 2006; Vistnes et al. 2004).

118 Sustainable management of wild reindeer requires that the management regime can
119 deal with the range of impacts exerted on reindeer, as well as taking into consideration the
120 economic, cultural and social concerns of mountain communities in reindeer areas. After a
121 long history of conflict around wild reindeer management (Nellemann, Vistnes, Jordhøy,
122 Strand and Newton 2003) and large fluctuations in the populations due to human disturbance,
123 hunting pressure and occasionally inadequate wildlife inventories, a working group consisting
124 of managers, policy representatives, researchers, land owners and NGOs produced a guide to
125 a more integrated framework for reindeer management (Andersen and Hustad 2004). This
126 document identified the need to increase public awareness and interest in the species, and
127 recommended; a stronger focus on land use management, reduce the splitting up of
128 management responsibilities across multiple institutions, manage for larger continuous wild
129 reindeer habitats, as well as work to increase non-consumptive benefits like wildlife
130 experiences in tourism, and market commodities linked to wild reindeer. It also advised
131 elevating the management units from the local to the regional level and defined ten national
132 reindeer areas. Two of these were later combined into one planning unit. A subsequent
133 parliamentary report (Ministry of Environment 2005) stated that the management challenges

134 should be solved by nine regional management plans. The process was initiated in 2007 and
135 should be completed by 2013.

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

156 The choice of the planning strategy represents changes in two directions. It is
157 simultaneously a change towards decentralization and a process of politically driven
158 governance. In the new management model, responsibility is transferred from the state

159 bureaucracy down to regions where politicians from the municipalities are given the task of
160 cooperating in complex wildlife management. The changes in governance structure are also
161 followed by a shift in policy objective. Initially the call for larger scale management plans
162 (Andersen and Hustad 2004) was motivated by conservation concerns. Government policy
163 later mandated a balance between conservation and utilization or sustainable use. Following
164 these changes towards a decentralized and politicized management that aim for sustainable
165 use of the areas, local communities will be more directly involved in management issues.
166 Consequently it becomes more important to know how rural communities judge the
167 importance of wild reindeer.

168 *1.2 Public attitudes in co-management regimes*

169 Challenges in Norwegian management of reindeer mirrors an international trend in wildlife
170 management, where former expert driven models with a narrow focus on harvest and
171 population numbers gradually must incorporate wider public interests and participation
172 (Sandström 2012). As co-management models emerge in different forms and with different
173 degrees of devolved power and responsibilities, political agendas and interests are
174 increasingly interwoven with science, and opens up for new sets of problems. Co-
175 management, at least in its ideal form, involves knowledge generation, bridging institutions,
176 social learning, and more adaptive management (Berkes 2009). It also entails combining
177 lay/local knowledge with science and ultimately balancing very different knowledge- and
178 value systems. Natural resource and caribou management have demonstrated some success
179 particularly in areas with indigenous populations (Houde 2007; Thomas and Schaefer 1991).
180 However, working towards politicization and broader public participation in wildlife
181 management above all means bringing communities' inherent social inequalities, wealth
182 differences, and other types of power imbalances into the policy and planning process.
183 Community cohesion and social capital are increasingly seen as critical to achieve the goals of

184 co-management of resources (Cox, Arnold, and Villamayor Tomás 2010). However, the
185 caveat is that community fractions may have different incentives and social capital is often
186 built around particular power interest rather than collective action. Utilizing social capital can
187 be an effective strategy for building specific institutions, but may actually constrain public
188 participation (Rydin and Pennington 2000). As Norwegian reindeer management moves from
189 a selected network of experts, managers and landowners to a broader and more open political
190 arena understanding public perceptions gain more importance.

191 Attitudes towards management objectives and perceptions of the importance of
192 reindeer are like other resource issues affected by more general and basic beliefs and attitudes
193 toward the environment (Kaltenborn, Andersen, Vittersø and Bjerke 2012, Tarrant, Bright and
194 Cordell 2008, Whittaker, Vaske, and Manfredo 2006; Edgell and Novell 1989). In multi-
195 faceted issues spanning different policy scales, understanding human responses, attitudes and
196 social processes on different levels becomes important (Cash, Adger, Berkes, Garden, Lebel,
197 Olsson, Pritchard and Youn2006; Sandström 2012). People's general environmental
198 orientation has in many cases been shown to predict variance in attitudes towards specific
199 development cases, resource conflicts or policy issues (e.g. Heberlein 2012; Liu, Ouyang, and
200 Miao 2010, Rauwald and Moore 2002), although the direct link between environmental
201 orientation and specific environmentally related behavior is often weak (Bamberg 2003;
202 Kaiser, Wölfling and Fuhrer 1999). However, we assume that local reactions to new
203 interventions in reindeer management to some extent are affected by and reflect the
204 community residents' broader environmental orientation and opinions about appropriate uses
205 of the environment.

206 In theoretical terms, environmental orientation is a collective expression of a set of
207 attitudes toward the environment. Environmental attitudes are fairly stable expressions of how
208 people favor or disfavor the environment in general (Heberlein 2012; Milfont and Duckitt

209 2010). They comprise emotional and cognitive components, hence express how people feel
210 about the environment as well as what they know or think about it. Environmental attitudes
211 are rooted in more fundamental, individual values and are thought to influence attitudes
212 toward specific objects or actions, like species conservation or development options in natural
213 areas (e.g. de Groot and Steg 2008; Hunter and Rinner 2004; Milfont and Duckitt 2004). In
214 our case, we expect that environmental orientation is related to how local residents rate the
215 importance of potential management objectives, and that the more environmentally oriented
216 (usually labeled on a scale from ecocentric to anthropocentric) people are, the more they will
217 support conservation related objectives rather than material/utilization type objectives. We
218 examine four research questions:

