

**LINKING VISITOR MOTIVATION WITH ATTITUDE TOWARDS
MANAGEMENT RESTRICTIONS ON USE IN A NATIONAL PARK**

(Final version)

by

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ABSTRACT

The increasing demand for visiting wilderness areas often requires management actions that both conserve the natural resources and ensure a high quality visitor experience. Many of the alpine national parks in southern Norway hold the last remaining populations of wild reindeer (*Rangifer tarandus tarandus*) in Europe. Therefore management needs more effective tools to reduce or remove recreational impact on wild reindeer populations. Management actions should also consult research-based knowledge on visitors. Therefore, this study explores the link between visitor motivations and their attitudes towards management actions on track-related (trail, path, trampling, track) and area-related (zoning, legal restrictions) use. The results show that two of the visitor motivations (i.e. hiking and place attachment) affect visitors' attitudes towards management restrictions on use significantly. For instance, those visiting the national park for hiking are more positive to area-related restrictions while individuals attached to the place are more positive to track-related restrictions. Practical and theoretical implications are also discussed.

KEY WORDS: Mountain; nature-based tourism; outdoor recreation; place attachment; socio-ecology, structural equation model; wild-reindeer

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MANAGEMENT IMPLICATIONS

When attempting to find socio-ecological solutions for conflicts between a wild reindeer population and recreational use, the following management recommendations should be considered:

- A management solution should regard the fact that local users differ significantly from non-local visitors.
- The strategy of 'area restriction' is highly controversial for local communities, due to their long tradition with subsistence harvesting, grazing and traditional agriculture; therefore such a strategy will receive only low approval among the locals and leave the management with low legitimacy at the local level.
- The strategy of 'management of the track system' will affect most non-local visitors, but these visitors are more flexible in adapting to a new trail system in the area, or may shift to another area.
- Visitors with strong place attachment, as well as wilderness seekers who desire solitude are difficult to influence with physical management actions.
- A management strategy that will limit the area of use and behaviour of off-track visitors should include information about ecosystem vulnerability.

1. INTRODUCTION

Norwegian national parks represent a specific type of wilderness area which attracts both local and international visitors (Hammer 2008). National parks in general, and wilderness parks in particular, face the continuous challenge of balancing the legally mandated ecological integrity with satisfactory visitor experiences (Cole 2004, Shin & Jackson 1997, Glorioso & Moss 2007, Fredman et al. 2007). Their decisions should also include knowledge about the wilderness users, such as their motivations, attitudes, and preferences.

Many of the alpine national parks in southern Norway hold the last remaining populations of wild reindeer (*Rangifer tarandus tarandus*) in Europe, and recreational use can affect their distribution, population dynamics and general conditions in several ways (Vistnes et al. 2004, Vistnes & Nellemann 2008, Reimers & Colman 2009, Forbes & Kumpula 2009). Recently these reindeer have received considerable national and international attention (e.g. Kofinas et al. 2000, Festa-Bianchet 2011, Panzacchi et al. 2012). The establishment of Norwegian national parks since the 1960s has changed the land use, management and development options for many mountain communities in this region considerably (Haukeland et al. 2011, Kaltenborn et al. 2014a). Legal direct restrictions have been imposed on the recreational use in wild reindeer migration corridors and in calving areas during critical periods of the year in some national parks (e.g. Hardangervidda), but this kind of direct regulation has been neglected by many users and the regulations have been discontinued after a short period of time. Instead, many indirect measures including manipulation of infrastructure and visitor facilities have been introduced in many parks in southern Norway (e.g. Rondane, Dovrefjell-Sunndalsfjella, Hallingskarvet, Hardangervidda) (Gundersen et al. 2011, Nellemann et al. 2003, 2010). The wilderness experience may be diminished by threatened sanctions, and indirect and nonregulatory management is preferred to direct or regulatory management of wilderness visitors (Vistad &

Vorkinn 2012). However, so far no systematic research has been undertaken on the effects of these management measures, both regarding the visitors' satisfaction and the ecological effects on wild reindeer (Strand et al. 2010, 2013). Obviously, new tools would be useful which can assist managers to reduce or remove recreational impact on wild reindeer populations (Strand et al. 2013), while at the same time ensuring the continuous freedom for visitors to roam and enjoy nature experiences satisfactorily.

In Norway and internationally, the present knowledge about wilderness use and users is insufficient (e.g. Vistad & Vorkinn 2012, Shin & Jaakson 1997). Hall et al. (2010) argue that most research on wilderness users has stopped at examining motivations and perceptions, while rarely relating these to management preferences. They hypothesise that meaningful segments (for management purposes) will emerge when visitors are clustered on their motives (and wilderness involvement) and that the resulting clusters will support management actions that provide setting characteristics with a potential to fulfil their motives. Thus the purpose of the current study is to examine whether wilderness users' attitudes toward management actions (e.g. restrictions on use) vary depending on their motives for visiting the national parks and wildernesses, as proposed by some previous research (Brown & Haas 1980, Virden & Schreyer 1988, Shultis 1999). Our empirical data come from a sample of visitors to Dovrefjell-Sunnalsfjella National Park in southern Norway. We examine three research questions:

- How do visitors perceive different direct (area restrictions) and indirect (e.g. track restrictions) management measures in national parks?
- Can different visitor segments be identified and are at least some of them flexible to adapt new track management systems or relocate their activity to another mountain area?
- What kinds of management measures are most adequate for meeting the preferences of the traditional users from the communities adjacent to the national parks?

