ELSEVIER

Journal of Environmental Management 90 (2009) 740–751

Journal of Environmental Management

www.elsevier.com/locate/jenvman

The role of cultural models in local perceptions of SFM – Differences and similarities of interest groups from three boreal regions

Kati Berninger*, Daniel Kneeshaw, Christian Messier

Centre d'Étude de la Forêt (CEF), C.P. 8888, Succursale Centre-ville, Montréal, QC H3C 3P8, Canada

Received 10 April 2007; received in revised form 12 September 2007; accepted 13 January 2008
Available online 5 March 2008

Abstract

Differences in the way local and regional interest groups perceive Sustainable Forest Management in regions with different forest use histories were studied using Southeastern Finland, the Mauricie in Quebec and Central Labrador in Canada as examples of regions with high, medium and low importance of commercial forestry. We present a conceptual model illustrating the cyclic interaction between the forest, cultural models about forests and forest management. We hypothesized that peoples' perceptions would be influenced by their cultural models about forests and would thus vary amongst regions with different forest use histories and among different interest groups. The weightings of the environmental, economic and social components of sustainability as well as themes important for each of the interest groups were elicited using individual listing of SFM indicators and group work aimed at developing a consensus opinion on a common indicator list. In Southeastern Finland the views of the different groups were polarized along the environment–economy axis, whereas in Central Labrador all groups were environmentally oriented. The social dimension was low overall except among the Metis and the Innu in Labrador. Only environmental groups were similar in all three research regions, the largest differences between regions were found among the forestry professionals in their weightings concerning economy and nature. As the importance of commercial forestry increased, a greater importance of economic issues was expressed whereas the opposite trend was observed for issues regarding nature. Also inter-group differences grew as the importance of commercial forestry increased in the region. Forest management and forest use can be seen as factors strongly influencing peoples' cultural models on forests.

Keywords: Three-pillar approach; Forest value; Cultural model; Forest use history

1. Introduction

The concept of Sustainable Forest Management (SFM) has been debated by scientists and forestry professionals during the last two decades (Messier and Kneeshaw, 1999; McDonald and Lane, 2002; Wang, 2004). Determining public and stakeholder forest values is considered an integral part of SFM and this knowledge is increasingly being used to guide forest management planning especially in publicly owned forests (Xu and Bengston, 1997; McFarlane and Boxall, 2000a,b; Watson and McFarlane, 2004). Local people have also been involved in the definition of Sustainable Forest Management criteria and indicators of SFM (CMFP, 2000). Despite this earlier work, the local definition of SFM is just beginning to take form and there is a need for innovative approaches to study how local people in different regions perceive SFM. Our study contributes to this end.

We use the *three-pillar approach* to sustainability (Goodland, 1995; Adamowicz and Burton, 2003; Robinson, 2004), where the concept of sustainable development is divided into ecological, social and economic components. In natural resource management, earlier studies related to the three-pillar approach used weightings by different stakeholder groups of the three components of sustainability in coastal management (Brown et al., 2001) and criteria for sustainable forestry (Sheppard and Meitner, 2005). These are all case

* Corresponding author. Tel.: +1 514 987 3000x4819; fax: +1 514 987 4647.
E-mail address: kati_berninger@yahoo.ca (K. Berninger).

0301-4797/$ - see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.jenvman.2008.01.004

studies focused on one region. In contrast, we compare three geographical regions with great differences in the importance of commercial forestry. In Section 2 we present a conceptual model that describes the dynamics by which local natural and socio-cultural conditions together with forest use history influence peoples' perceptions on forests and forestry.

Specific and contrasting perceptions about the forest and forestry have been associated with various interest groups (McFarlane and Boxall, 2000a,b; Tindall, 2003; Horne et al., 2004; Kant and Lee, 2004). Forest owners and forestry sector employees tend to have greater support for economic values in forestry than the general public (Tindall, 2003; Horne et al., 2004; Kant and Lee, 2004). In contrast, users of non-timber forest products, like hunters and campers, have been shown to support protection-oriented management strategies (McFarlane and Boxall, 2000a). Members of environmental organizations have, logically, been found to be more environmentally oriented and biocentric than the general public or other stakeholder groups (McFarlane and Boxall, 2000b; Leskinen et al., 2004). Although differences between interest groups have been consistently identified in local studies, it is unclear whether such trends exist across regions. We predict that forest subcultures of interest groups are partially shared across regions so that in spite of regional differences the same interest groups, such as forestry professionals or environmentalists, should have similar views in all regions.

