Participatory forest planning and multiple criteria decision analysis (MCDA)

Eva-Maria Nordström
Ljusk Ola Eriksson

Arbetsrapport 198 2007

SVERIGES LANTBRUKSUNIVERSITET
Institutionen för skoglig resurshushållning
S-901 83 UMEÅ
Tfn: 018-671000

ISSN 1401-1204
ISRN SLU-SRG--AR—198--SE

Participatory forest planning and multiple criteria decision analysis (MCDA)

Eva-Maria Nordström
Ljusk Ola Eriksson
Department of Forest Resource Management
Swedish University of Agricultural Sciences, Umeå

Preface

This paper is written on behalf of the Baltic Forest project (www.balticforest.net). It is based on work conducted in a larger project, “Konflikthantering i skogar med hög nyttjandetäthet” (Conflict management in intensely utilised forest areas) (Nordström 2007).

Eva-Maria Nordström
Ljusk Ola Eriksson

Umeå 15 December 2007

Table of contents

1 Introduction

With the industrial revolution, the human utilization of the forest took a new turn as wood became a commercial product (Östlund & Zackrisson 2000). Since then, economical considerations have pervaded the public perspective on forest and forestry. However, the awareness of the need for sustainability in the use of the forest resource has also grown, and during the last decades other values have entered the discussion and the practice of forestry. Today, sustainable forest management (SFM) where economical, ecological and social values are all satisfied, is a core element in the development of acceptable forest management practices.

Public participation is strongly related to SFM. In some industrialized countries, e.g. Canada, demands for participation in natural resource management have subsequently been incorporated into the legislation (Chambers and Beckley 2003), but in most countries there is no legal demand for participation. In Sweden for example, the only demand for participation in the Forestry Act is consultation before clear cutting in certain areas of reindeer herding. Forest certification, which is now covering extensive areas in several countries, plays an interesting role in the promotion of SFM. However, its main purpose is not public participation and the integration of social values into forestry (Angelstam et al. 2004). Internationally, there is the Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters. This convention has been ratified by Sweden amongst other countries, but it is difficult to make a strict interpretation of it. New approaches and methods are obviously needed in forest management planning to incorporate forest values other than timber production and to help solve conflicts of interest. There have been some attempts made by different types of projects. The Canadian Model Forest concept promotes participation in the work for SFM, and has been tried out in Sweden in the Vilhelmina Model Forest project (Svensson et al. 2004). Some of the LIFE projects sponsored by the European Union are also applications of participation with SFM as the objective; the project “Local Participation in Sustainable Forest Management based on Landscape Analysis” is a Swedish example of a LIFE project sponsored by the European Union (http://www.svo.se/minskog/templates/svo_se_vanlig.asp?id=8001, 2007-01-12).

A potentially powerful tool in the work for sustainable forest management (SFM) and participation is multiple criteria decision analysis (MCDA), an approach which can make it possible to handle complex decision situations involving conflicting interests and several stakeholders.

The purpose of this paper is to clarify concepts related to participation and present methods that are applicable in participatory planning. More specifically the following questions will be dealt with:

- What is meant by participation? What methods and techniques are available to participatory planning processes?
- What is MCDA and what phases do this approach require?

In order to illuminate the state of art of participatory planning in forestry, an analysis of a number of case studies is presented.

2 Participation

2.1 What is participation?

Running metres have been written about participation in different areas of application, in different forms, and under different names such as “participatory” or “collaborative planning” or “public involvement”. In case studies of participatory methods in areas like natural resource management and planning, this central term often lack a clear definition, even in scientific papers.

Existing definitions of participation often imply that participation is some kind of process; of communication, of decision making, of social change, or all of this simultaneously. This process involves actors, denoted respectively *people*, *those with legitimate interests*, *stakeholders*, and *have-not citizens*. Implicitly, these actors are not those that have the ultimate power over decisions and resources.

The use of the expressions *those with legitimate interests* and *stakeholders* convey the idea that there are those with the right to participate and a notion that it might be in the opponent’s power to set the rules for this. Who is a stakeholder is a basic participatory question. One standpoint is that everyone who is concerned, or affected, by or can contribute to the decision at hand is a stakeholder (Hunter & Bird 1997, Anon. 1996). Another standpoint is formed by the idea of public and citizen participation, and indicating that for democratic reasons, all citizens should have influence on the decision making.