Results of this research will be relevant for wilderness managers who may initiate or implement different types of use restrictions and/or site management in their areas.

2. BACKGROUND

2.1. National park management in Norway

Most Norwegian mountain areas and national parks receive few visitors (but their numbers are increasing) compared to national parks worldwide (Gundersen et al. 2011). Most Norwegian national parks are located in remote areas far from settlements and, by definition, they are without roads and other heavy infrastructure (Nature Diversity Act 2009). Thus, by international comparison their physical appearance and service level usually matches the IUCN category I, wilderness areas, rather than the category II, national parks (Holt-Jensen 1978). In addition, the principle of common access rights to all uncultivated land in Norway (Outdoor Recreation Act 1957) is undisputable, and includes all protected areas (Nature Diversity Act 2009). Public right of access and the tradition of outdoor recreation in Norway is much simpler, or more primitive, than the commercialized and specialized outdoor recreation activities in North America (Kaltenborn et al. 2001). “Every man’s right” (*allemannsretten*) grants anyone the right, within certain restrictions, to move freely across private and public land, and to pick wild berries, mushrooms and flowers, collect dry wood for campfire, and put up a tent, although not closer than 150 meters from private homes and cabins (50 meters in the coastal zone). These individual rights to enjoy nature include of course related responsibilities, and assume good judgment by all involved (Sandell 2006, Puhakka 2011). In short, *allemannsretten* is considered an intrinsic component of local Nordic culture (Kaltenborn et al. 2001).

The type of visitors to alpine national parks in the Nordic area has changed over the past decades (e.g. Wall-Reinius & Bäck 2011, Gundersen et al. 2013a). For visitors’ adventure and

risk taking, the provision of basic services, marked hiking tracks and easy accessibility through designated entrances and visitor centers has become more important. Now, the average age of hikers has increased while their length of stay has decreased (e.g. Gundersen et al. 2013b). Overall, the majority of hikers accepts and uses recreational infrastructure to a greater extent today, and significant visitor segments have strong preferences for more modern management measures like infrastructure and services (Haukeland et al. 2010). Recreation in its most simple and traditional way is a legitimate and publicly desired use of national parks in Norway. At the same time, all national parks declare conservation as an overall objective, but usually in a rather general statement only. At the same time, most visitors to the Norwegian national parks expect a promotion of wilderness that would be more typical internationally (e.g. Hendee et al. 1990, Hallikainen 1998, Sæþórsdóttir 2011), i.e. based on landscape naturalness, few other visitors, visitors who walk or ski, and little infrastructure (Haukeland et al. 2010). In this context the strict protection enjoyed by national parks constitutes important motivational factors for visiting the area.

Due to the right of common access, direct visitor management measures such as zoning and spatial regulations, or quota restrictions are rarely applied in Norwegian national parks. On the other hand, indirect approaches and site-specific management measures are more common. One approach is to use physical infrastructure strategically for visitor guidance. For example, visitor centers, viewpoints, information plates, marked trails, campsites and bridges will attract and concentrate visitors in particular areas, while protecting valuable natural resources at the same time. Such facilitation may, however, impact negatively on the experience of those who are seeking “authentic” experience in nature, and who prefer solitude (Virden & Schreyer 1988, Raadik et al. 2010). To balance the need for resource protection and visitor satisfaction in national parks, it is vital to understand visitor tolerance/preferences for such facilitation and for values such as solitude, remoteness and isolation (Roggenbuck et al. 1993, Floyd et al. 1997,

Meng et al. 2006). What kinds of recreational impacts are acceptable in relation to protection rules, and where? And what is unacceptable?

Recent trends in natural area management such as the concepts of adaptive management (Plummer & Fennell 2009) or management by objectives (Gundersen et al. 2011), have explicitly declared the importance of “knowledge based” management, and should ideally be based on science and social science based research. This knowledge based principle is also imbedded in the Norwegian Nature Diversity Act (2009). Wildlife and land use policy makers need to balance the complexity of competing societal needs, stakeholders, individual requirements and wildlife management goals (Falleth & Hovik 2009, Kaltenborn et al. 2014a). The uncertainty associated with each of these layers, which may gain additive or multiplicative effects throughout the decision-making process (Haukeland et al. 2011) needs to be addressed by management. Furthermore, the final spatially-explicit management plan is expected to be sustainable in both social and ecological terms in the long term (Kaltenborn et al. 2014 a, b). Thus the interest in how to implement and evaluate management actions has increased over the last decades; in this study it is about protecting the natural resources in mountains and to ensure visitor satisfaction in Norwegian national parks, especially within the wild reindeer range (Hammer 2008, Haukeland et al. 2013). Similarly, as the concept of protected areas (that are often within the wild reindeer range) is shifting from “protection from people” to “sustainable use”, a much deeper understanding of responses to anthropogenic disturbance is urgently needed to support sustainable and more flexible management strategies (Kaltenborn et al. 2014a). One of the main challenges is to manage visitors by different types of site-specific measures and facilities.

