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Multiple Criteria Decision Analysis with Consideration to Place-specific Values in Participatory Forest Planning

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The combination of multiple criteria decision analysis (MCDA) and participatory planning is an approach that has been applied in complex planning situations where multiple criteria of very different natures are considered, and several stakeholders or social groups are involved. The spatial character of forest planning problems adds further to the complexity, because a large number of forest stands are to be assigned different treatments at different points in time. In addition, experience from participatory forest planning indicates that stakeholders may think about the forest in terms of place-specific values rather than in forest-wide terms. The objective of this study was to present an approach for including place-specific values in MCDA-based participatory forest planning and illustrate the approach by a case study where the objective was to choose a multipurpose forest plan for an area of urban forest in northern Sweden. Stakeholder values were identified in interviews, and maps were used to capture place-specific spatial values. The nonspatial and nonplace-specific spatial values were formulated as criteria and used to build an objective hierarchy describing the decision situation. The place-specific spatial values were included in the creation of a map showing zones of different silvicultural management classes, which was used as the basis for creation of forest plan alternatives in the subsequent process. The approach seemed to work well for capturing place-specific values, and the study indicates that formalized methods for including and evaluating place-specific values in participatory forest planning processes should be developed and tested further.

Keywords forest management, decision support, public participation, spatial planning
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1 Introduction

Forest planning has traditionally meant planning of timber production. However, nowadays interest is frequently directed towards nontimber forest values, and new methods for planning are needed. Increasingly, the value of forests cannot be considered purely in economic terms, and additional goals must be considered, such as conserving biodiversity or increasing possibilities for recreation. This results in planning situations where multiple criteria of very different natures have to be considered, often involving several stakeholders or social groups. An approach that has been tested in situations like these is the combination of multiple criteria decision analysis (MCDA) and participatory planning. The rationale for using MCDA in the participatory process is the possibility of incorporating stakeholder values in a decision-making situation and, given these values, to identify the most appropriate alternative or action to take. Appropriately used, MCDA can help to structure the decision problem clearly, handle both qualitative and quantitative objectives, and create a model that can be used as a basis for discussion with different stakeholders (Belton and Stewart 2002). If we assume there will be a limited number of distinct alternatives to decide on, this variety of MCDA is called multiattribute decision analysis (Hwang and Yoon 1981, Malczewski 2006). A general model of the participatory MCDA process can be described in the following way:

1) Definition of the decision problem, including identification of stakeholders and criteria.
2) Identification or generation of alternative solutions to the decision problem.
3) Elicitation of the stakeholders' preferences for criteria and evaluation of alternatives in terms of each criterion.
4) An overall ranking of alternatives is obtained by using some kind of decision rule to combine preferences for criteria and alternatives. In a situation with multiple stakeholders, individual preferences must be aggregated in some way in order to obtain a group preference.

Forest planning problems have a spatial character that adds further to the complexity created by multiple criteria and multiple stakeholders, and this may require the use of a geographical information system (GIS). Typical spatial problems that have been addressed with GIS-based MCDA are the land suitability problem, where, e.g., different land uses can be located in a landscape based on analyses of the suitability of the land, and the site selection problem, where the task is to identify the most suitable location for, e.g., a factory or plant of some kind (Malczewski 2006). Forest planning problems are typically larger and more complex than these types of problems because of the spatial and temporal scales that characterize forest planning. Generally, in a forest planning problem, a relatively large number of forest stands are assigned different treatments at different points in time (Andrienko et al. 2007). Malczewski (2006) named this kind of problem as plan/scenario evaluation. Current approaches for GIS-based MCDA that have been mainly developed for the land suitability and site selection problem types may thus require further development to be applicable to complex forest planning problems.

In situations with multiple objectives and multiple stakeholders, the problem is to define appropriate trade-offs between conflicting objectives in order to design or identify the most suitable plan with respect to the values of the stakeholders. Experience from participatory forest planning indicates that there are different types of values, and that stakeholders may think about the forest in terms of certain specific areas rather than in general forest-wide terms (Cheng and Mattor 2006, Kangas et al. 2008, Saarikoski et al. 2010, Nordström et al. 2010). In addition, the values connected to these areas are not exclusively utilitarian and instrumental, but often intrinsic and non-instrumental (Bengston 1994). However, traditional planning methods are mostly focused on instrumental values based on scientific and technical knowledge. To capture non-instrumental values, planners need to find alternative methods and ways of thinking that are able to incorporate local and traditional knowledge. For instance, Williams and Stewart (1998) discussed the concept of "sense of place" and possible implications for forest management. Sense of place is a complex phenomenon, not only denoting that there are values, feelings and meanings associated with a specific place, but also that these values, feelings