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

228 2. METHODS

229 2.1 Study area

230 The Rondane region (Figure 1) covers a rugged mountain area and important reindeer
231 habitat surrounded by multiple communities. The planning unit covers two counties and
232 fourteen municipalities and a diverse environment with rugged peaks, alpine tundra, mountain

233 forests, marshlands, grazing areas, farmland, small to medium sized communities (up to
234 approx. 5000 residents, all living outside the protected areas) and important recreational sites.
235 The area is considered rich in natural and cultural heritage. The core of the planning unit is
236 Norway's first national park which was designated in 1962. The park covers 963 km² and
237 encompasses mostly remote alpine environments of low productivity, and including wild
238 reindeer habitat outside the park the study area encompasses 1513 km². The park is managed
239 to minimize human impacts, but it is pressured by high levels of recreational use. Areas
240 adjacent to the park are also part of the habitat that is utilized by the reindeer, but these areas
241 are more heavily impacted by human activities and they are also the source of many of the
242 pressures felt inside the park such as second home and tourism resorts and livestock
243 production (Haukeland, Daugstad, and Vistad 2011). The management of Rondane reindeer
244 population has been associated with major conflicts, particularly related to tourism and
245 second home development, road development and road access in the winter season as well as
246 livestock and agricultural activities (Jordhøy 2008 a, b).

247 Protection of the wild reindeer population was the main objective of the national park
248 when it was designated five decades ago. Genetic research shows that the wild reindeer in this
249 area carries very little or no genes from domesticated reindeer, and is generally considered to
250 represent the 'original' wild reindeer species that populated the mountains thousands of years
251 ago from the east (Røed 2007; 1987; Røed, Flagstad, Nieminen, Holand, Dwyer, Røv and
252 Vilá 2008). The population currently numbers around 3400 animals, most of the time divided
253 into a northern (approx. 1100 animals) and a southern herd (approx. 2300 animals), and the
254 northern herd belongs to the study area.

255 *2.3 Sample and data collection*

256 An important objective of this study was to measure attitudes that were representative
257 of the local communities, not only those people with a particular relationship or interest in
258 wild reindeer. Data collection was carried out during the final phases of the planning exercise,
259 but before the respondents had the opportunity to reflect on the outcomes of the plan. Nor
260 have the respondents had any direct part in the planning process other than the ability to voice
261 their opinions to their political constituency. The sample frame was the total number of
262 residents (N = 18636) in the five municipalities in the Rondane region, and we defined a
263 required net sample of 500 individuals. Hence, we constructed a weighted sample of 500
264 respondents (sex and age) that was representative, i.e. had the same socio-demographic
265 distribution, as the population in the study region. Data was collected using a structured
266 questionnaire and telephone interviews conducted by a data collection agency. The
267 interviewer used a systematic random sampling procedure defined by the sample structure,
268 and performed the interviews until the net sample of 500 respondents was achieved. Two-
269 thirds of the total number of contacts made (67.8%) did not wish to participate in the survey
270 for different reasons (reported, did not have time, not interested, topic of little relevance, no
271 particular reason). Low response rates in surveys have become a trait of social science
272 research over the past decade or so concurrent with the tremendous increase in internet-based
273 surveys which offers a huge potential for experimentation (Lindhjem and Navrud 2011).
274 Online surveys have become highly attractive also to wildlife research as a cost effective way
275 to measure constituents' positions on a variety of issues. However, they are frequently not
276 representative of the population of interest, may give biased results and potentially invalid
277 conclusions (Duda and Nobile 2010). However, combinations of methods and modes may
278 improve response rates (Dillmann, Phelps, Tortora, Swift, Kohrell, Berck and Messer 2009).
279 In this case we considered direct contact via telephone to be the best approach, and an

280 effective response rate of 32.2% is more or less in line with current average response rates on
281 telephone surveys in Scandinavia (Gundersen and Frivold 2008).

282 The questionnaire covered different topics such as interest in reindeer and wildlife
283 management issues and the role of wild reindeer to the local communities. Questions about
284 management of reindeer, and the role of reindeer in the mountain communities were based
285 both on previous land use- and reindeer research in these regions as well as input from public
286 meetings and interviews with individuals involved with reindeer (managers, hunters,
287 landowners) (e.g. Aaris-Sørensen, Mühldorff and Petersen 2007; Kofinas, Osherenko, Klein
288 and Forbes 2000; Tyler, Turi, Sundset, Strøm Bull, Sara, Reinert, Oskal et al. 2007).

289 Environmental orientation was measured using a revised version of the new
290 environmental paradigm (NEP) scale (Dunlap 2008; Dunlap, Van Liere, Mertig and Jones
291 2002; Dunlap and Van Liere 1978). This is a standardized measure of environmental
292 orientation on a more general level that has been used in a large number of contexts
293 (Hawcroft and Milfont 2010). Originally the scale contained two sub-scales (1), the ‘new
294 ecological worldview’, implying that humans are part of nature and should use resources
295 wisely and sustainably, and (2), ‘the human exemptionalism paradigm’, implying that humans
296 rule over the physical world and are exempt from the laws of nature. The original scale
297 contained 15 items. Multiple studies applying this scale over a number of years, as well as
298 reviews have shown that the NEP scale has satisfactory measurement properties, and can
299 predict pro-environmental behavior (Dunlap 2008; Dunlap Van Liere, Mertig and Jones 2002;
300 Hawcroft and Milfont 2010). Several studies have shown that it is possible to achieve
301 sufficient inter-item reliability and validity with a reduced number of items (Bjerke, Thrane
302 and Kleiven 2006; Dunlap 2008; Edgell and Nowell 1989; Kaltenborn, Andersen, Vittersø
303 and Bjerke 2012). The revised scale used in this study includes six items measuring both
304 perspectives. In the analysis the pro-human/exemptionalism items are reversed and computed

305 along with the pro-environment items to produce an index that indicates the degree of
306 environmental orientation. A NEP score (degree of environmental orientation) was calculated
307 for each respondent by first recoding the two items that measure pro-human development, so
308 that all six items measure pro-environment views, and then computing an index based on the
309 sum score. The respondents are then divided into three groups of approximately the same size
310 based on a ranking (ntiles) procedure labeled, low-, medium-, and high ecocentrics (Table 1).