2.2. Factors influencing visitor motivation

Reasons for visiting Norwegian national parks can be as diverse as the visitors themselves (Vistad & Vorkinn 2012). A set of different components including individual conditions (e.g. personality, preferences, attitudes, lifestyle, sociodemography), environmental or managerial settings (e.g. restrictions), and social components (crowding, new activities) influence visitor participation in recreation (e.g. Vistad 1995, Fredman & Heberlein 2005, Haukland et al. 2010). A central construct in the Nordic recreation history is ‘motivational recreation research’ (Aasetre & Gundersen 2012), which is based on North American research and management traditions. Motivation occurs when an individual wants to satisfy a need. Motivation is generally examined in relation to ‘push’ and ‘pull’ factors that influence visitor behavior. Push factors would comprise visitors’ socio-psychological constructs that predispose them by their own motivation to visit an attraction/destination (peacefulness, solitude, feelings of renewal etc.), whereas pull factors include qualities of the settings that attract them to a specific attraction or destination (Dann 1977, Manning 1999, Pomfret 2006). Important environmental factors attracting visitors to national parks are the outdoor recreation opportunities, landscape scenery, natural resources and authentic nature (Raadik et al. 2010, Haukland et al. 2010, Sæþórsdóttir 2010, Vistad & Vorkinn 2012). Social and managerial conditions value places for providing opportunities for activities, for accommodation and other infrastructure, as well as regulations and restrictions (Dann 1977, Pomfret 2006, Haukland et al. 2010, Wall-Reinius & Bäck 2011). In addition, visitors’ socio-demographic characteristics also influence their decision to visit a national park (Vistad 1995, Haukland et al. 2010), such as age, gender, place of residence and level of education (Gundersen et al. 2013b). For example hiking attracts more visitors from a high socio-economic class, as defined by education, income and occupation (e.g. Fredman & Heberlein 2005, Odden 2008, Statistics Norway 2014).

Visitors' desires are readily reflected by their preferences for different types of activities that they would like to pursue in wilderness areas. The academic literature contains some evidence that visitors' outdoor activity preferences may influence their level of support for conservation-orientated management actions. However, studies have also shown that visitors to parks and wilderness do observe and are influenced by a variety of negative environmental impacts (Floyd et al. 1997). Research also shows that environmental outcomes such as litter, noise, vegetation, or damage to trees all influence wilderness users' perception of their experience in different wilderness areas (Roggenbuck et al. 1993, Vistad 1995). This finding applies to a greater degree to visitors who have the wilderness (e.g. a national park) as their primary attraction/destination (Uysal et al. 1994, Puhakka 2011) and have a higher environmental concern (Floyd et al. 1997, Dorwart et al. 2009).

The concept of purism represents attitudes characterized by a high level of expectations of, and an acute sensitivity to, variations in the quality of something (Jaakson & Shin 1993); a wilderness purism scale measures the desirability of selected activities, facilities, and experiences in what a person ideally considers to be wilderness (Shultis 1999). The wilderness purism scale has indeed established itself as a valid instrument in the literature. Although the use of a single global index (i.e. sum of all the wilderness purism scale items) has been justified by several scholars (e.g. Jaakson & Shin 1993), the wilderness purism scale is acknowledged to be a multidimensional construct expressed by sub-dimensions such as solitude, artifactualism etc. The wilderness purism scale has either as a whole or in its sub-dimensions been related to management actions as well (Vistad 1995, Vistad & Vorkinn 2012). Hall et al. (2010) suggest that the more purist clusters (of wilderness users) would be more likely than others to support managements restrictions while recognizing the fact that earlier research has not supported this claim. Moreover, a specific sub-dimension of the purism scale, namely solitude, has in some

studies been suggested to positively correlate with support for management restrictions on use (Hall et al. 2010), while others (e.g. Cole 2004) claim that the relationship between solitude and wilderness conditions is not that straightforward but a rather complex one.

3. METHODS

3.1. Study site

Dovrefjell-Sunndalsfjella National Park (DSNP) is one of the 37 national parks on Norway's mainland, and one of the largest protected areas. It was initially established in 1974 under the name "Dovrefjell nasjonalpark" to protect an intact alpine ecosystem which also constitutes an important habitat for European wild reindeer. In 2002 the protected area was expanded and the name changed to "DSNP", now covering 1693 km² (Fig. 1). DSNP is located on a mountain plateau within Sør-Trøndelag, Oppland and Møre og Romsdal counties. The national park is a significant part of two larger management areas for wild reindeer, out of a total of 23 distinct management areas in Norway, and encompasses 6830 km² of mountainous terrain (Andersen & Hustad 2004, Bang-Andersen 2008). DSNP's main attractions are alpine wilderness landscapes including the popular Snøhetta mountain (2286 m a.s.l.) Musk ox (*Ovibos moschatus*), which has been re-introduced last century is a very popular attraction in the eastern part of the DSNP, where guided musk ox safaris are offered. Approximately 37% of visitors are foreigners and only 15% of the Norwegian visitors are local users (Gundersen et al. 2013a).

Fig. 1 near here

Recent studies indicate that the park receives approximately 40,000 visitors annually, of which approx. 30,000 arrive during the summer months of July, August and September (Gundersen et al. 2013b, c). A total of 43 marked trail segments in the park connect 9 tourist lodges and several small rental cabins inside the protected area. A further 5 tourist lodges exist in the immediate vicinity of the park (White Paper 2006). Up-to-date estimates of economic revenue related to tourism in the park are not available, but a study from 2002 reports a total turnover of approximately EUR 6.5 million (NOK 53 million) generated by tourism in the park and within a 5 km buffer zone (Aas et al. 2003).

In the period 2009-2014 a comprehensive research project has been implemented to identify management solutions to balance human use and protection of wild reindeer populations in the DSNP area. In all, 26 individuals of wild reindeer were captured and GPS collared. The human use of the area was monitored, in 12 surveys, 33 automatic counters, 900 GPS tracked hiking routes, and field observations (Gundersen et al. 2013a). This knowledge is used to identify ecological effects of human use on wild reindeer population, and to develop visitor management measures to avoid conflicts (Strand et al. 2013). The DSNP authorities used this knowledge for all planning and management initiatives, including both operational day to day decisions of what should be allowed or not, and more strategic long-term planning, e.g. management plans for the national park and regional plans for the protection of wild reindeer (Kaltenborn et al. 2014a).