and meanings may be difficult to identify and quantify, especially for someone from outside this context and possibly even for the "inside" people, who may not recognize these values until they are threatened or lost (Williams and Stewart 1998). The sense of place is socially constructed and constantly reconstructed within people's minds and the shared culture and practices, similar to the dynamics of ecosystems. People may connect different meanings to the same places, which may lead to conflicts. Furthermore, forest managers and planners are mostly outsiders and may not be aware of the meanings attached to these places. However, to make the planning legitimate and successful, these different meanings have to be recognized.

Not including place-specific values in an MCDA process could result in exclusion or misrepresentation of stakeholder values, meaning that the definition of the decision problem will be incomplete. If MCDA is to be used in a participatory context, the stakeholders should have the opportunity to express these place-specific values and make sure they are included in the evaluation process. Thus, different types of values have to be recognized and different methods for expressing and handling these values are needed.

In this paper, the focus is on participatory forest planning using MCDA. We approached the spatial planning problems from a stakeholder perspective, and from a forest planning context. Thus, the forest planning problem addressed in this paper consists of selecting one among many treatments for each stand and time period in a landscape so that the objectives of the stakeholders are maximized.

The values held by stakeholders are used as the starting point for the study rather than formalized criteria. With this view, stakeholder values can be subdivided into *nonspatial values* and *spatial values* (Fig. 1). Nonspatial values can be expressed as the type of criteria commonly defined for MCDA and can be measured without using any spatial analysis, e.g., "Area of old-growth forest". Spatial values, in turn, can be divided into *nonplace-specific spatial values* and *place-specific spatial values*. Nonplace-specific spatial values can also be expressed as conventional MCDA criteria, but spatial analysis is needed to measure the performance of this type of criteria;

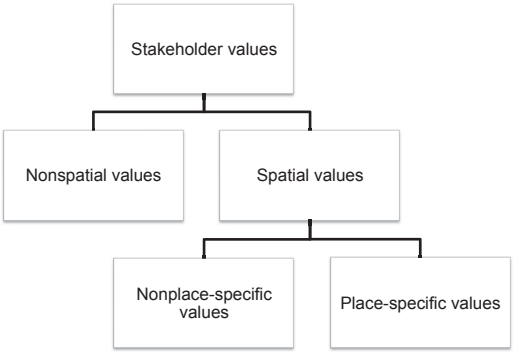

Fig. 1. A representation of the connection between different types of values that forest stakeholders may want to express in a participatory planning process.

for instance, some kind of measure describing a pattern in the landscape may be used. "Fragmentation of old-growth forest" is a criterion of this type; i.e., it is not only the amount of old-growth forest that is important, but also the spatial distribution. "Area of habitat for species X" may also be a criterion of this type since habitat patches may need to be of a certain size and within a certain distance of other patches. Place-specific spatial values concern specific areas that are important because of their location, often in combination with certain structures or properties of the forest. The areas concerned are not interchangeable; i.e., the loss of one area cannot be fully compensated for by preserving another area. A place-specific criterion could be expressed as, e.g., "Preserve stand no. 5". This terminology will be used here to characterize previous studies as well as for the construction of a methodology that includes these categories in an integrated approach.

The combination of participatory forest planning and MCDA has been applied in a number of cases in recent years (Kangas 1994, Pykäläinen et al. 1999, 2007, Kangas et al. 2001, 2005, Ananda and Herath 2003a, 2003b, Laukkanen et al. 2004, Sheppard and Meitner 2005, Hiltunen et al. 2008). In these case studies, stakeholder values are expressed as criteria in a general forest-wide way, e.g., "Net present value" or "Area of old-growth forest". Nonspatial and nonplace-specific spatial criteria are included in the objective hierarchy defining the decision problem, but place-specific

spatial criteria are not. Commonly, stakeholders have been involved in the identification of criteria, but criteria are sometimes defined exclusively by experts, analysts, or an existing criteria and indicator framework (Pykäläinen et al. 1999, Maness and Farrell 2004); in a few cases, it is unclear how criteria were identified (Kangas et al. 2001, 2005, Ananda 2007). Alternatives are mostly defined by analysts or experts (e.g., Laukkanen et al. 2004, Sheppard and Meitner 2005, Ananda 2007); in some cases, stakeholders are consulted (e.g., Kangas et al. 2005, Pykäläinen et al. 2007), and in a few cases, additional alternatives are produced as a result of stakeholder input (e.g., Hiltunen et al. 2008). How alternatives are produced, and if place-specific spatial values are included, are not clearly stated.