311 The data was analyzed by calculating mean scores for preferred management
312 objectives and perceptions of the role of wild reindeer in local development. Skewness is used
313 as a measure of distribution deviance from means score value. A negative skew indicates that
314 the tail on the left side (lower score values) of the mean score value is longer or fatter than the
315 right side. The effects of environmental orientation on preferred management objectives and
316 the role of reindeer were analyzed by ONEWAY analysis of variance in SPSS version 19.

317

318 3. RESULTS

319 *3.1. Perception of management objectives and the role of reindeer in the local community*

320 When asked about potential management objectives for wild reindeer, objectives
321 addressing healthy ecosystem conditions, educational aspects and the species' contribution to
322 local community development are on the average ranked above providing meat and economic
323 revenue to land owners (Table 2). On these questions we find that the distribution of the
324 responses are skewed towards the positive end of the scale, i.e. a majority of the sample agree
325 or strongly agree that these are preferred objectives (ecosystems, 78.2 %, education, 58.7%,
326 community, 70%). For the statements suggesting optimal meat harvest and economic yield to
327 landowners (highly unevenly distributed in the community), the sample is skewed towards the
328 lower end of the scale, that is a minority agree or strongly agree with these as important

329 objectives (meat, 22.4%, economy, 22.5%) (Table 2). Collective goods and benefits from wild
330 reindeer are thus perceived as more important than individual gain. The importance of
331 reindeer in maintaining ecosystems and untrammled nature in the mountains is ranked on
332 top, followed by the role reindeer can play in developing sustainable communities, increasing
333 the public's knowledge about nature, its contribution to sustainable local communities, and as
334 an experience resource for nature based tourism and recreation. Providing maximum
335 economic yield to land owners is seen to be least important of all options (Table 2). The
336 neutral (neither agree nor disagree) segment of the sample for this set of questions range from
337 15.7 – 34.4%.

338 Wild reindeer management can also be a source of conflict and concern (Table 3). When
339 asked about the role of wild reindeer in the mountain communities the statement that receives
340 the highest level of agreement is 'The municipalities need to cooperate better around wild
341 reindeer management', followed by 'Disagreements about wild reindeer management creates
342 conflicts in the local community', 'Wild reindeer management across large areas will result in
343 less conflict and better coordination of local interests linked to the mountains', and 'Concerns
344 and needs of reindeer should take precedence over other land uses'. The distribution of
345 responses for all of these statements are skewed towards the positive end of the scale, that is a
346 majority agree or strongly agree with these statements (need for cooperation, 67.7%,
347 disagreements in community, 54.2%, large scale management, 54.3%, concerns of reindeer,
348 52.7%). There was somewhat less agreement about the role reindeer plays relative to
349 commercial development of the mountain regions, and whether or not reindeer interests act as
350 a barrier to economic development. The statements that reindeer interests should take
351 precedence over other land uses, and that wild reindeer conservation is more important than
352 second home tourism receive some support. It elicits mean scores slightly above the neutral
353 part of the scale, and a majority either agrees or strongly agrees (precedence, 52.7%, more

354 important than second homes, 47.2). Wild reindeer management is on the average seen to be
355 only marginally overshadowing other land use management tasks. Likewise, there is no clear
356 perception that rights and benefits associated with wild reindeer are very unevenly distributed
357 in the local community (Table 3), as the average score for all statements lie between ‘neither
358 disagree nor agree’ and ‘agree’. The neutral segment (neither agree nor disagree) for this set
359 of questions range from 22.2 – 41.1%.

360 *3.2 Hunters and non-hunters*

361 Approximately one – fourth of the sample (23.3%) was hunters and three fourths
362 (76.7%) reported that they did not participate in hunting of reindeer. We found significant
363 differences among hunters and non-hunters in perceptions of preferred management
364 objectives for three out of seven types of management objectives. Although neither groups are
365 not much in favor of providing maximum economic yield to land owners, non-hunters are
366 more supportive than hunters ($F=4.531$, $Sig.=0.034$). Hunters are more in favor than non-
367 hunters of ensuring resources for hunting in order to maintain harvesting traditions in the local
368 communities ($F=27.934$, $Sig.<0.001$), as well as conserving sustainable populations in order
369 to maintain ecosystems and untrammled nature in the mountains ($F=6.552$, $Sig.=0.011$).
370 When it comes to the role of reindeer in local development, hunters are more supportive than
371 non-hunters of three out of the nine statements; Wild reindeer conservation is more important
372 than second home development’ ($F=10.583$, $Sig.=0.001$), ‘Management of wild reindeer
373 should be guiding other kinds of development in the mountains’ ($F=8.197$, $Sig. = 0.004$), and
374 ‘The concerns and needs of the reindeer habitat should take precedence over other land uses
375 in mountain areas where reindeer are present’ ($F=7.217$, $Sig.=0.007$).