3.2. Sampling and data

Self-registration checkpoints (boxes with a short questionnaire) were placed at the 24 main entrances during the summer of 2009. The sampling frame and methods are described in detail in Gundersen et al. (2013b). Self-registration cards were available in Norwegian,

English and German. Each registration box was inspected seven or eight times during the summer. In all, 3651 self-registration cards were completed by individuals older than 15 years. The most common group size was two and three persons, and a few groups with more than 10 members were set to 10 for the data analysis (Gundersen et al. 2013b). We assume that respondents answering on behalf of a couple or a small group of people are representative for the rest of the group (5223 individuals in all). This is especially true for trip-related information, as a group undertakes the same trip, but not necessarily for attitudes and perceptions. However, a pre-test using eight questions found no differences in preferences for facilities and solitude and therefore we use $n=5223$ persons as our sample in the survey. A test for non-response bias was made (Wilberg 2010), and the overall results showed some minor biases that were mainly in accordance with other similar international non-response studies on wilderness recreation (e.g. Fredman et al. 2005, Hindsley et al. 2011): Local inhabitants are underrepresented, and highly educated people interested in nature conservation are to some extent overrepresented. However, we find no significant differences between a sample from these groups of visitors and the entire survey material regarding trip characteristics, preferences and attitudes (Wilberg 2010), and we conclude that the survey sample is representative for the people visiting the DSNP. In addition, 24 automatic counters (EcoCounter with a pyroelectric sensor; Andersen et al. 2014) were installed in association with the self-registration boxes to calculate the response rate. We counted a total of 25,589 individuals on these locations (target population), indicating an average response rate of 20.4% (i.e. the 5223 respondents to the survey). A follow-up study was undertaken among those respondents who left their e-mail contact details. A total of 1474 valid e-mail addresses were collected, both from foreign and Norwegian visitors. In all, 623 valid questionnaires were returned, giving a 42 % response rate to the follow-up study or a response rate of 2.43% out of the target population. More important than the response rate were insights gained from

the bias check (Wilberg 2010). For several reasons we did not weight the data according to the biases identified, because we (i) compared different visitor groups relatively, (ii) had a large sample within each group, and (iii) assumed that the respondents in each group were representative for the group as a whole.

The follow-up study included a comprehensive questionnaire (Gundersen et al. 2013b), mainly based on Kajala et al. (2007). A simplified and standardized version of the wilderness purism scale was included both in the questionnaire used at the self-registration checkpoints and in the follow-up study (Vistad & Vorkinn 2012). The basic idea of the wilderness purism scale is that facilities like trails, campsites and bridges tend to attract and concentrate visitors in particular areas, and at the same time, this facilitation may impact negatively on the experience of those who are seeking “authentic” experiences in nature, and who prefer solitude. The Wilderness Purism Scale has been used repeatedly, and Vistad and Vorkinn (2012) conclude in a review based on eight studies in Norway, that “...our simplified scale, based on two interrelated sub-dimensions (preferences for physical facilities and social conditions) is a relevant, valid and reliable instrument for management and monitoring purposes, and that it also seems to tap a broader content of the purism construct”. Other questions in the survey asked about visitor use, motive, experience, behavior and perception towards biological-physical attributes in DSNP, as well as questions related to social and management factors in the area.

3.3. Measures

Exogenous variables

Visitor motivations were represented by three latent constructs (WILDLIFE, HIKING, and ATTACHMENT), each of which was measured by two indicators (Table 1). The latent constructs in Table 1 were operationalized using items from different sources (Kajala et al.

2007, Vistad & Vorkinn 2012, Raadik et al. 2010). Visit motives were measured using a five-point ordinal scale ranging from 1 (not important at all) to 5 (very important). The factor solution with three motive dimensions was obtained through an exploratory factor analysis (EFA) prior to the confirmatory factor analysis (CFA), an approach suggested to be used in studies to uncover the underlying structure of a relatively large set of variables (see Schumacker & Lomax 2010). The second set of latent constructs represented two separate dimensions (PREPARATION and SOLITUDE) of the wilderness purism scale consisting of eight indicators (see Vistad & Vorkinn 2012) (Table 1). Here, too, we employed an EFA before the CFA. These indicators reflect different personal attitudes and preferences concerning the visitor's ideal area for a trip in a forest or mountain. These attitudes/preferences (Table 1) were measured on a seven-point ordinal scale as well (1= very negative to 5= very positive). A final latent exogenous variable was WEAR which was represented by three indicators (Table 1) measuring the extent to which the respondents considered the area worn (impacted ground). A five-point ordinal scale (1= completely disagree to 5= completely agree) was used here.

In addition to the latent constructs, some observed/manifest variables were also included. First, the interest in three different types of outdoor activities was measured using a four-point ordinal scale (1= not interested to 4= very interested). These included traditional mountain outdoor activities (e.g. fishing, hunting), ordinary mountain activities including skiing, and modern mountain outdoor activities (climbing, kiting etc.) Another variable measured whether the respondents perceived the area as a wilderness area on a recoded scale (0= no and 1= yes). Furthermore, four different demographic variables were included in the study's model: Gender (0= male and 1= female), age (continuous), educational level (0= lower education and 1= higher education) and nationality (1= Norwegian and 2= foreigner).