Few case studies have tested approaches for identifying and including place-specific values in participatory forest planning. Hytönen et al. (2002) applied a spatial participatory approach to capture stakeholder values, connect the values to certain places, and weight the values in order to create a score map. Store (2009) used the results from this study to produce a recreational-use-based suitability score map for the same area. Suitability maps were also produced for the habitat of redstart birds (*Phoenicurus phoenicurus*) and for timber production in the same area. MCDA methods were then used in a GIS environment to combine these suitability maps and identify areas where the different forest uses are compatible and mutually conflicting, respectively. Ståhle (2000) used an approach called social value mapping for capturing place-specific stakeholder values in a Swedish urban woodland planning case. Through interviews, observations, and literature reviews, maps showing eight different social values were produced. These maps were merged, resulting in a map that indicates especially attractive areas and the relationships between different values. Tyrväinen et al. (2007) and Kangas et al. (2008) used the social value mapping approach in Finland in an urban woodland planning case and a forest planning case, respectively. In these cases, the social value mapping was accomplished through questionnaires about the values of the forest supplemented by maps for marking specific places and connecting them to certain values. However, the methods for place-specific value identification in these studies were not integrated into an approach where participatory forest planning is combined with MCDA.

The objective of this study is to present an approach for including place-specific values in MCDA-based participatory forest planning. The approach is illustrated by a case study where MCDA was integrated into a participatory process for choosing a multipurpose forest plan for an area of 8000 ha of urban forest in northern Sweden. In the case study, stakeholder values were identified in interviews, in which maps were used to identify place-specific spatial values. The nonspatial and nonplace-specific spatial values were formulated as criteria and used to build an objective hierarchy describing the decision situation. The place-specific spatial values were used in the definition of zones of different silvicultural management. The resulting zonal map was then used as a basis for creation of three forest plan alternatives for different strategic directions.

2 Methods

The approach is based on the idea that place-specific values should be extracted into a zonal map. The zones define different management regimes. Because forest management can be described in so many different dimensions, it is essential to design the process so that concepts can be clarified, especially for stakeholders with limited experience of forestry and forest operations.

The process for including general, forest-wide, and place-specific stakeholder values in an MCDA-based participatory forest planning process consists of the following general steps:

1) Identification of different kinds of stakeholder values.
2) Definition of zones based on place-specific spatial values and other geographical information.
3) Creation of an objective hierarchy consisting of nonspatial and nonplace-specific spatial criteria.

In step 1, the purpose is to identify all stakeholder values relevant to the planning situation in question, using a variety of the social value mapping techniques (Ståhle 2000), focusing not only on recreational values but other values as well. Stake-

holders need to be involved in this step to ensure that their values are included and the methods used must be able to capture the different kinds of values. This can be done through individual interviews where stakeholders are given the opportunity to express their values in a natural way as opinions, wishes, and needs. Because certain questions need to be answered, e.g., concerning the activities of the stakeholders and their views on forest management, the interviews should be semistructured with at least some predefined questions. In the interviews, maps should be used so that stakeholders can mark areas of interest on the map and explain why these areas are important and how they are used. The interview should also include questions on how these areas should be managed to benefit the stakeholder values. A number of alternative, predefined silvicultural management classes are described to the stakeholder who is asked to assign a preferred management class to each of the identified areas.

The starting point in step 2 is the maps from step 1. If paper maps were used, the areas marked by stakeholders are first introduced as vector-based objects into a GIS environment through digitalization. Information about the areas, e.g., management class, is added to the object table. Then, if stakeholder groups have been defined, common thematic maps for each group are created from the individual maps. At this stage, other relevant geographic information should be included, such as databases on nature reserves etc. The stakeholder maps and other relevant information are then used as a basis for delineating zones that are characterized by different management classes. The zones are defined by an analyst, but the resulting zonal map is then presented to stakeholders for feedback, and adjustments are then made iteratively.