There can be many reasons for undertaking a participatory process; these reasons may well influence who should participate. Basically, the purpose is either goal or process oriented; that is, participation can be used as a means to reach an end or it can be considered as an end in itself (Buchy and Hoverman 2000). The motive for using participation as a means to an end is often an expectation of effectiveness and facilitation of the implementation of decisions. If people that will be affected by consequences of a decision have participated in the process of decision making, they are hopefully motivated to support the decision.

Incentives for considering participation as an end in itself can be a notion of ethics and subtler, long-term motives. The participatory process ideally turns into a social learning process, which may lead to redistribution of power between the participants. Such a process generally demands a higher level of participation than a goal oriented participatory process.

2.2 Levels of participation

The power relationship between the participants is a very important aspect of participation. “Power” is here used in the sense of having control over resources and decision making. A participatory situation where it is unclear what impact the process will have on the final decision will give rise to misunderstandings, disappointed stakeholders and future mistrust. As a decision maker it is crucial to be explicit about the power relations in order to preserve credibility in the long run.

The level of participation indicates to what extent the participants have the possibility of influencing the outcome of the process and the process *per se*. It also tells something about the relationship between the participants; how power is distributed and what the intention with the process is.

The spectrum of participation is often modeled as a ladder where the rungs represent the different levels of participation. Several "ladders of participation", with a different number of steps and thus different levels of detail, have been suggested (see Arnstein 1969, Berkes 1994, Campbell 1996, Creighton 1986 in Priscoli 1997, IAP2 2003a, Sandström 2004, Wilcox 1994). Many of the models are modifications of the ladder of citizen participation, which Sherry R. Arnstein constructed in 1969.
A simplified version of Arnstein's ladder is published by the International Association of Public Participation (IAP2 2003a) (table 1). This model is made as a tool for classification and analysis of participation while Arnstein's ladder was intended as a political critique.

Table 1. IAP2's Public Participation Spectrum (IAP2 2003a)

Level	**Public participation goal**	**Promise to the public**
5 Empower	To place final decision-making in the hands of the public	We will implement what you decide.
4 Collaborate	To partner with the public in each aspect of the decision including the development of alternatives and identification of the preferred solution	We will look to you for direct advice and innovation in formulating solutions and incorporate your advice and recommendations into the decisions to the maximum extent possible.
3 Involve	To work directly with the public throughout the process to ensure public issues and concerns are consistently understood and considered	We will work with you to ensure that your concerns and aspirations are directly reflected in the alternatives developed and provide feedback on how public input influenced the decision.
2 Consult	To obtain public feedback on analysis, alternatives and/or decisions	We will keep you informed, listen to and acknowledge concerns and aspirations, and provide feedback on how public input influenced the decision.
1 Inform	To provide the public with balanced and objective information to assist them in understanding of problems, alternatives and/or solutions	We will keep you informed

2.3 Methods of participation

The level of participation is linked to how the participatory process is conducted; it is appropriate to use the participatory ladder as the starting point for the choice of a participatory method. The method used will to some extent direct the participatory process; what you get out will be in proportion to what you put in. The method should agree with the intended level of participation in order to be sufficient and efficient.
In table 2 are examples of suitable participatory techniques listed according to the level of participation; for a more detailed review of methods, see e.g. IAP2 2003b, Sidaway 2005, Wilcox 1994.
Both the method and level of participation should of course be adapted to the nature of the issue at hand. Does the question concern a lot of people and require extensive participation? Is the question "hot" — could it be expected to give rise to conflict or has it already done so? Is there a deadline for the decision and thus for the participatory process? And, of course, how much money can be spent on the process?

Table 2. The range of participatory techniques (Sidaway 2005, IAP2 2003b)

Level of participation	Techniques to consider, IAP2 2003b	Techniques to consider, based on Sidaway 2005
5. Empower	Citizen juries Ballots Delegated decisions	Grants Advice Visioning workshops: Planning for Real Participatory appraisal Site visits Development trusts
4. Collaborate	Citizen Advisory Committees Consensus building Participatory decision making	Joint working groups Advisory groups Team building Facilitated (visioning) workshops
3. Involve	Workshops Deliberate polling	Facilitated workshops: brainstorming consensus building and action planning Face-to-face meetings Interviews
2. Consult	Public comment Focus groups Surveys Public meetings	Meetings and interviews Staffed exhibits Reports Social surveys Consultative committees Forums and panels Participatory appraisal Telephone hotlines
1. Inform	Fact sheets Web sites Open houses	Press releases and briefings Reports Fact sheets and brochures Exhibits Presentations at public meetings Advertising Websites