Our study will provide additional insights into the ways local communities define sustainability and weighs the three components of sustainability in forest use and management in three regions. We used a combination of different methods including individual listing of SFM indicators and group work aimed at developing a consensus opinion on a common indicator list to elicit themes and weightings of the three components of sustainability. The comparisons in this paper are structured on the differences between the three regions, each having a different history of forest management and use. Within each region we also studied the differences between the perceptions of interest groups. Thus this is a stratified study with the main focus on regional comparison.

2. Conceptual framework and hypothesis

Many previous studies state that forest management and other forest uses reflect peoples' values (Xu and Bengston, 1997; McFarlane and Boxall, 2000a,b). We believe that this relationship between values and forest use functions in two ways. Forest use history affects our forest values through the experiences we have in the forest and the cultural models that reflect life experiences shared by a group of people.

Human perception of the environment is influenced by how the experience is modeled by a particular socio-cultural environment (Shore, 1996, p. 4). The theory of cultural models describes the existence of prepackaged forms of knowledge that coordinate groups of people (Shore, 1996, p. 10). Culture is here understood as not only a private or a public property, but as a combination of the two (Shore, 1996, p. 36). The theory of cultural models is related to the psychologists' theory of schemas which can be described as mental structures by which we interpret the world or organize information (Strauss and Quinn, 1997, p. 16, 49). Cultural models are schemas that are socially shared and learned through explicit teaching or observation (Strauss and Quinn, 1997, p. 7, 16). Cultural models are not uniform, but may vary between individuals and groups (Shore, 1996, p. 312). Some persistent cultural models are transmitted from one generation to the next either unintentionally or deliberately (Strauss and Quinn, 1997, pp. 111–112). This creates the historical durability of cultural models. Different sub-cultural groups may have different typical experiences, their cognitive networks may develop in a different way and thus their interpretation of a certain object or event may differ (Strauss and Quinn, 1997, p. 89).

Using the theoretical basis on the creation and transmission of cultural models explained above, we created a conceptual model to illustrate the cycle of interaction between the forest, cultural models about forests and forest management (Fig. 1). A certain group of people has a shared understanding (cultural models) about how forests can and should be managed or used. The models are based on both local natural and socio-cultural conditions as well as the relationship each individual has with the forest, and thus they are a result of an interaction of public and individual factors. For example, public attitudes toward forest management are related to both the individuals' economic dependence on forestry and the local socio-cultural conditions (Brunson et al., 1997). These cultural models modify and are modified by forest values and public discourse. The cultural models about forests together with other cultural models have an effect on forest policy. The extent of this effect depends on how widely shared the particular cultural models are in the society. Forest policy determines how forests are managed whereas cultural models have a direct effect on forest use in guiding the activities we do in the forest. Forest policy has an indirect effect on cultural models by modifying the forest itself and by influencing the public discourse on forests. The forest, modified by historical and current use, has an effect on our understanding of what the forest should be

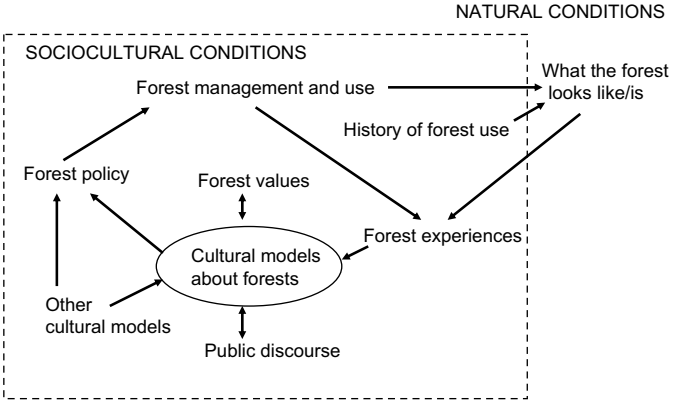

Fig. 1. A conceptual model illustrating the cycle of interaction between the forest, cultural models on forests and forest management. Values transmitted from the previous generation will affect the forest experiences of the next generation.

like. The forest that we have become accustomed to see and the activities we normally do in the forest become familiar and natural. These perceptions of what is familiar and natural are then transmitted from one generation to another (Strauss and Quinn, 1997, p. 112). Certain attributes of the forest are associated with characteristic forest experiences (Stedman, 2003). New forest experiences or public discourse will either change or reinforce existing models (Strauss and Quinn, 1997, p. 89, 115). Cultural models about forests are thus created by an interaction between forest experiences, forest values and social interaction.