In step 3, the purpose is to formulate nonspatial and nonplace-specific spatial values as criteria and organize them into an objective hierarchy, which defines the decision problem and the relationships between different criteria. The information gathered in the previous step is processed by an analyst; nonspatial and nonplace-specific spatial criteria are identified and formulated to be applicable to a forest planning situation. Relationships between criteria are identified and criteria are organized in a fundamental objective hierarchy, according to the terminology of Keeney (1992), so that lower-level criteria are specifications of higher-level criteria. In this step, it may be possible to identify similarities in values of different stakeholders and group the stakeholders and criteria according to this, e.g., recreationists and recreation criteria. The resulting hierarchy is then presented to stakeholders for feedback and adjustments can be made iteratively.

In the subsequent participatory process not covered in this study, stakeholders' preferences for the criteria in the objective hierarchy are elicited using a suitable MCDA method, and the performance of alternative forest plans is evaluated using the criteria in the objective hierarchy (see Nordström et al. 2010). The zonal map is used as a basis for generating the alternative forest plans, starting on the basis that each forest stand is assigned a treatment class defining the set of allowed treatment schedules based on which zone the stand belongs to.

3 Case Study

The town of Lycksele in northern Sweden is the regional center in a forest landscape area where commercial forestry is an important industry for the local economy. However, the forest holds other values and is important to the inhabitants of the town for purposes other than timber production, e.g., for reindeer (*Rangifer tarandus*) herding, for preserving biodiversity, and for providing forest suitable for recreation, hunting, and fishing opportunities. The existence of several seemingly incompatible interests in the forest is a potential source of conflict. In addition, there are several owners of the urban forest of Lycksele: the municipality of Lycksele, three commercial forest companies, the Church of Sweden, and several private land owners. To create a comprehensive overview of the forest use and management around the town of Lycksele, the municipality initiated a project with the aim of producing a multiple use forest management plan. The plan was to be a strategic forest management plan where both timber production and other uses of the forest were included. The plan was to cover a period of 100 years and a total area around the town of

8637 ha of productive forest was divided into 980 forest stands, encompassing approximately 964 ha of municipality forest, 7277 ha of forest belonging to the three forest companies and the Church of Sweden, and 396 ha of land owned by nonindustrial forest owners. The authors of this paper were charged with the task of designing and leading the planning process. The process started with a workshop for representatives from the three forest-owning companies, the Church of Sweden, the municipality, the Swedish Forest Agency, the County Board, and two of the authors. In this first meeting, the representatives formed a steering group for the planning process. The discussions in the meeting formed the basis for stakeholder analysis, which resulted in a list of stakeholders, mostly representatives from different organizations, who were to be interviewed regarding their criteria. The majority of these stakeholders were members of an existing network used by the municipality ecologist as a reference group in forestry-related issues.

The stakeholders were grouped into four different groups, hereafter called social groups: timber producers, reindeer herders, recreationists, and environmentalists. The social groups were not expected to be completely homogeneous concerning the interests of the stakeholders in the group, but the intergroup disagreements were judged more important than were intragroup disagreements. The number of representatives varied among the social groups. All the forest-owning companies and the municipality were included in the group of timber producers, resulting in five representatives, while there was only one person in the reindeer herders' group (the representative of the reindeer husbandry district of the area). The environmentalists were represented by two people from nongovernmental organizations and one person each from the municipality and the County Board. The recreation group was represented by 14 people; this number was a consequence of the existence of many associations using the urban forest.

3.1 Step 1, Identification of Values

In the first step, individual interviews were conducted with 24 people. The interviews lasted between 30 and 90 minutes and were semistructured. During the interviews, a form was used for making notes; this form contained basic questions about the activities of the stakeholders and their views on the forest and forest management. Stakeholders were given maps on which they could mark areas of interest to them and explain why they were important, how they were used, and what kind of forest management would support their use. The stakeholders had four different classes, covering different forms of management, to choose from. The meaning in terms of actions and consequences of the different forms of management was explained and discussed with the stakeholders.

All the social groups expressed values that could be formulated as conventional MCDA criteria, mostly nonspatial criteria. As for place-specific spatial values, the recreationists especially used the maps for pointing out areas of importance for different activities. Place-specific values were also important for environmentalists, who used the maps for marking habitats for certain species and areas with high natural values. The reindeer herder used the maps for marking areas used for gathering together the reindeer herds and critical passages along the migration paths of the reindeer. However, the reindeer herder did not want to mark good lichen grazing areas, which are very important for the reindeer herding industry during the winter. Instead, the general characteristics of good grazing areas were included as criteria in the objective hierarchy. The timber producers did not mark particular areas, but expressed general priorities referring to the forest data. It should be noted that the stakeholders specified one nonplace-specific spatial criterion, clear-cut size; the rest of the criteria were nonspatial.