3 Multiple criteria decision analysis

3.1 What is MCDA?

Multiple criteria decision analysis (MCDA) is, in a technical and more restricted perspective, a set of techniques that can be used in decision situations with a range of different and conflicting interests. In a wider perspective MCDA is rather an approach, with the purpose to support “planning and decision processes by providing a framework for collecting, storing, and processing all relevant information” (Lahdelma et al. 2000). With this view, MCDA is not merely a technique, but a way of thinking about and structure a problem. Belton and Stewart (2002) share this viewpoint, and add other aspects by defining MCDA as “an umbrella term to describe a collection of formal approaches which seek to take explicit account of multiple criteria in helping individuals or groups explore decisions that matter." That it is a question of multiple criteria is obvious from the term itself, but here it is stated that it

can involve interests of both individuals and groups. Another notable point is that MCDA concerns “decisions that matter”; that is, the problem in matter is of such a complex nature regarding conflicting criteria or/and stakeholder preferences that ordinary, unstructured decision-making is insufficient to find a solution.
In this paper the view is taken of MCDA as an approach and a structured process. Also, MCDA is viewed in a multi-stakeholder context, as a means for solving interpersonal conflicts of interests. In the literature, MCDA as a term is used synonymously with multiple criteria decision making (MCDM), multiple criteria decision support (MCDS) and multiple criteria analysis/aid (MCA). Here, the term MCDA will be used throughout and be regarded as interchangeable with the other terms.

3.2 The phases of the MCDA process

The process of MCDA can take many different forms and paths. In order to get an overview, a structured mapping of the different phases of the process is required. In the literature, there are different suggestions as to which the elements are and how they are arranged to form the MCDA process (Ananda & Herath 2003b, Belton & Stewart 2002, Kouplevatskaya-Yunusova & Buttoud 2006, Lahdelma et al. 2000, Maness & Farrell 2004). In this paper, six key phases of the MCDA process have been identified: stakeholder analysis, definition and structuring of objectives and criteria, the articulation of preferences, analysis and development of alternative solutions, evaluation of alternative solutions, and making the final decision (figure 1).

- **Stakeholder analysis**
  The purpose of the stakeholder analysis is to identify all potential stakeholders. The decision maker or the initiator of the participatory process could start by answering questions about who is concerned by the issue in question; who will benefit and who will feel negative effects. There might be people with legal rights to participate, people with a special knowledge of the issue, or people in general that want to contribute to the discussion. The already recognized stakeholders can possibly add other, previously unidentified stakeholders to the list. The stakeholders are often grouped according to common interests, so that several individuals or representatives with similar interests are considered as a stakeholder group.

- **Definition and structuring of objectives and criteria**
  At the heart of the MCDA process lies the procedure of defining and structuring the decision problem. Overall objectives must be defined and broken down into appropriate and operational criteria. This is a decisive point as it will influence the perspective and most probably the outcome of the MCDA process; the choice of objectives and criteria will direct and possibly restrict the alignment of solutions.