Based on this conceptual model, we formulated three research hypotheses:

1. Based on different social environments and forest experiences, cultural models about forests in our three study regions will be different. This will lead to differences between weightings of sustainability components and topics included in SFM across regions.
2. The same interest groups in different regions will have partially shared cultural models about forests in spite of regional differences in forest culture. This will lead to similarities in weightings of sustainability components and topics included in SFM by the same interest groups across regions.
3. Different interest groups in the same region will have partially contrasting cultural models about forests as a result of subcultures created by partially different forest experiences, forest values and forest discourse. Thus the weightings of sustainability components and topics included in SFM will differ between groups in the same region. Even if the regions are different, the environmental groups are predicted to be more environmentally oriented and forestry professionals more economically oriented than other groups in each region.

3. Study areas

The study regions were selected to form a gradient of the present and historical importance of commercial forestry. The attributes used to describe the importance of commercial forestry include: the length of time of commercial forestry, current forest management intensity, the importance of the forest sector to local and regional employment and the economy as well as the forest ownership structure (see Table 1). The common criteria of selection for all regions include an extensive forest cover, importance of forest use for the local people and location in the boreal forest. The study was conducted in three regions that fit into these criteria: the Forestry Region of Southeastern Finland, the Mauricie in Central Quebec and Goose Bay in Central Labrador (Table 1, Fig. 2). The study locations have a different history of forest use and they form a gradient in the selected attributes describing the importance of commercial forestry. These factors together with the public discourse on forestry should explain an important part of the differences between regions. The forest use history and the importance of commercial forestry in the region affect peoples' cultural models about forests (Fig. 1) and their perceptions on sustainable forestry.

All three regions are currently undergoing planning processes, which increased motivation for the interest groups to participate in the study. A new Forest Management Plan is in preparation in the Mauricie area, while the Regional Forestry Program in Southeastern Finland is being revised. In Goose Bay, Central Labrador, the Forest Management Plan has been completed and is being implemented with an active follow-up group. Although the planning process in Southeastern Finland is on a regional level, the forest area in all the study regions is comparable, varying from 816 000 to around 2 100 000 ha.

4. Methods

We used a combination of quantitative and qualitative methods to collect data from the same individuals. Individuals' listings and rankings were collected using forms before participants discussed the given task. After the individual work, a consensus opinion was developed during group discussions. Work done in groups include inter-group interaction which makes it possible to gather information that would be difficult to reach in individual situations (Morgan, 1997, p. 2). Groups have previously been used to study environmental values and attitudes (Myers and McNaghten, 1998; Linnros and Hallin, 2001), public participation in forestry (Smith and McDonough, 2001; Schusler et al., 2003) and weighting of criteria of sustainable forestry (Sheppard and Meitner, 2005).

4.1. Interest groups

The target public included those residents of the study areas that belonged to the selected interest groups. The purpose of this study was thus not to reach the silent majority, but rather to contact individuals actively involved in the use or protection of forests. Interest groups included those who have direct links to the management or the use of forests in each study area: (1) local or regional environmental groups; (2) multiple users of the forest including local hunting, berry and mushroom picking or recreation groups; and (3) forestry professionals in each of the three study locations. The forestry professionals group included representatives of both government forest resource management and the forest industry. They were grouped together because earlier studies have shown that their views on forestry are similar (Leskinen et al., 2004).