3.2 Step 2, Definition of Zones

In step 2, the maps drawn at the interviews were digitalized as files in ESRI® ArcGIS® Desktop (version 9.2) so that maps showing the areas of interest to the stakeholders of the recreation, environmentalist, and reindeer herding groups could be created (see Fig. 2). Areas with high biological values set aside for conservation by the forest owners were also included in areas of biodiversity interest identified by the environmentalists. The maps

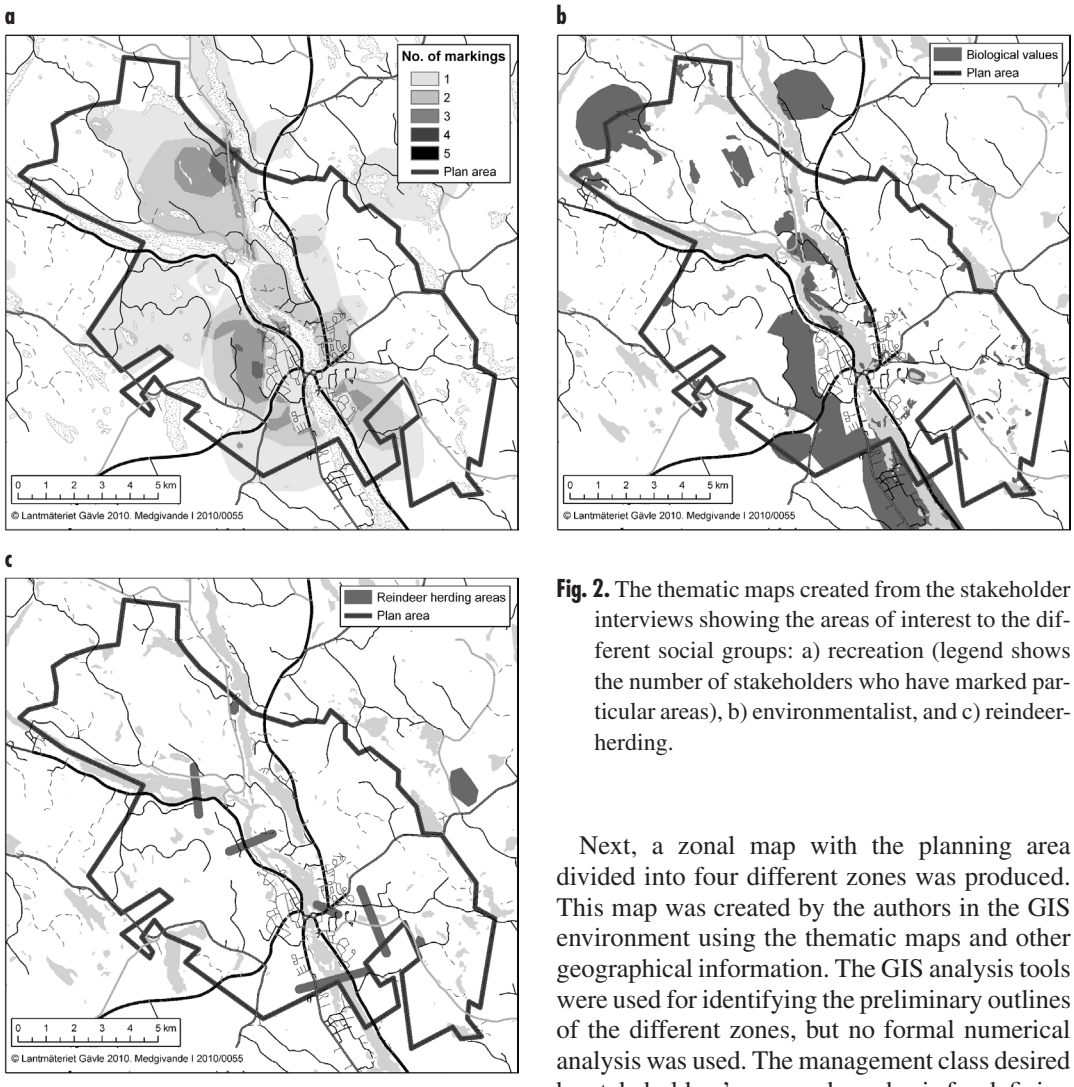

Fig. 2. The thematic maps created from the stakeholder interviews showing the areas of interest to the different social groups: a) recreation (legend shows the number of stakeholders who have marked particular areas), b) environmentalist, and c) reindeer-herding.

drawn by stakeholders were overlaid with existing information about areas with high biological and recreational values. These thematic maps showing the areas important to different stakeholder groups had information about use of the area and desired management class attached in attribute tables. All interviewed stakeholders were invited to a meeting where the thematic maps and a map showing the desired management class were presented for discussion. However, only the steering group, a private forest owner, and one person from the recreationist group attended this meeting.