376 Recreational activity levels can be an indication of involvement with local
377 surroundings and are sometimes thought to correlate with environmental interest and attitudes

378 towards management. We hence tested for potential effects of activity levels on preferred
379 management actions and perceptions of the role of reindeer by asking how many times the
380 respondent had participated in outdoor recreational activities in the near surroundings during
381 the past year (never, 1-5 times, 6-10 times, 10-20 times, more than 20 times). Overall, activity
382 level was not a good predictor, as it differentiated significantly for only two out of seven
383 management objectives. Lower levels of recreational activity correlated with support for
384 providing maximum yield of game meat ($F=3.271$, $Sig.= 0.006$) and providing maximum
385 economic yield to land owners ($F=3.832$, $Sig.=0.002$). Likewise recreational activity level
386 discriminated for only two out of nine aspects of the role of reindeer in local communities;
387 ‘Disagreements about wild reindeer management creates conflicts in the local community’
388 ($F=2.893$, $Sig.= 0.014$), and ‘Wild reindeer concerns is a barrierer for other important
389 economic development issues locally’ ($F=2.233$, $Sig.=0.05$). Here, higher levels of
390 recreational activity were associated with increasing support for the statements.

391 *3.2 Effects of environmental orientation*

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

402 objectives. In terms of economic profit for the land owners, increasing environmental
403 orientation is associated with less of support for these objectives.

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

421 4. DISCUSSION

422 The general community view suggests that wild reindeer is a management challenge
423 and a source of conflict, but also that the reindeer populations are valuable, and that reindeer
424 interests should guide economic exploitation of mountain resources. There is a perception that
425 communities and municipalities need to cooperate better around management, but there is

426 also some ambiguity about making real priorities and no clear consensus on whether wild
427 reindeer issues should be prioritized over other economic interests and development issues.

428 This tension reflects the conflict between policy levels, i.e. between the municipalities
429 in the steering committee for the regional plans and the county governor. This may reflect a
430 typical feature of devolved management systems set up to handle multi-scale society-
431 environment tasks; namely lack of communication through the process, lack of trust, and
432 different interpretations of the goals (Armitage et al. 2009; Bergseng and Vatn 2009).

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

446 Overall, collectively oriented management objectives like using wild reindeer for
447 educational purposes, and maintaining mountain ecosystems and sustainable local
448 communities, are more likely to receive community support than management strategies
449 aimed at enhancing economic benefits to land owners, e.g. those individuals who possess

450 hunting rights, through for instance larger harvest quotas or higher prizes on permits.
451 Although reindeer interests appear to have relatively strong support in these communities, the
452 degree of environmental orientation varies like it does in any community and policy situation;
453 favoring wildlife over alternative land uses will always create some tension. The positive
454 attitudes toward diverse and partly non-consumptive uses of reindeer in supporting local
455 livelihoods, maintaining local traditions, increasing environmental awareness and supporting
456 tourism, show that the species can play an important role in land use planning. On the other
457 hand, it is far from certain that reindeer management can actually strengthen community
458 cohesion. Around one-half of the community residents had positive views of the aspects of
459 management examined here, the other half less so. At the time being, the market for wildlife
460 based tourism is either limited and/or underdeveloped, and expectations might be more
461 idealistic than realistic in terms of revenue. Community cohesion is usually linked to social
462 capital (Pretty and Smith 2004; Pretty 2003), and while the latter was not the subject of this
463 study, the history of former management, the distribution of land- and hunting rights, as well
464 as the variability in the general public's interest in wildlife management, suggests that
465 networks and social capital associated with reindeer do not include a cross section of the
466 communities. One implication is the need to put more emphasis on education and raising the
467 awareness of potential benefits from reindeer conservation locally. As future management
468 increasingly will be shaped by elected politicians, there will be a great need for capacity
469 building with inputs from scientists and environmental professionals.

470 Furthermore, the new plans emphasize reindeer conservation balanced against
471 sustainable development, the latter being a term most can agree to, but one that conceals
472 multiple interpretations. As research has shown, more collaborative forms of governance
473 requires a considerable amount of negotiations and discussions to reach shared
474 understandings of goals, strategies and responsibilities, and often lead to increased conflicts in

475 decision making (Davies and White 2012; Crona and Parker 2012; Reed, Graves, Dandy,
476 Posthumus, Hubacek, Morris, Prell, et al. 2009) In the Rondane region there is a long way to
477 go for reaching agreement on acceptable levels of second home development, tourism and
478 trail development, logging, grazing of livestock, road development and winter access, as well
479 as off-road motorized access.

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

499 The findings in this study emphasize the need to understand social groups and
500 differential preferences in order to maintain local motivation for the enduring efforts required
501 in collaborative decision making. New ideas spread rapidly where there is high social capital
502 (Bodin and Crona 2009; Pretty and Smith 2004) and research can help define the social
503 dynamics that drive the support for and opposition against new governance forms. This is
504 particularly relevant in this multi-level policy process where the state level see the plan as a
505 final blueprint for management, while the local and regional level institutions see the plan as a
506 basis for negotiating appropriate use and limits of acceptable change (Hongslo and Lundberg
507 2012). This discrepancy indicates that the planning authorities seriously underestimate the
508 task of the new governance model and the realities of more collaborative and adaptive
509 management. Unless effective stakeholder forums are established, policy at different
510 institutional levels will not be bridged, and local interests will lose motivation over time.