We also included area-specific interest groups to reflect important stakeholders. In Finland, a non-industrial private forest owners group (later called only forest owners) was added because they are a key group in Finnish forestry (see Table 1 about the forest ownership structure). In the Labrador study area, the Innu Nation (about 13% of the population in Central Labrador) and the Labrador Metis Nation were included in the study because they strongly influence forestry

Table 1
Basic information characterizing the three areas[a]

	Southeastern Finland	Mauricie	Central Labrador
Land area (km^2)	12 824	35 452	About 70 000
Population	321 900 in 2003	260 078 in 2005	9640 in 2001
Population density (inhabitants/km^2)	24	7	0.14
Unemployment rate (%)	From 12.9 to 14.3 in 2004	10.0 in 2005	Happy Valley-Goose Bay 12.8 Northwest River 19.1 in 2001
History of forestry	Industrial forestry since the 1870's[b]	Forestry since the early 20th century, virgin forests still being cut	Marginal logging in 1970's and again since 1990's
Forest sectors' share of the labor force (%)	12 in 2002	4 in 2003	0.8[c]
Forest sectors' share of the total production (%)	32.7 in 2002	31.6 in 2004	Minimal
Forest area (ha)	815 900	3 388 100	About 7 100 000 Around Goose Bay[d] 1 200 000
Annual logging (m^3)	4 053 000 in 2002	3 874 000 in 2002	45 000 in 2003
Forest ownership			
Non-industrial private (%)	80	9	1
Companies (%)	12	8	0
State or province (%)	2	83	99
Others (%)	5	–	0

[a] Data is from the following institutions: Central Labrador Economic Development Board, Finnish Forest Research Institute, Forest Centre of Southeastern Finland, Institute de la Statistique Québec, Newfoundland and Labrador Department of Forest Resources and Agrifoods, Statistics Canada.
[b] Tasanen (2004, p. 421).
[c] An estimate using 2001 census data on population, labor force participation and an estimate of forest sector jobs.
[d] This area includes most of the closed canopy forest.

decisions. In contrast with some earlier studies and other regions, these groups have been empowered and are equal partners in the decision making process regarding the development of forest management in the region. Although their views differ somewhat, they represent an indigenous view that clearly differs from the Euro-American view (Pobihuschchy, 1986; Adamowicz et al., 1998). In the quantitative results the Innu and the Metis are together called First Nations, whereas in the qualitative results their views are presented separately.

4.2. The meetings and the participants

The study consisted of separate meetings with a sample of each interest group in order to obtain information about their views and rankings for each of the three components of Sustainable Forest Management. The use of separate meetings for each group has proven to be effective at least in conflict-prone areas (Sheppard and Meitner, 2005). The meetings were organized during the summer and fall of 2005: in Shawinigan, Mauricie May 25th and October 17th; in Goose

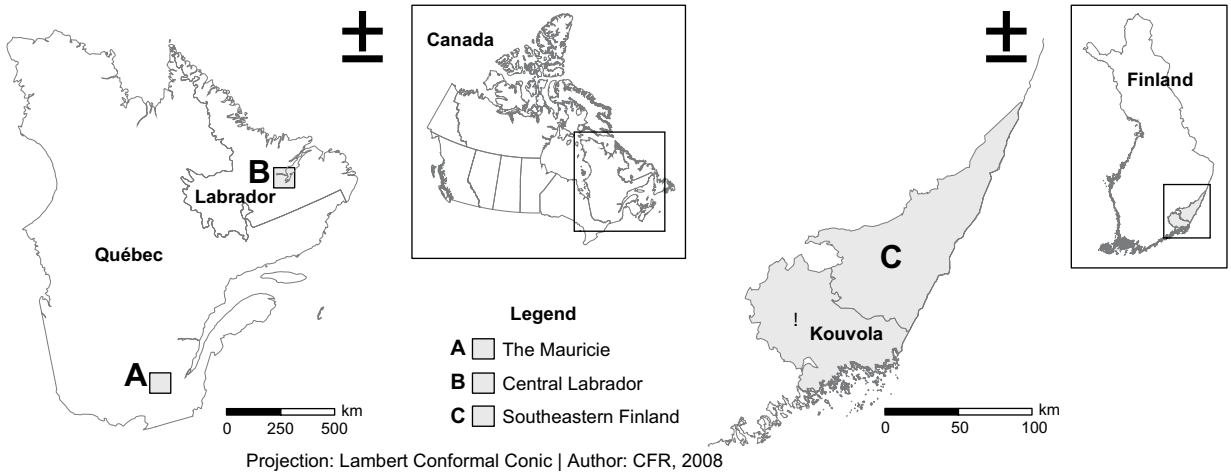

Fig. 2. The study locations: the Mauricie region in Quebec, Central Labrador and Southeastern Finland.

Bay and Sheshatshiu, Central Labrador from June 2nd to June 8th; and in Lappeenranta, Southeastern Finland from August 23rd to August 25th.