Next, a zonal map with the planning area divided into four different zones was produced. This map was created by the authors in the GIS environment using the thematic maps and other geographical information. The GIS analysis tools were used for identifying the preliminary outlines of the different zones, but no formal numerical analysis was used. The management class desired by stakeholders' was used as a basis for defining four different zones of silvicultural management. The four zones were as follows: 1) zone with no commercial management, 2) zone with no clear-cutting, 3) zone with reinforced consideration to objectives other than timber production, and 4) zone with standard forest management. Most areas of high environmental value were assigned to zone 1 but some areas were assigned to zone 2 or 3, e.g., bird habitats where cutting may be allowed or even beneficial. In general, the most intensely used recreation areas were assigned either to zone 1 (when overlapping with environmental values) or zone 2; other important recreation areas and areas close to housing areas

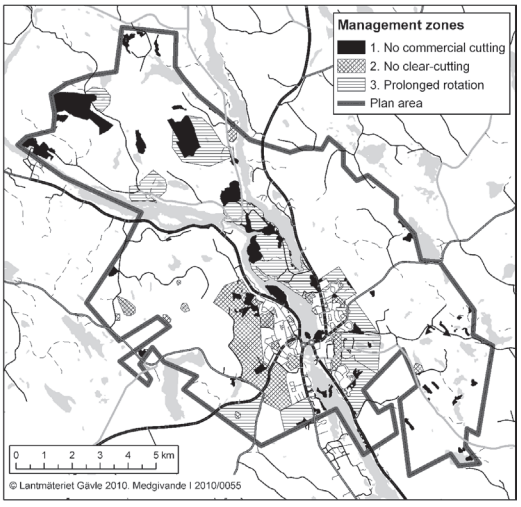

Fig. 3. The zonal map that was created in the process in Lycksele based on place-specific values, in which the zones indicate the type of silvicultural management that should be applied to the forest.

were assigned to zone 3. In the zonal map, buffer zones adjacent to water were included in zone 1 as a constraint. The zonal map was sent to the members of the steering group to give them the opportunity to comment and suggest changes. Some minor adjustments were made to the zonal map after this review. The final version of this zonal map is shown in Fig. 3.

3.3 Step 3, Creation of the Objective Hierarchy

In step 3, which was the definition of an objective hierarchy, the information from the interviews was used to construct a preliminary objective hierarchy for each of the four social groups. The hierarchies and the maps were presented to the stakeholders for discussion at the same meeting, and minor changes were made to the hierarchies according to opinions expressed at the meeting.

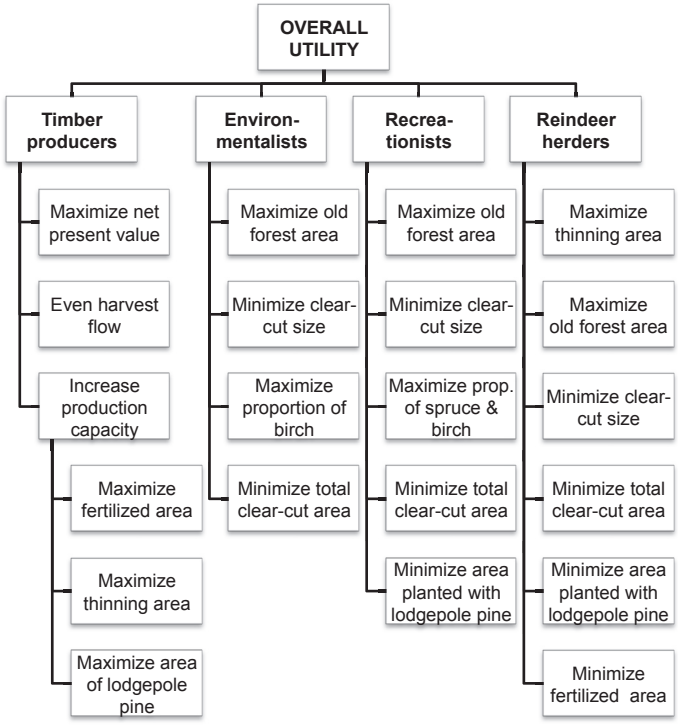

Fig. 4. The objective hierarchy consisting of criteria formulated from the non-spatial values expressed by stakeholders in the Lycksele process.