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

522 Rural Norway is, like many parts of rural Europe, transforming into amenity
523 destinations for urban populations where agriculture and traditional industries decline and

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

535 Prior to the recent policy move, reindeer population management, including the main
536 objective of utilizing reindeer for harvest, caused minimal conflict and was not seen to
537 threaten rural values or lifestyles to any significant extent (Bråtå 2003). However, this is
538 already changing as reindeer is being used as an umbrella species for broader conservation
539 objectives. History shows that when centralization and urbanization tap rural regions of
540 economic, social and cultural diversity, symbols or elements of nature often play a part in the
541 resulting discourses and policy debates. In Norway this has been particularly prominent in
542 terms of large carnivore re-establishment and conservation, protected area governance and
543 second home development where attempts to set the rules by state institutions are frequently
544 seen as an infringement on rural rights (Blekesaune and Rønningen 2010; Kaltenborn,
545 Andersen, Nellemann, Bjerke and Thrane 2008 ; Skogen 2003; Skogen and Thrane 2008).
546 The changing role of reindeer may well play a more controversial and prominent role in this
547 dynamic, since the species is assigned a broader conservation role and defines a more

548 complex policy situation, linking international conservation interests and pressures with local
549 level management.

550 5. CONCLUSIONS

551 The last remaining populations of wild mountain reindeer in Europe are vulnerable to
552 the rapid expansion of road building, second homes, tourism resorts, and agricultural
553 activities (Nellemann, Vistnes, Jordhøy, Støen, Kaltenborn, Hanssen, and Helgesen, 2010;
554 Panzacchi, Van Moorter, Jordhoy and Strand 2012). There is national and international
555 recognition that this situation requires new conservation measures and policies (Forbes and
556 Kumpula 2009; Nellemann, Vistnes, Jordhøy, Strand and Newton 2003).

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

570 When reindeer management moves from population-level management to spatial
571 planning, power is transferred from the scientific bureaucracy to politicians at regional and

572 local levels. Efforts aimed at raising awareness and knowledge among elected officials of
573 reindeer ecology and public attitudes toward wildlife will be crucial. As reindeer management
574 advances on the local political agenda, the opinions of local residents will carry more weight,
575 and it becomes important to identify social networks and monitor patterns and changes in
576 public perceptions through research. The environmental attitudes of segments of community
577 residents varies considerably and this also affects the attitudes towards wild reindeer
578 management and what is perceived as legitimate use of this resource.

579 Wildlife conservation is increasingly challenged to produce research-based
580 knowledge about the ecology, range requirements, and social values of reindeer to support
581 their concerns about the societal importance and vulnerability of the species (Salafsky,
582 Margolius, Redford and Robinson 2002; Thirgood and Redpath 2008). It is predictable that
583 reindeer conservation interests will also be expected to produce increasingly detailed and
584 localized scientific evidence to document their concerns as the scope of planning for wildlife
585 management and conservation expands.

REFERENCES

- Aaris-Sørensen, K., Mühldorff, R., and Petersen, E. B. 2007. The Scandinavian reindeer *Rangifer tarandus* L. after the last glacial maximum: time, seasonality and human exploitation. *Journal of Archeological Science* 34: 914-923.
- Andersen, R. and Hustad, H. (eds). 2004. *Villrein og samfunn. En veiledning til bevaring og bruk av Europas siste villrein fjell* in Norwegian: Wild reindeer and society. A guide to conservation and use of Europe's last reindeer range. Research Report, Norwegian Institute for Nature, Trondheim.
- Armitage, D.R., Plummer, R., Berkes, F., Arthur, R.I., Charles, A.T., Davidson-Hunt, I.J., Diduck, A.P. et al. , 2009. Adaptive co-management for social–ecological complexity. *Frontiers in Ecology and the Environment* 7: 95–102.
- Bamberg, S. 2005. How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *Journal of Environmental Psychology* 23: 21-32.
- Bang-Andersen, S. 2008. Prehistoric reindeer hunting in the southern Norwegian highlands. In: Grimaldi, S. and Perrin, T. Eds. *Mountain environments in prehistoric Europe : settlement and mobility strategies from the Palaeolithic to the Early Bronze Age*. Archaeopress: Oxford.
- Berger, J. 2004. The last mile: how to sustain long distance migrations in mammals. *Conservation Biology* 18: 320-332.
- Berger, J., Cain, S.L., and Berger, K.M. 2006. Connecting the dots: an invariant migration corridor links the Holocene to the present. *Biology Letters*, 2, 528-531.
- Bergseng, E. and Vatn, A. 2009. Why protection of biodiversity creates conflict – Some evidence from the Nordic countries. *Journal of Forest Economics* 15: 147-165.
- Berkes, F. 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management* 90: 1692-1702.
- Bjerke, T., Thrane, C., and Kleiven, J. 2006. Outdoor recreation interests and environmental attitudes in Norway. *Managing Leisure* 11:116-128.
- Blekesaune, A. and Rønningen, K. 2010. Bears and fears: Cultural capital, geography and attitudes towards large carnivores in Norway. *Norwegian Journal of Geography* 64: 185-198.
- Bodin, Ö. and Crona, B.I. 2009. The role of social networks in natural resource governance. *Global Environmental Change* 19(3): 366-374.
- Bråtå, H.O. 2003. The Norwegian system for wild reindeer management – major development since the 19th century. *Rangifer* 14: 29-36.
- Cash, D.W., Adger, N., Berkes, F., Garden, P., Lebel, L., Olsson, Pritchard, L., and Young, R. 2006. Scale and Cross-Scale Dynamics: Governance and Information in a Multilevel World. *Ecology and Society* 11(2): 8 (online). URL: <http://www.ecologyandsociety.org/vol11/iss2/art8/>
- Chase, L.C., Decker, D., and Lauber, T.B. 2004. Public Participation in Wildlife Management: What Do Stakeholders Want? *Society and Natural Resources* 17: 629-639.