The participants were mainly invited using letters sent by email or by regular mail. Contact information was obtained from the networks of the forestry planning processes mentioned above. Additional contact information was sought from environmental and recreation organizations active in each area. In Central Labrador, there was no active hunters' organization, so the multiple users' meeting was also announced in the local newspaper and on the radio.

A total of 72 participants (Table 2) generated a list of indicators of sustainable forestry, or of factors important for them in the forest. These participants were then asked to select the five most important indicators in order of priority. This information was collected on simple forms. The participants were not given a definition of sustainable forestry, but instead they were presented a figure with three circles illustrating that sustainability may be divided into three components that may overlap. The participants were also told that they may concentrate on a single component they felt was the most important or they may wish to include all three components. The participants were given a definition of a sustainable forestry indicator as an aspect used for evaluating the state of the forest, but they were not given a list of indicators to choose from, so as not to lead their thinking. Measurable indicators were not required and thus a list of topics or important factors in the forest was acceptable.

After the individual reflection, the participants formed one or several groups to discuss their indicator lists and form a common opinion on the most important indicators based on consensus within the group. In meetings where several small groups were formed, each presented their results to the other participants and a consensus opinion was formed for the whole group. The discussions were recorded on tape for later analysis. In the Mauricie area, the group work was carried out only with forestry professionals because individuals in the other groups were spread out over too large a geographic area to get them together for group discussions.

Demographic characteristics of the participants were compared to the findings of other studies. In the present study, the majority of the participants were men; in some groups there were no women at all (Table 2). The multiple users from Southeastern Finland consisted of only male hunters from age groups 41–50 and 51–64. This reflects the typical profile of Finnish hunters (Petäjistö et al., 2004). The Central Labrador forestry professionals were all men. The age distribution of forestry professionals in Southeastern Finland and Central Labrador is consistent with the study of McFarlane and Boxall (2000b) where the mean age of forestry professionals was 42.5 years. The professionals from the Mauricie were younger, half of them under 30 years of age. The age profile of the environmentalists in Southeastern Finland is close to that reported by McFarlane and Boxall (2000b), where the mean age of environmentalists was 50.6 years. The age distribution of forest owners is consistent with the study of Horne et al. (2004) where the mean age of forest owners was 58 years.

Table 2
Number of participants and their age group distribution for each interest group and region (the number of female participants is in parenthesis)

	Southeastern Finland	The Mauricie	Central Labrador
Environmentalists	7 (4)	4 (0)	4 (2)
Professionals	10 (2)	6 (2)	9 (0)
Multiple users	4 (0)	5 (1)	6 (1)
Forest owners	8 (2)	–	–
First Nations	–	–	9 (3)
Total	29	15	28
Age group			
30 and under	0	8	1
31–40	3	4	7
41–50	13	1	4
51–64	10	0	12
Over 64	3	1	4
Not known	0	1	0

The age distribution in the meetings was quite similar in Southeastern Finland and in Central Labrador, whereas in the Mauricie area the participants were generally younger than in the other research areas (Table 2).

The participants were asked to indicate if they identified themselves with another interest group included in the study. In Southeastern Finland, more than half the respondents were multiple users of the forest, which is very common in Finland. Nine people belonging to other interest groups were also forest owners, a phenomenon typical in the region. In the Mauricie area, three professionals and one environmentalist considered themselves multiple users, and in Central Labrador all groups included multiple users, although the Innu did not explicitly indicate they were multiple users. In Central Labrador various professionals and Metis associated themselves with environmental groups. The Metis were also represented in the environmental, professional and multiple user groups.

4.3. Analysis

The individual data consisted of indicators identified by each participant and their order of preference. The data were first classified into broad categories according to themes and the themes were divided into sub-themes if relevant. Ranks assigned to each topic were then counted for each study area. The topics with the highest number of first ranks were considered to be the most important. Table 3 presents the themes and sub-themes used and examples of indicators assigned to each theme. Also the main themes identified in the different locations during the group work were compared (Table 4).