One objective hierarchy, containing nonspatial and nonplace-specific criteria, was produced for each of the four social groups. The common hierarchy was constructed by joining the four social groups under the overall objective "Overall utility" (Fig. 4). As can be seen, environmentalists, recreationists, and reindeer herders had several criteria in common, whereas timber producers expressed a divergent set of criteria.

3.4 The Subsequent Process

In the subsequent process, the zonal map was used as the basis for development of three forest plan alternatives of different strategic directions. MCDA was then used to elicitate the stakeholders' preferences for the criteria in the objective hierarchy and the alternatives. In this case study, the Analytic Hierarchy Process (Saaty 1990) was used, but any suitable MCDA method could have been used. The individual preferences of the stakeholders were aggregated into a common ranking of the alternatives using the weighted arithmetic mean method. The plan that ranked highest was later adopted as the multiple use plan for the area by the municipality and the forest owners. The municipality will integrate the plan into existing forest management plans. On a voluntary basis, the forest companies agreed to use the plan as a tool in their planning processes, but they have not formally undertaken to pursue the plan. For a full description of the process in Lycksele, see Nordström et al. (2010).

4 Discussion

This paper presents an approach for including place-specific values in a participatory forest planning process using MCDA. In the following section, the general approach is discussed based on experiences from the case study.

The use of maps during the interviews supported the process of identifying values. Most stakeholders used the maps for marking areas, especially the recreationists, although the environmentalists and, to some extent, the reindeer herder, also expressed place-specific values by means of the maps. The forest company representatives, however, mostly talked in forest-wide terms. With a few exceptions, the approach seemed to work well; only a few stakeholders seemed unsure because they were not accustomed to using maps or because the scale or general layout of the maps was a novelty to them.

For the majority of stakeholders, explaining how specific areas were used and what kind of management they wished for in these areas was not a problem. In some cases, the questions about management were complemented by asking the stakeholders what they wished the forest to look like, and this information was then used to decide which management class was most suitable. That the management classes were predefined might have been a limitation for the stakeholders, but from a practical perspective it was necessary to have a few well-defined management classes that could be modeled when generating treatment schedules for the alternatives later on in the process. From the outset, the interviews were planned to include a stage where the stakeholders were asked to allocate points to the areas they marked in proportion to the importance of each area. Because this proved to be difficult for the stakeholders and would have resulted in information of dubious value, this part was excluded from the interviews. A less complicated procedure would have been to ask the stakeholders to rank the areas rather than allocate points, which would result in ordinal but possibly more reliable information.

In this study, individual interviews with stakeholders were used to identify place-specific values, in contrast to the questionnaires used by Tyrväinen et al. (2007) and Kangas et al. (2008). This allowed a dialogue where the analyst could answer questions from and explain unclear points directly to the respondents, e.g., regarding the different management classes, so that uncertainties in the data due to misunderstandings were decreased. In addition, the analyst could ask clarifying questions and help stakeholders elaborate thoughts on their values, which yielded more information about the values than a predefined set of questions would have produced. If a questionnaire is used, the problem has to be very well-defined beforehand to ensure that the "right" questions are asked. Conversely, interviews produced qualitative data that may need

to be analyzed in another way than the data from questionnaires for which statistical analysis may be used. Furthermore, by using questionnaires, more people may be involved. Conducting individual interviews with many stakeholders may be a time consuming and burdensome procedure. Thus, in choosing methods for investigating place-specific values, the character of the situation and the number and types of stakeholders to be involved should be considered. An alternative to individual interviews and questionnaires is to bring stakeholders together in focus groups for the identification of values. A collective process like this would demand careful facilitation to ensure that all stakeholders are comfortable in expressing their values and that the communication is open and constructive (Ansell and Gash 2008). Approaches such as soft systems methodology (Checkland 1981) may be used to promote a creative and constructive group process. A successful group process for identifying values could support social learning, possibly resulting in better understanding of the values of other stakeholders and improving the ability to manage conflicts constructively (Garmendia and Stagl 2010).