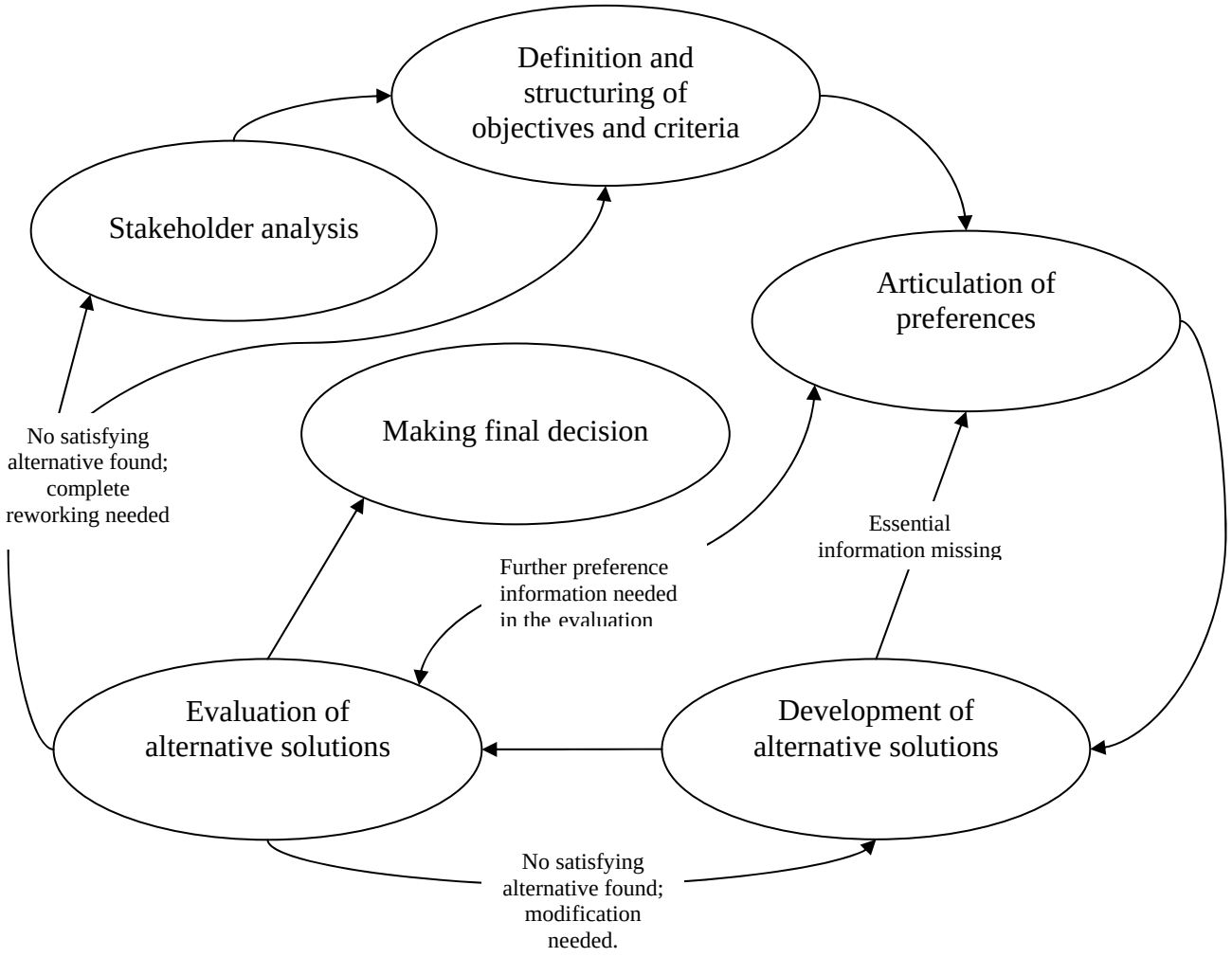

Figure 1. A schematic description of the MCDA process.

- **Articulation of preferences**
  A structured articulation of preferences usually takes place after the problem structuring procedure. The way preferences are extracted and modeled varies between the different techniques, but the basic principle is that the different criteria are ranked, weighted or given values. In cases where the problem consists in choosing from a set of alternative solutions, preference information regarding the different alternatives can be collected.

  Belton and Stewart (2002) classified the MCDA methods into three different categories, based on the way the preferences are modeled. The categories are value measurement models; goal, aspiration or reference level models; and outranking models. These three types of models are suitable in different situations, depending on what kind of preference information that is available and the nature of the decision problem to be solved (Mendoza and Martins 2006).

- **Development of alternative solutions**
  In the classic MCDA problem a set of alternatives is given and the task is to choose from these (Belton & Stewart 2002). There are however situations where the starting point is a continuum of possible combinations where no alternatives exist from the beginning. One of the potential strengths of MCDA actually lies in being an instrument in this kind of situation, to be used to identify a set of feasible alternatives with preference information as a basis.

- **Evaluation of alternative solutions**
  The different alternative solutions are evaluated before decision making. If the alternatives are given from the beginning, it is in this phase of the process the preference information is used. If alternatives are developed during the MCDA process, it might be necessary to collect new preference information regarding the alternatives before the evaluation.

- **Making final decision**
  The main purpose of an MCDA process is to make a thorough analysis of the issue at hand and form a basis for a sound decision. However, to expect MCDA to produce the ultimate and perfect solution to a problem would be a mistake. The final choice must always be made by the decision maker(s) or, in the case of an empowerment process, by the participants, but with a well-built process that choice can be made much easier.