- Cox, M., G. Arnold, and S. Villamayor Tomás. 2010. A review of design principles for community-based natural resource management. *Ecology and Society* 15(4): 38. (online) URL: <http://www.ecologyandsociety.org/vol15/iss4/art38>.
- Crona, B.I. and Parker, J.N. 2012. Learning in Support of Governance: Theories, methods, and a Framework to Assess How Bridging Organizations Contribute to Adaptive Resource Governance. *Ecology and Society* 17(1): 32. (online) <http://hdl.handle.net/10535/8172>
- Daugstad, K., Rønningen, K. and Skar, B. 2006. Agriculture as an upholder of cultural heritage? Conceptualizations and value judgments – A Norwegian perspective in international context. *Journal of Rural Studies* 22: 67-81.
- Davies, A.L., and White, R.M. 2012. Collaboration in natural resource governance: Reconciling stakeholder expectations in deer management in Scotland. *Journal of Environmental Management* 112: 160-169.
- de Grooth, J.I.M., and Steg, L. 2008. Value Orientations to Explain Beliefs Related to Environmental Significant Behavior. *Environment and Behavior* 40(3): 330-354.
- Dillman, D.A, Phelps, G., Tortora, R., Swift, K., Kohrell, J., Berck, J., and Messer, B.L. 2009. Response rate and measurement differences in mixed-mode surveys using mail, telephone, interactive voice response (IVR) and the Internet. *Social Science Research* 38:1–18.
- Duda, M.D., and Nobile, J. L. 2010. The Fallacy of Online Surveys: No Data Are Better Than Bad Data. *Human Dimensions of Wildlife* 15(1): 55-64.
- Dunlap, R. 2008. The New Environmental Paradigm Scale: From Marginality to worldwide use. *Journal of Environmental Education* 40: 3-18.
- Dunlap, R. E., and Van Liere, K. 1978. The "new environmental paradigm": A proposed measuring instrument and preliminary results. *Journal of Environmental Education* 9:10-18.
- Dunlap, R. E., Van Liere, K. D., Mertig, A. G., and Jones, R. E. 2002. Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues*, 56, 425-442.
- Edgell, M.C.R., and Nowell, D.E. 1989. The New Environmental Paradigm Scale: Wildlife and environmental beliefs in British Columbia. *Society and Natural Resources*, 2: 285-296.
- Falleth, E. and Hovik, S. 2009. Local government and nature conservation in Norway: decentralization as a strategy in environmental policy. *Local Environment* 14(3), 221-231.
- Festa-Bianchet, M. Ray, J.C., Boutin, S., Coutin, D., and Gunn, A. 2011. Conservation of caribou Rangifer tarandus in Canada: an uncertain future. *Canadian Journal of Zoology* 89(5): 419-434.
- Forbes, B.C. and Kumpula, T. 2009. The Ecological Role and Geography of Reindeer Rangifer tarandus in Northern Eurasia. *Geography Compass* 3: 1356-1380.
- Gundersen, S.V. and Frivold, L.H. 2008. Public preferences for forest structures: A review of quantitative surveys from Finland, Norway and Sweden. *Urban Forestry & Urban Greening* 7: 241–258.

- Hammer, R. 2008. Recreation and Rural Development in Norway: Nature Versus Culture. *Scandinavian Journal of Hospitality and Tourism* 82: 176-186.
- Harris, G., Thirgood, S., Hopcraft, J.G., Cromsight, J.P.G.M., and Berger, J. 2009. Global decline in aggregated migrations of large terrestrial mammals. *Endangered Species Research* 7: 55-76.
- Haukeland, J.V., Daugstad, K., and Vistad, O.I. 2011. Harmony or Conflict? A Focus Group Study on Traditional Use and Tourism Development in and around Rondane Jotunheimen National Parks in Norway. *Scandinavian Journal of Hospitality and Tourism* 111: 13-37.
- Hawcroft, L. J., and Milfont, T. C. 2010. The use and abuse of the new environmental paradigm scale over the last 30 years: A meta-analysis. *Journal of Environmental Psychology* 30: 143-158.
- Heberlein, T. A. 2012. *Navigating environmental attitudes*. New York: Oxford University Press.
- Hongslo, E. and Lundberg, A. K. 2012. Regional planlegging i villreinområder – arealplanlegging som nytt virkemiddel? in Norwegian: Regional planning in wild reindeer areas – area-based planning as a new tool? *Kart og Plan* 4: 255-265.
- Houde, N. 2007. The Six Faces of Traditional Ecological Knowledge: Challenges and Opportunities for Canadian Co-Management Arrangements. *Ecology and Society* 12(2): 34 (online).
- Hunter, L. M. and Rinner, L. 2004. The Association Between Environmental Perspective and Knowledge and Concern With Species Diversity. *Society and Natural Resources* 17: 517-532.
- Jordhøy, P.(ed.) 2008a. *Villreinen i Rondane- Sølnekletten: Status og leveområde*. In Norwegian: Wild reindeer in Rondane-Sølnekletten: Status and range Report 339. Norwegian Institute for Nature Research, Trondheim.
- Jordhøy, P. 2008b. *Problematikk ikring ferdsle og villrein i Rondane* In Norwegian: Issues around human traffic and wild reindeer in Rondane – Report 331. Norwegian Institute for Nature Research, Trondheim.
- Kaiser, F. G., Wölfing, S., and Fuhrer, U. 1999. Environmental attitude and ecological behavior. *Journal of Environmental Psychology* 19: 1-19.
- Kaltenborn, B.P., Andersen, O., and Linnell, J.D.C. 2013. Predators, stewards, or sportsmen – how do Norwegian hunters perceive their role in carnivore management? *International Journal of Biodiversity Science, Ecosystem Services & Management* 9(3): 239-248.
- Kaltenborn, B.P., Andersen, O., Nellemann, C., Bjerke, T., and Thrane, C. 2008. Resident attitudes toward mountain second home tourism development in Norway. The effect of environmental attitudes. *Journal of Sustainable Tourism* 166: 664-680.
- Kaltenborn, B. P., Andersen, O., and Nellemann, C. 2007. Second home development in the Norwegian mountains – Is it outgrowing the planning sector. *International Journal of Biodiversity Science and Management* 3: 1-11.