In the present case study, the zonal map was created by analysts based on the stakeholders' place-specific values, and presented to the stakeholders for feedback and revision. Results from the subsequent process indicated that the zonal map was a useful tool for the forest owners in overall forest management planning, and not only as a basis for forest plans (Nordström et al. 2010). The zonal map is used for identifying areas where potential land use conflicts may arise and where consultation with stakeholders at the operational planning stage may become important.

The zonal map was created using ESRI® ArcGIS® Desktop but without applying any formal methods or GIS analysis tools. Instead, the stakeholders were given the opportunity to adjust the thematic maps in a meeting. In addition, the steering group wanted the possibility to review the zonal map before it was finalized. However, trust in the participatory process and the resulting map might have been improved by increased transparency as to how the zonal map was created. A formalized method for producing the zonal map could have increased the transparency, given that the method can be clearly explained to stakeholders. Such a method could combine the tools for suitability analysis from the GIS with MCDA, like the approach for sustainably locating different forest uses described by Store (2009) or the approach for protected area zoning developed by Geneletti and van Duren (2008). Moreover, with a formalized method it would be possible to assign different weights to different stakeholders or interests. For instance, reindeer herding is a means of livelihood and may thus be considered more important than recreation and could be given a larger weight, which would be reflected in the zonal map by including reindeer herding areas to a greater extent and by letting the needs of reindeer herding guide the choice of management class to a greater extent than recreation.

In this case study, the same zonal map was used as the basis for creation of all alternatives later on in the process, i.e., it acted as a constraint for all alternatives. However, as the zonal map was created by aggregating input from individual stakeholders, it would be possible to do this aggregation of place-specific values in different ways and produce several versions of the zonal map; e.g., the zones could have been drawn differently or several zonal maps with more and less consideration to different interests could also have been produced. Because the zonal map in itself turned out to be a valuable result, both process and outcome might have been improved by exploring alternative zonal maps. However, it should be recognized that there is a multiplicative relationship between the number of zonal maps and the number of alternatives to be computed and evaluated, i.e., for each zonal map a range of alternatives are needed to explore the space of nonplace-specific criteria.

Instead of including place-specific values as a constraint, they may be formulated as criteria and included in the objective hierarchy. This type of criteria would then be qualitative rather than quantitative and could be formulated as, e.g., "Location of recreation areas". One option is to let stakeholders evaluate this criterion in terms of maps showing the recreation areas at one or several specific points in time or for the whole planning period. Another option would be to use visualization to illustrate the consequences. The latter option would be especially attractive for values that are associated with aesthetics or

for stakeholders less experienced in interpreting maps. However, if this approach is used, the criteria have to be very clearly formulated and explained, to ensure that the stakeholders evaluate the criterion in question and are not distracted by other information that is shown on the maps.

In addition to the methodological issues discussed above, there are a number of difficulties connected to incorporating local people's viewpoint in the planning. First, there is the question of how to handle non-instrumental values. In this study, the focus on forest use and management class may have resulted in that non-instrumental values of the forest were neglected or that stakeholders did not feel it was acceptable or possible to express such values. To avoid this, the interviews could have used more open questions and pictures of different kinds of forest (see, e.g. Lindhagen and Hörnsten 2000). The second question is related to the first: How can sense of place be expressed and described and place-specific values be captured? The ready-made maps used in this study may be too static and inflexible in some situations. For traditional interviews, working directly with a GIS software enables dynamic display of different scales and features, and possibly the stakeholders may use the system for exploring and marking areas. Other options could be to make a group excursion to the forest together with the stakeholders, or make "go-along" interviews (Carpiano 2009) with individual stakeholders; that is, that the interview is conducted in the forest and the stakeholders show and describe what is important to him or her. Third, how can we handle the fact that the meanings and values attached to different places are continually changing? Clearly, plans cannot be static and planning has to be a continuing process, though that would require an earnest commitment both from the forest owner and the local community.

5 Conclusions

When used in participatory forest planning, MCDA methods have mostly been used for incorporating general, forest-wide values. However, some stakeholders think in terms of specific areas when they articulate their criteria and preferences and using an approach like the one described in this study may improve the possibilities of capturing stakeholder values more fully. That could in turn help to increase the stakeholders' trust in the MCDA-based participatory process and make it more legitimate. We hope that the approach presented here will find its way into the forest manager's tool box for spatial participatory forest planning. There is, however, still a need for developing and testing both approaches for assisting stakeholders in expressing and communicating place-specific values and formal approaches for incorporating these place-specific values in the planning process.

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