These phases of the MCDA process are put in a sequence according to the design of the individual process. In some cases one or more phases are omitted from the process, and sometimes phases are repeated to form an iterative process.
In a multiple-stakeholder situation, participation can occur to different extent in these phases of the MCDA process. According to the description of the IAP2 Public Participation Spectrum (table 1), a process where participation actually takes place in every phase would be an empowerment process. If every phase but the decision making is participatory, it could be called a collaborative process. In an involvement process participation takes place in the articulation of preferences and possibly also in the evaluation of alternatives, while a consultative process implicates some degree of participation in the articulation of preferences. An informative process does not include participation in any of the phases.
One of the reasons for forming and using a classification of this kind is to solve the meta-MCDA problem of which kind of MCDA process to choose in a particular situation.

4 A review of MCDA case studies in participatory forest planning

A search for case studies on MCDA in participatory forest management planning was made in October 2006, using the web-based search engine ISI Web of Knowledge^{SM} (Nordström 2007). The automated search was complemented with a manual search and all articles concerning case studies of participatory forest management planning in industrial countries was regarded as relevant to this review. The case studies were considered participatory if participation took place at least on the consultation level and were required to concern actual real world cases in the sense that the forest data pertain to existing areas and factual stakeholders are involved. The automatic and manual search resulted in eleven papers that fulfil the criteria that were set up.

The case studies are located in Australia, Canada, Finland and the USA, respectively, and as much as six of the studies have their origin in Finland. The areas concerned in the studies are mostly on the landscape level, as large as 4 million hectares. The smallest area is a single property of 128 hectares.

A noticeable feature is that the majority of the case studies are not iterative processes. The stakeholders have given their preferences at one stage, but the process has not involved feedback and a possibility to adjust the preferences according to the new knowledge and perspective the process might have brought on. In only three cases can truly be called iterative in this sense. The pattern for the level of participation is similar; the two parameters seem to be related.

The level of participation each case was assessed according to IAP2's Public Participation Spectrum (IAP2 2003a). In all cases participation is employed in the articulation of preferences, which must be a basic condition for a process to be called participatory. The occurrence of participation in the other phases of the process is rather scattered between the studies; e.g. participation only takes place in one case of stakeholder analysis and problem definition and structuring, respectively. There is only one case where participation reaches the level of collaboration, three cases of involvement, and the rest are judged to be cases of consultation.

With one exception all the non-iterative cases are on the consultation level of the participatory ladder, and the three iterative cases are cases of involvement. The first type of case, non-iterative and on the consultation level, is "the ordinary case" in this review. The common trait is that participation mainly takes place in the collection of stakeholder preferences. The ordinary case only demands consultation; the participation doesn't have to reach a higher level in this type of case. The other type of case, which is iterative and on the involvement level, could be called "the participatory case", since stakeholders have the possibility of influencing the outcome to a greater extent as they are actually involved in the development of alternatives. The communication in that kind of process is a dialogue, rather than a questioning about preferences. The purpose with using an iterative process is to get this dialogue and use the ideas, knowledge and support of the stakeholders. To get a process like this the participation should be at least on the involvement level. In this review, the highest level of participation is reached in the outsider case, which is on the collaboration level since the stakeholders actually had a say in the final decision. Though, according to Arnstein's ladder of participation, none of the cases could in fact be regarded as truly participatory since power is not really redistributed in these

processes in the way Arnstein demands for a process to be called participatory; and the distribution of power is an interesting and important issue in participatory processes. A redistribution of power enhances the motivation and possibility for social learning; participation becomes an end in itself, not just a means for gaining temporary acceptance of decisions (Buchy and Hoverman 2000).

5 Conclusions

The literature on participatory planning identifies several key factors for a good participatory process, e.g. the following list compiled from experience of public participation in forest management issues (Duinker 1998, in (Chambers and Beckley 2003)):

1. Openness, fairness, and inclusiveness in selection of participants;
2. Clear mandate and purpose;
3. Professional design and implementation;
4. Informal but structured process;
5. Design for positive-outlook problem-solving to elicit collective solutions;
6. Variety of techniques for eliciting input;
7. Clear influence on decision making;
8. Sufficient time and supporting technical resources;
9. Keeping decision makers informed throughout; and
10. Reasonable and realistic expectations.

MCDA is here suggested as one instrument for the kind of fair and transparent processes advocated by Duinker (1998). It offers a number of clearly defined steps through which the participatory process could proceed. Still it offers much leeway in the choice of specific techniques to be employed in each step.