- Kaltenborn, B. P., Andersen, O., Vittersø, J., and Bjerke, T. 2012. Attitudes of Norwegian ptarmigan hunters towards hunting goals and harvest regulations: the effects of environmental orientation. *Biodiversity Conservation* 21: 3369-3384.
- Kofinas, G., Osherenko, G., Klein, D., and Forbes, B. 2000. Research planning in the face of change: the human role in reindeer/caribou systems. *Polar Research* 191: 3-21.
- Lindhjem, H., and Navrud, S. 2011. Using internet in stated preference surveys: A review and comparison of survey modes. *International Review of Environmental and Resource Economics* 5: 601 309–351.
- Liu, J., Ouyang, Z., and Miao, H. 2010. Environmental attitudes of stakeholders and their perceptions regarding protected area-community conflicts: A case study in China. *Journal of Environmental Management* 91: 2254-2262.
- Milfont, T. L., and Duckitt, J. 2010. The environmental attitude inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology* 30: 80-94.
- Milfont, T. L., and Duckitt, J. 2004. The structure of environmental attitudes: A first- and second-order confirmatory factor analysis. *Journal of Environmental Psychology* 24: 289 - 303.
- Miljøverndepartementet 2005. Stortingsmelding nr. 21 Regjeringens miljøvernpolitikk og rikets miljøtilstand. In Norwegian, Parliamentary report no. 21. The government's environmental policy and state of the environment.
- Nellemann, C., Vistnes, I., Jordhøy, P., Støen, O.G., Kaltenborn, B.P., Hanssen, F., and Helgesen, R. 2010. Effects of Recreational Cabins, Trails and Their Removal for Restoration of Reindeer Winter Ranges. *Restoration Ecology* 186: 873-881.
- Nellemann, C., Vistnes, I., Jordhøy, P., Strand, O., and Newton, A. 2003. Progressive impact of piecemeal infrastructure development on wild reindeer. *Biological Conservation* 113: 307-317.
- Panzacchi, M., Van Moorter B., Jordhøy, P., and Strand, O. 2012. Learning from the past to predict the future: using archeological findings and GPS data to quantify reindeer sensitivity to anthropogenic disturbance in Norway. *Landscape Ecology* online DOI 10.1007/s10980-012-9793-5.
- Perlik, M. 2006. The Specifics of Amenity Migration in the European Alps. In, Moss, L.A.G. ed. *The Amenity Migrants – Seeking and Sustaining Mountains and their Cultures*. CABI, Wallingford, pp. 215-231.
- Pretty, J. 2003. Social Capital and the Collective Management of Resources. *Science* 302: 1912-1914.
- Pretty, J., and Smith, D. 2004. Social Capital in Biodiversity Conservation and Management. *Conservation Biology* 18(3): 631-638.
- Rauwald, K.S., and Moore, C.F. 2002. Environmental Attitudes as Predictors of Policy Support across Three Countries. *Environment and Behavior* 346: 706-739.

- Reed, M.S., Graves, A., Dandy, N., Posthumus, H., Hubacek, K., Morris, J., Prell, C., Quinn, C.H., and Stringer, L.C. 2009. Who's in and why? A typology of stakeholder analysis methods for natural resource management. *Journal of Environmental Management* 90: 1933-1949.
- Reimers, E., and Colman, J.E. 2009. Reindeer and caribou *Rangifer tarandus* response towards human activities. *Rangifer*, 262,55–71.
- Rauschmayer, F., Paavola, J., and Wittmer, H. 2009. European governance of natural resources and participation in a multi-level context: An editorial. *Environmental Policy and Governance* 19: 141-147.
- Røed, K.H., Flagstad, Ø., Nieminen, M., Holand, Ø., Dwyer, M.J., Røv, N., and Vilá, C. 2008. Genetic analyses reveal independent domestication origins of Eurasian reindeer. *Proceedings of the Royal Society Biological Sciences* 275: 1849-1855.
- Røed, K. H. 2007. Taxonomy and origin of reindeer. *Rangifer* 122007: 17-20.
- Røed, K. 1987. Transferrin variation and genetic structure of reindeer populations in Scandinavia. *Rangifer* 71: 12-21.
- Rydin, Y., and Pennington, M. 2000. Public Participation and Local Environmental Planning: the collective action problem and the potential of social capital. *Local Environment* 5(2): 153-169.
- Salafsky, N., Margolius, R., Redford, K.H., and Robinson, J.G. 2002. Improving the Practice of Conservation: a Conceptual Framework and Research Agenda for Conservation Science. *Conservation Biology* 166: 1469-1479.
- Sandström, C. 2012. Managing Large Ungulates in Europe: The Need to Address Institutional Challenges of Wildlife Management. *Human Dimensions of Wildlife* 17(5): 320-332.
- Skogen, K. 2003. Adapting adaptive management to a cultural understanding of land use conflicts. *Society and Natural Resources* 165: 435-450.
- Skogen, K., and Thrane, C. 2008. Wolves in context: Using survey data to situate attitudes within a wider cultural framework. *Society and Natural Resources* 211: 17-33.
- Skogland, T. 1986. Density dependent food limitation and maximal production in wild reindeer herds. *Journal of Wildlife Management* 50: 314–319.
- Strand, O., Gundersen, V., Panzacchi, M., Andersen, O., Falldorf, T., Andersen, R., Van Moorter, B., Jordhøy, P., and Fangel, K. 2010. Ferdsel i villreinens leveområder. In Norwegian: Human traffic in wild reindeer range lands. Report 551, Norwegian Institute for Nature Research. Trondheim.
- Strand, O., Nilsen, E. B., Solberg, E.J., and Linnell J.D.C. 2012. Can management regulate the population size of wild reindeer (*Rangifer tarandus*) through harvest? *Canadian Journal of Zoology* 90: 163–171.
- Tarrant, M.A., Bright, A.D., and Cordell, H.K. 1997. Attitudes toward wildlife species protection: Assessing moderating and mediating effects in the value-attitude relationship. *Human Dimensions of Wildlife* 2(2): 1-20.