Endogenous variables

The respondents were asked to reveal their reactions to eight possible conservational restrictions (Table 1) that could in the future be established in the mountains of Dovre. The respondents' reactions were captured by a recoded nominal variable 0 and 1 whether the respondents are still willing to choose to come to Dovre if the proposed restrictions are implemented (0= choose to come to Dovre, 1= choose another place). These eight nominal items (i.e. reactions to restrictions) were reduced to two different dimensions in an EFA: TRACK and AREA restrictions. These two dimensions were later tested in the context of CFA before being used as the latent endogenous constructs in the complete structural equation model.

The relationships between the endogenous and exogenous variables are proposed in the form of a conceptual model depicted in Fig. 2. Here the purpose is to examine the net effects of visitor's motivation on their attitude towards track- and area-related restrictions by also controlling for some relevant latent/manifest variables.

Fig. 2 near here

4. MODEL FIT

The model depicted in Fig. 2 was tested within the structural equation modelling (SEM) framework. In contrast to other multivariate procedures, SEM incorporates both latent and

manifest variables and also accounts for measurement error of the manifest variables when representing their latent variables (Byrne 2012). The two-stage approach to testing a full SEM model as suggested by Anderson and Gerbing (1988) was pursued in our study. First we tested the measurement part in a CFA and subsequently the structural part in a full SEM analysis. Both the measurement and full SEM model were tested using the weighted least-squares regression with the mean and variance adjustment (WLSMV) method of estimation in the Mplus software (see Muthén & Muthén 1998-2010), which allows for modelling latent constructs with categorical indicators.

4.1. Measurement model

The measurement part of the model refers to the relationships between the latent variables and their manifest variables (Diamantopoulos & Siguaw 2000). As the structural model requires a psychometrically sound measurement model (Byrne 2012), one should examine the convergent and discriminant validity of the latent variables of the model [i.e. construct validity] (Anderson & Gerbing 1988).

As shown in Table 1, one measure for convergent validity, namely the standardised factor loadings of the manifest variables reflecting the four latent variables, were all of an acceptable size (i.e. > 0.4) (see Brown 2006) and statistically significant. Another measure for convergent validity is the construct or composite reliability. The construct reliability (CR) coefficient was measured with the formula provided by Hair et al. (2006, p. 777). CR coefficients for all of the latent variables apart from one were exactly of or above the desirable level of 0.60 (Bagozzi & Yi 1988). A further measure, the amount of variance in the manifest variables captured by each of the latent variables, is represented by AVE (average variance extracted) values, which were relatively close to or above the recommended level of

0.5. Despite some low AVE values, all the AVE values were still larger than the squared correlations between the latent variables (Table 2).

Table 1 near here

In addition to the evidence of construct validity, measurement model validity depends on goodness-of-fit (GoF) for the measurement model (Hair et al. 2006). GoF reflects the discrepancy between Σ (predicted variance-covariance matrix) and S (sample variance-covariance matrix) (see Brown, 2006). The smaller this discrepancy, the better fitting is the measurement model (or the structural model for that matter). The fit index of RMSEA was 0.052, lower than the threshold of 0.06 suggested by Hu and Bentler (1999). Accordingly, we could conclude that the model fit the data well. Due to this result and the demonstrated construct validity, we could also suggest that the study's measurement model was an acceptable one, a condition necessary for testing and assessing the structural model.

Table 2 near here

4.2. Structural model

The structural part represents the hypothesised relationships between latent-latent and/or latent-manifest variables in a model. The first criterion for evaluating the validity of the

structural model is assessing the model fit as done for the measurement model. The fit index of RMSEA was 0.058, which again was lower than the recommended figure of 0.06 for good fitting models. The second criterion for evaluating the structural model is similar to that used in traditional multiple regression analysis in that we examined the statistical significance and direction of individual estimates for the paths given as well as the proportion of the explained variance in the endogenous variables of the model.

5. Results

Respondents who assigned more importance to hiking as a motive are more likely to choose another place as an alternative to DSNP if the proposed trail-related restrictions are implemented (Table 3). On the other hand, more importance given to attachment as a visit motive leads to lesser possibilities to choose another place than DSNP, even if the proposed track-related restrictions are implemented. Likewise, more solitude sought on the trip leads also to less willingness to choose another place than DSNP if the proposed track-related restrictions are implemented. Finally, women are on average more willing to choose another place than DSNP if the proposed track-related restrictions are implemented. The model explained about 19 per cent of the variance in reactions to track-related restrictions. In the social science applications, R-square values generally vary between 0.15 and 0.30, and Allison (1999) and Keith (2006) consider an R-square value of 0.25 as an indication of a large effect. As such, we have considered the R-square values of our model satisfactorily.

When it comes to the effects on the second endogenous variable, more importance given to hiking as a visiting motive leads to less willingness to choose another place than DSNP even if the proposed area-related restrictions are implemented. In the same manner, more worn perception of DSNP leads also to less willingness to choose another place than DSNP, if the

proposed area-related restrictions are implemented. On the other hand, more interest shown in ordinary and modern types of mountain activities generates more willingness to choose another place than DSNP, if the proposed area-related restrictions are implemented.

Moreover, those considering DSNP wilderness area are on average less willing to choose another place than DSNP, if the proposed area-related restrictions are implemented. Similarly, age is negatively related to reactions to the proposed area-related restrictions. The model explained 17 per cent of the variance.