However, forestry appears to have a long way to go before participation becomes a standardized procedure. The case studies reveal that participatory process is limited to the consultation and involvement levels. There are several possible explanations for this. Participatory processes are expensive and tend to get more difficult to manage with a higher level of participation. Participation is a new phenomenon that has to compete with more established procedures for decision making; there is a lack of knowledge and experience of participatory processes. But is it also possible to discern a power perspective? According to such a view, a more cynical reason for choosing a lower level of participation would be reluctance to share power. Participation could be used to create the impression that the decision maker cares about the opinions of other stakeholders and the public, when the intention is to gain support for implementing the final decision.

Participatory forest management planning processes have been mainly conducted on state owned land; there is a need for studies about participatory planning with private forest owners and other stakeholders. The case studies reveal a gap between experts and practitioners in this field. With the vision of SFM ahead, the time must be ripe to try out participatory forest management planning with MCDA in practice.

References

Ananda, J. & Herath, G. 2003b. The use of Analytic Hierarchy Process to incorporate stakeholder preferences into regional forest planning. *Forest Policy and Economics* 5: 13-26.

Angelstam, P., Persson, R. & Schlaepfer, R. 2004. The sustainable forest management vision and biodiversity – barriers and bridges for implementation in actual landscapes. *Ecological Bulletins* 51: 29-49.

Anon. 1996. The World Bank Participation Sourcebook. The World Bank, NewYork.

Anon. 2003a. IAP2 Public Participation Spectrum. http://www.iap2.org/associations/4748/files/spectrum.pdf

Anon. 2003b. The IAP2 Public Participation Toolbox. http://iap2.org/associations/4748/files/toolbox.pdf

Arnstein, S.R. 1969. A ladder of citizen participation. *Journal of American Institute of Planners* 35(4): 216-224.

Belton, V. & Stewart, T. 2002. Multiple Criteria Decision Analysis: An Integrated Approach. Kluwer Academic Publishers, Massachusetts.

Berkes, F. 1994. Co-management: Bridging the Two Solitudes. Northern Perspectives 22(2-3): 18-20.

Buchy, M., & S. Hoverman. 2000. Understanding public participation in forest planning: a review. Forest Policy and Economics 1:15-25.

Campbell, T. 1996. Co-management of Aboriginal Resources. *Information North* 22(1), http://arcticcircle.uconn.edu/NatResources/comanagement.html.

Chambers, F.H. & Beckley, T. 2003. Public involvement in sustainable boreal forest management. In Burton, P.J., Messier, C., Smith, D.W. & Adamowicz, W.L. (eds), Towards sustainable management of the boreal forest. NRC Research Press, pp. 113-154.

Hunter, I. & Bird, P. 1997. Experience with participatory forest management (PFM) in the tropics. *EFI Proceedings* 14: 177-186.

Kouplevatskaya-Yunusova, I. & Buttoud, G. 2006. Assessment of an iterative process: The double spiral of re-designing participation. *Forest Policy and Economics* 8: 529-541.

Lahdelma, R., Salminen, P. & Hokkanen, J. 2000. Using multicriteria methods in environmental planning and management. *Environmental Management* 26:595-605.

Maness, T. & Farrell, R. 2004. A multi-objective scenario evaluation model for sustainable forest management using criteria and indicators. *Canadian Journal of Forest Research* 34: 2004-2017.

Mendoza, G.A. & Martins, H. 2006. Multi-criteria decision analysis in natural resource management: A critical review of methods and new modelling paradigms. *Forest Ecology and Management* 230:1-22.

Nordström, E.-M. 2007. The use of multiple criteria decision analysis (MCDA) in participatory forest planning. Report no. 163, Department of Forest Resource Management, Swedish University of Agricultural Sciences, Umeå.

Östlund, L. & Zackrisson, O. 2000. The history of the boreal forest in Sweden: a multidisciplinary approach. In Agnoletti, M. & Anderson, S. (eds), Methods and approaches in forest history. IUFRO Research series 3. CABI Publishing, pp. 119-128.

Priscoli, J.D. 1997. Participation and conflict management in natural resources decision-making. *EFI Proceedings* 14: 61-87.

Sandström, C. 2004. Samråd mellan rennäring och skogsbruk – ett exempel på samförvaltning av gemensamma resurser? FjällMistra-rapport nr 8.

Sidaway, R. 2005. Resolving Environmental Disputes – From Conflict to Consensus. EarthScan, London-Sterling, VA.

Svensson, J., Fries, C. & Jougda, L. 2004. Synthesis of the model forest concept and its application to Vilhelmina model forest and Barents model forest network. Rapport nr 6. Skogsstyrelsens förlag, Jönköping.

Wilcox, D. 1994. The guide to effective participation. Delta Press, Brighton.