- Thirgood, S., and Redpath, S. 2008. Hen harriers and red grouse: science, politics and human-wildlife conflict. *Journal of Applied Ecology* 45: 1550-1554.
- Thomas, D.C., and Schaefer, J. 1991. Wildlife Co-management defined: The Beverly and Kaminuriak Caribou Management Board. *Rangifer*, Special Issue No. 7: 73-89.
- Tyler, N.J.C., Turi, J.M., Sundset, M.A., Strøm Bull, K., Sara, M.N., Reinert, E. Oskal, N., et al. 2007. Saami reindeer pastoralism under climate change: Applying a generalized framework for vulnerability studies to a sub-arctic social-ecological system. *Global Environmental Change* 17: 191-206.
- Vistnes, I., and Nellemann, C. 2008. The matter of spatial and temporal scales: a review of reindeer and caribou response to human activity. *Polar Biology* 314: 399-407.
- Vistnes, I., Nellemann, C., Jordhøy, P., and Strand, O. 2004. Effects of infrastructure on migration and range use of wild reindeer. *Journal of Wildlife Management* 68: 101-108.
- Vors, L.V., and Boyce, M.S. 2009. Global declines of caribou and reindeer. *Global Change Biology* 15: 2626-2633.
- Whittaker, D., Vaske, J.J., and Manfredi, M.J. 2006. Specificity and the Cognitive Hierarchy: Value Orientations and the Acceptability of Urban Wildlife Management Actions. *Society and Natural Resources* 19: 515-530.

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

Table 2. Potential management objectives (analysis of variance)

Table 3. The role of reindeer in local development (analysis of variance)

Figure 1. Map of study areas

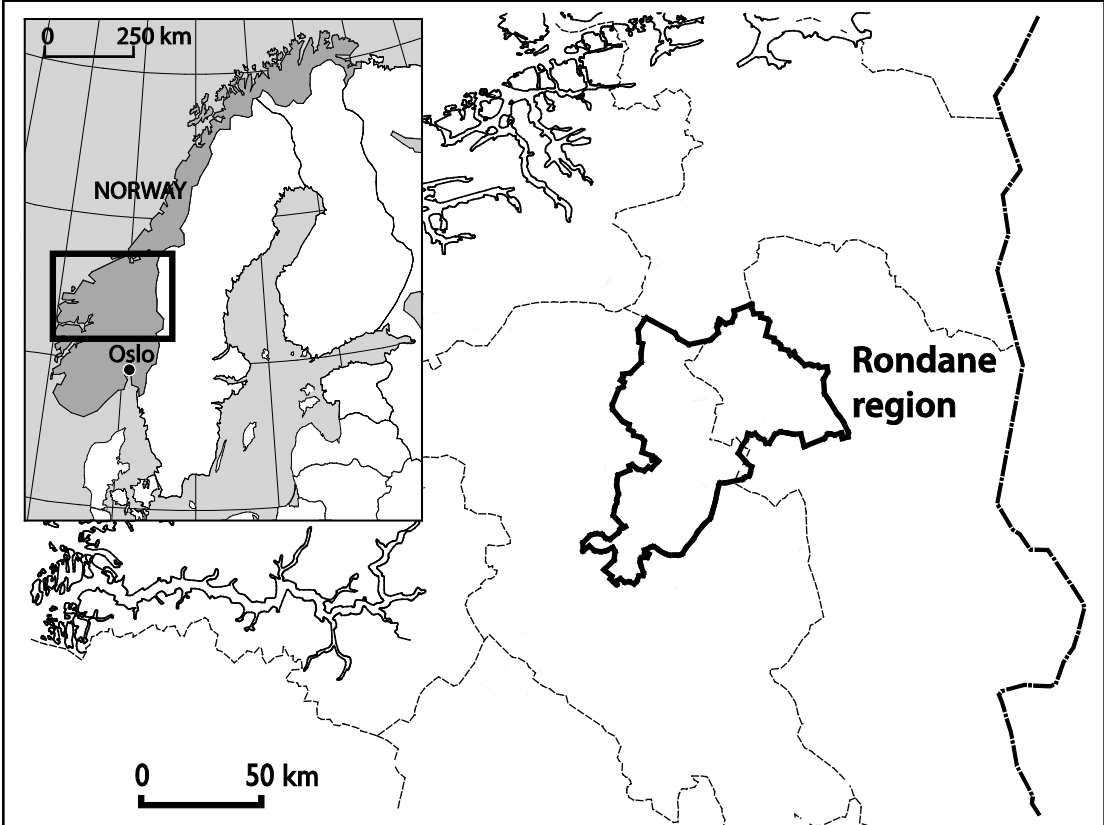


Table 1. Items in the New Environmental Paradigm (NEP) scale and NEP groups

	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 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

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

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 land owners	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 untrammled 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

Response format: 1: Completely disagree, 2: Disagree, 3: Neither disagree nor agree, 4: Agree, 5: Absolutely agree, L: Low ecocentrics, M: medium ecocentrics, H. High ecocentrics.

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, L: Low ecocentrics, M: medium ecocentrics, H. High ecocentrics.

List of figures

Figure 1. The Rondane reindeer region