Table 3 near here

6. DISCUSSION AND CONCLUSIONS

6.1. Implications of *track restrictions*

Management regulations seem to influence future opportunities for users in several ways, whether they will stay in the same area or replace the area with a new one, as several earlier studies of recreational opportunity in protected areas have shown (Schindler & Shelby 1995, Schneider & Hammit 1995). For the strategy “track restrictions” in central areas of DSNP, where visitors have a negative impact on vegetation or wildlife, we find that the group of visitors that hike along marked tracks (HIKING) and women (GENDER) would prefer to find another recreational area than DSNP. On the other hand, visitors who were strongly attached to the DSNP area (ATTACHMENT), or visitors who wish to experience nature alone or with few other visitors (SOLITUDE), welcome “track restrictions” and would use the area even more if such restrictions were implemented. Understanding these differences is crucial for a management situation, as they clearly distinguish between different visitors segments to the

park: the majority of tourists (foreign and national) use the marked trail and cabin network of the Norwegian Trekking Association (DNT), while local users and select others pursue subsistence harvesting off the tracks. More foreign visitors seek wilderness compared to Norwegian visitors (Vistad & Vorkinn 2012), and according to visitor studies in Iceland (Sæþórsdóttir 2010, 2011), the wilderness seekers prefer to hike in an undeveloped natural environment and prefer more primitive conditions including a low degree of infrastructure and development. The main purpose of “track restrictions” is to pull visitors away from vulnerable areas and lead them to less vulnerable areas. Mostly, this strategy implies to guide visitors away from wild reindeer habitat, either to areas outside of the national park or to the fringe areas of the park. The predominant user group in DSNP (about 80%) is hikers (Gundersen et al. 2013c) and they are rather diverse in demography and motivations for visiting the area. However, a strong characteristic of hikers is that they stay on and follow the marked track system in the DSNP area, whether they visit for a day trip or are on a cabin-to-cabin hike over several days. Comparable surveys using self-registration boxes at the main entrances in three national parks in southern Norway showed that the proportion of visitors mostly following marked tracks was 80% or higher (80% in DSNP, 83% in Hallingskarvet NP and as high as 92% in the park the Rondane NP) (Andersen et al. 2011, Wold et al. 2012, Gundersen et al. 2013a). Although these three national parks vary significantly in their amount of infrastructure, accessibility through designated entrances, proportion of wilderness (distance from infrastructure) and importance for tourism, at least four out of five visitors are only using marked tracks. The few visitors who either walked mainly outside marked tracks or combined on-track with off-track (max. 20% of all visitors) would not be affected much by management based on “track restrictions” and manipulation of track features. These visitors would be much more seriously affected by “area restrictions”.

The mentioned three national park surveys show that 47%, 35% and 37% in respectively DSNP, Hallingskarvet and Rondane are first time visitors, either foreign or domestic (Andersen & Gundersen 2010, Wold et al. 2012, Gundersen et al. 2013b). First-time visitors are generally more diverse (e.g. Cohen 2003), depending on whether the visit was planned and organized or a random day stop on a round-trip. First time visitors, e.g. to DSNP differ significantly with regarding to their knowledge about the actual national park, and in general, they are easy to direct by different management actions, including both “track restrictions” and “area restrictions”, as they need and will seek specific information about the management setting, for navigation and safety considerations (Fredman et al. 2005, 2007).

6.2. Implications of *area restrictions*

For the strategy “area restrictions” the results indicate that visitors who pursue ordinary recreational activities (mainly hiking) and modern recreational activities (mountain biking, kiting, rock climbing etc.) would want to move to other mountain areas. Together, these two groups comprised the majority of visitors to DSNP. The only category of users who would desire to stay is the segment of traditional harvesters (hunting, fishing, berry picking) and pastoralists. These users are mostly local inhabitants and cabin owners, and they are less flexible in substituting to another area if regulations would reach an unacceptable level. As almost 50% of the land in Norway is alpine (above the treeline), plenty of substitutes exist for a mountain region like Dovrefjell. Interestingly, the two visitor constructs, HIKING (visitors motivated to hike along marked tracks) and WEAR (visitors who experienced that tracks are heavily impacted and that there is unacceptable behavior in the area) state that they intend to stay in the DSNP area even with “area restrictions” implemented. An explanation might be that these visitors do not realize that “area restrictions” will affect the track infrastructure within the area, if the hikers stay on track. In relation to impact on wild reindeer, traffic on

marked tracks and infrastructure can function as a barrier for migration to areas that are functionally important for the reindeer population (Nellemann et al. 2003, 2010). To achieve the required effects of management actions in important migration corridors for wild reindeer, the category “area restrictions” might also include restrictions for visitors both on and off marked tracks (Strand et al. 2010, 2013). For the WEAR group the explanation could be that “area restrictions” reduce the pressure and intensity of use, and consequently reduce the extent of impacted ground and vegetation, as well as leading to less litter in the terrain and vandalism on infrastructure and nature.

Land use within protected areas has many facets; our results show that the two main groups of users/visitors, namely hiking tourists and local users, have very different responses to “track restrictions” and “area restrictions”. “Area restrictions” are less preferred by the local community, and therefore the associated management actions will have less support in these communities. Local use is strongly connected to the tradition of subsistence harvesting and pastoralism. As mentioned above, tourists, and especially first-time visitors and foreign visitors, have little prior knowledge about the place, making it easy to lead them through management measures (Fredman et al. 2005). By contrast, subsistence users and pastoralist have a strong attachment to the area, have a long-term experience with the landscape and therefore relate to the area in a completely different way. They hardly regard themselves as ‘visitors’ since this term is strongly associated with the use of mountains as tourists (Haukeland et al. 2011, Vistad & Vorkinn 2012, Flemseter et al. 2013). The consequences of “area restrictions” will be much more serious for them than for ‘the visitors’, as it is “their mountain” area that is affected.

6.3. Implication for management strategies

Among the spectrum of opportunities to guide recreation in an adaptive management process, “area restrictions” and especially “track restrictions” are the two main strategies available for the management authority¹. The ambition with the previously mentioned regime shift in management and planning of alpine national parks and wild reindeer ranges in Norway is to implement a knowledge based “adaptive management” process (Strand et al. 2013, Kaltenborn et al. 2014a). The main challenge is to balance the recreational use and further tourism development of the area with protection of the landscape, wild reindeer, native vegetation etc. A program for developing visitor strategies in national parks in Norway has recently been initiated by the Norwegian Environment Agency. A basic understanding of visitor use, their motives and how they experience the landscape is crucial both in order to pave the way for good experiences and to find solutions for how to include and manage acceptable use and visitation (Kaltenborn 1994, Kaltenborn & Qvenild 2011, Haukeland et al. 2011). The underlying premise is that an adaptive management approach is well suited for situations with lack of knowledge and uncertainties about the ecological system (i.e. several competing ecological hypotheses can be formulated and tested), and with a high degree of control on the societal/institutional process in the social system, with possibilities to manipulate the system in the management process (Gregory et al. 2006, McFadden et al. 2011, Tyre & Michales 2011). The latter is fundamental in order to plan, implement, monitor and test the hypothesis under consideration (Folke et al. 2005). The possibility to control the social conditions requires good knowledge and understanding of the social diversity in the actual geographical area and of the societal drivers and political goals concerning the area.

Knowledge has been lacking about visitor numbers and categories and their needs, preferences, behavior and response to management actions in Norwegian national parks,

¹According to the Nature Diversity Act (2009), area restrictions within a national park might be more controversial than track restrictions, depending on the size of the restricted area. § 35 of the Act states that traffic on foot can only be prohibited in limited parts of a national park.

whether management plans and actions work as intended (Vistad et al. 2007). Our results show that the two main management strategies (track restrictions and area restrictions) are met with very different responses from different visitor or user groups. These differences will likely have large consequences for future nature use and management, either for the presumed effect of a chosen management tactic concerning problematic use, for the different user groups, or for the legitimacy of the actual tactic.

To conclude, “track restrictions” and changes to the track infrastructure affect visitors such as cabin-to-cabin hikers, foreign visitors, females, and first-time visitors, while “area restrictions” will affect local users, especially subsistence harvesting (hunting, fishing, berry-picking etc.) and pastoralists, and wilderness seekers. Implementing “area restrictions” is highly controversial in Norway, because the Outdoor Recreation Act (1957) grants open access to and free roaming on all “outfield” land for hikers, skiers etc. The Nature Diversity Act (2009) explicitly states that this right generally applies also in national parks. “Area restrictions” can only be implemented on limited parts of a national park, and only for protecting nature (§ 35).

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Table 1
Psychometrics of the measurement model.

LATENT CONSTRUCT Manifest variables	λ	t-value	CR	AVE
TRACK RESTRICTIONS			0.79	0.50
Removal of some tracks in central mountain areas	0.647	7.263		
Building up prepared tracks on the outskirts of the mountain	0.456	4.223		
Fewer prepared ski tracks	0.857	10.726		
More prepared ski tracks on the outskirts of the mountain	0.791	8.898		
AREA RESTRICTIONS			0.87	0.62
Application requirement for the use of specific areas on the mountain	0.870	24.522		
Prohibition of putting up a tent in areas outside the tourist cabins	0.748	19.075		
Shorter opening hours for tourist cabins in the national park area	0.644	13.546		
Prohibition of hiking in certain areas without a guide	0.863	23.973		
WILDLIFE			0.77	0.62
Opportunities for observing reindeer	0.857	14.333		
Opportunities for observing other animals and birds	0.717	13.656		
HIKING			0.53	0.37
Terrain easy to move about in	0.740	13.433		
Many hiking possibilities	0.446	10.762		
ATTACHMENT			0.86	0.76
Have been to the area several times	0.739	15.725		
Area has a special meaning to me	0.984	17.621		
PREPARATION			0.82	0.44
There are plain campsites with toilets, firewood, fire rings and bins	0.538	16.697		
You can dispose of litter in bins along the way	0.479	13.683		

There are marked trails in the area	0.761	36.852		
Trailheads and crossroads are well signposted	0.728	31.246		
Boardwalks are provided in wet marshes	0.755	34.214		
There are huts/lodges where food is served with made beds	0.648	23.672		
SOLITUDE			0.60	0.44
You meet a lot of other visitors during the trip (reversed)	0.809	18.120		
You can hike for hours without meeting anyone	0.478	12.321		
WEAR			0.68	0.42
Some of the tracks in the area are worn out	0.605	13.637		
There are visitors who do not know how to behave on the mountain	0.560	13.284		
There are too many visitors in the area during the high season	0.755	16.651		

λ =Standardised coefficients; CR=Construct reliability; AVE=Average variance extracted.

Table 2

AVE of and squared Pearson correlations between latent constructs.

	TRACK	AREA	WILD- LIFE	HIKING	ATTACH- MENT	PREPAR- ATION	SOLITUDE	WEAR
TRACK	1							
AREA	0,32	1						
WILDLIFE	0,01	0,01	1					
HIKING	0,06	0,03	0,04	1				
ATTACHMENT	0,01	0,02	0,02	0,11	1			
PREPARATION	0,05	0,00	0,02	0,13	0,01	1		
SOLITUDE	0,10	0,00	0,03	0,14	0,00	0,33	1	
WEAR	0,07	0,02	0,03	0,07	0,00	0,14	0,15	1
AVE	0.50	0.62	0.62	0.37	0.76	0.44	0.44	0.42

Table 3.
Results of the structural model.

EXOGENOUS	ENDOGENOUS		TRACK		AREA	
		β	SE	β	SE	
WILDLIFE		-0.091 (-0.126)	0.059	0.003 (0.003)	0.065	
HIKING		0.278* (0.262)	0.145	-0.227* (-0.166)	0.139	
ATTACHMENT		-0.103* (-0.146)	0.056	-0.081 (-0.088)	0.054	
PREPARATION		0.074 (0.106)	0.078	-0.046 (-0.051)	0.081	
SOLITUDE		-0.170** (-0.246)	0.080	0.088 (0.099)	0.086	
WEAR		-0.085 (-0.070)	0.118	-0.356*** (-0.227)	0.116	
Traditional mountain outdoor activity		-0.044 (-0.063)	0.054	0.009 (0.010)	0.048	
Ordinary mountain activities		0.083 (0.076)	0.080	0.282*** (0.197)	0.071	
Modern mountain outdoor activities		0.005 (0.005)	0.061	0.128** (0.118)	0.056	
Perceive Dovre as wilderness area		-0.048 (-0.028)	0.133	-0.210* (-0.096)	0.111	
Gender (Female=1)		0.186* (0.128)	0.112	-0.146 (-0.078)	0.094	
Age		0.002 (0.031)	0.004	-0.009** (-0.135)	0.004	
Educational level		0.089 (0.048)	0.126	0.055 (0.023)	0.114	
Nationality		-0.109 (-0.069)	0.120	0.000 (0.000)	0.101	
R-SQUARE			0.19		0.17	

Indicates statistical significance at *p<0.1; **p<0.05; ***p<0.01
Standardised coefficients are provided in parentheses.



Fig. 1. Study area: Dovre-Sunndalsfjella National Park.

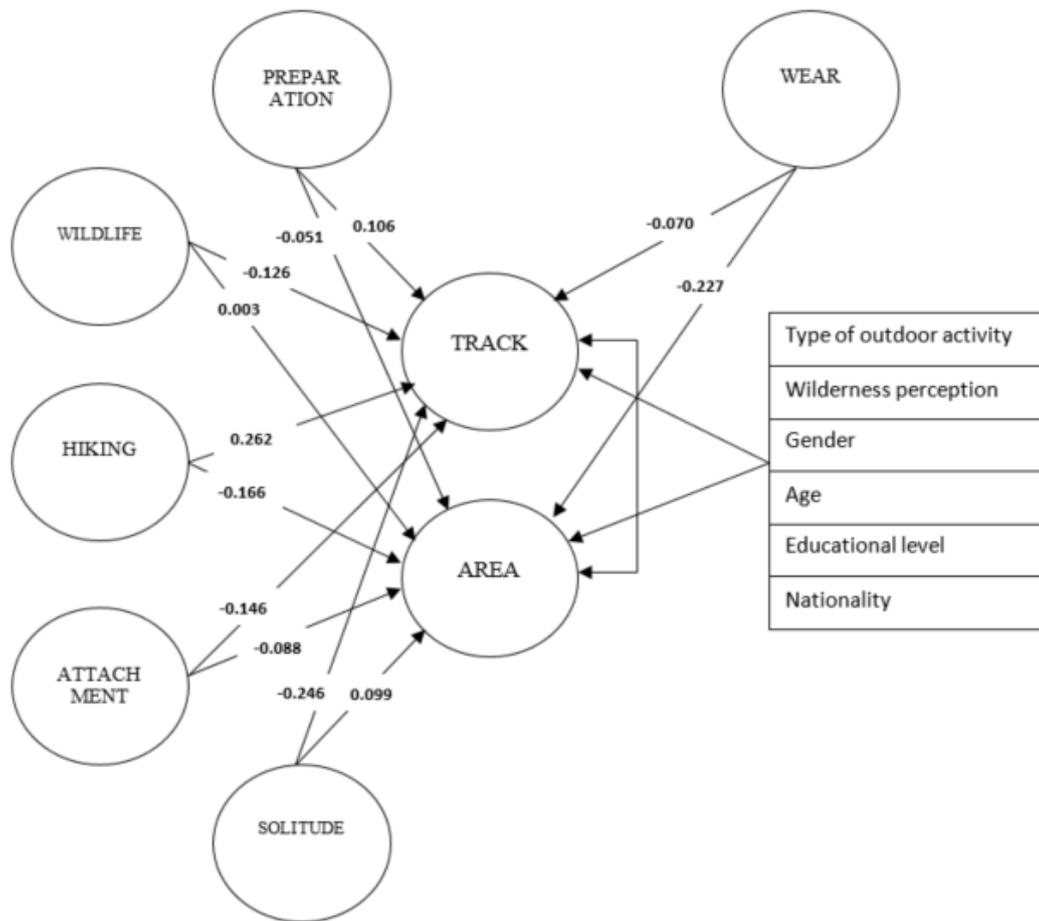


Fig 2. The research model. Rectangles represent manifest variables while ellipses represent latent variables and the numbers are the standardised coefficients.