The individual data were also analyzed to study the weightings of each of the three components of sustainability: environmental, economic and social. The five most important indicators listed by each individual were included. The order of priority marked by the individuals was converted into points so that the most important indicator was given 5 points and the fifth most important received 1 point. The answers

Table 3
The main themes and sub-themes identified and examples of indicators belonging to each theme

Main theme	Sub-theme	Examples of indicators
Environmental sustainability		
Nature	Protection of biodiversity	Maintaining the species richness of trees (MAUR)
		Ecosystem diversity, integrity (LAB)
	Maintenance of wildlife habitat	Beaver habitat, wetlands (LAB)
		Wildlife habitat, most of the forest to be preserved for animals (LAB)
	Old growth or undisturbed areas of forest	Proportion of old growth forest of the total forest area (FIN)
		There is enough intact (undisturbed) forest left to support healthy ecosystems (enough territory for animals requiring large range for example, LAB)
	Protection of special places	Known areas of valuable nature protected (FIN)
		Conservation of rare forest types (MAUR)
	Endangered species	Site protection of the endangered or vulnerable species (MAUR)
	Others	Safeguarding biodiversity by combining economic and ecological interests (compensation from the state to the forest owners, FIN)
		Protection and productivity of soils (MAUR)
		Carbon sink (weather influence, LAB)
"Green forestry"	No clear cuts	Clear cuts only in connection with monoculture plantations on old fields (FIN)
		Partial cutting (MAUR)
	Soft silvicultural methods	Treatment or use of forests doesn't spoil the environment or water (FIN)
		Careful, cautious commercial harvest practices going toward minimum harvest rather than maximizing 'economic' benefit (LAB)
Economic sustainability		
Permanence of forest		Logging should not exceed the growth (FIN)
		Secure the permanence of the resource (MAUR)
Silviculture	Securing regeneration of the forest	Planting and seeding right after the area has been cut (FIN)
	Different silvicultural treatments	Silvicultural treatment of young forest (clearings and liberation work, FIN)
Economy	Forest owners' economy	Income from forestry (FIN)
	Broader economic aspects	Profitability of forest industry from the national economy point of view (FIN)
		Maintaining the economic benefits related to forestry activities (employment, regional development, etc., MAUR)
		No exporting logs out of here (LAB)
Wood supply		Continuous wood supply for the industry (FIN)
Infrastructure		Building and maintenance of the road network (FIN)
Social sustainability		
Jobs and vitality of rural areas		Safeguarding jobs and vitality in the countryside (FIN)
		Maintenance and creation of employment in the forest sector (MAUR)
		Maximum local job creation (LAB)
Multiple use		All the uses of the forest can exist side by side (FIN)
		Minimize the impacts of forestry on other users of the forest (MAUR)
		Hunting, gathering, trapping, berry picking (LAB)
Social acceptability		Developing forest management that is socially more acceptable (MAUR)
		Agreement among the stakeholders (MAUR)
No disturbance and esthetics		Maintenance of esthetic values (FIN)
		No disturbance caused by humans (i.e. noise, pollution of air or water, FIN)
Knowledge		Increasing information on forests and forestry in primary education (FIN)
		Education i.e. teach the children the importance of forests so they value what we have and hold the forests in trust for their children (LAB)
Others		Forests' positive effect on health (FIN)

Indicators were identified by the participants. They were subsequently classified into sub-themes and main themes and into environmental, economic and social components of sustainability by the authors. The examples of the indicators were chosen to cover and illustrate every sub-theme and to give examples from different regions. FIN = Southeastern Finland, MAUR = Mauricie, LAB = Central Labrador.

were grouped into three categories: environmental, economic and social (Table 3). Each individual had a score in each category that varied from 0 to 15. For example, if all five of the most important aspects were classified into only one category, this category was given 15 points and the other two categories got 0 points. Some indicators did not fit into any category, for example, the continuing improvement of activity that refers to the environmental management systems of forest companies. These indicators were left out of the quantitative analysis. Some participants listed less than five aspects. If there were less than five indicators or the same person gave the same rank to several indicators, they were weighted so that the sum of the points equalled 15.

As there is an overlap in the components of sustainability, it was sometimes difficult to decide in which component an aspect belonged. The following examples illustrate how

Table 4
Group opinions on the most important issues in sustainable forestry in each interest group in Southeastern Finland, the Mauricie and Central Labrador

Group	Highest ranking	2. Highest ranking	3. Highest ranking	4. Highest ranking	5. Highest ranking
Southeastern Finland					
Environmentalists	Biodiversity	Multiple use: mushrooms, berries, recreation, hunting, nature tourism, wood production, aesthetics	Securing availability and quality of wood using ecological forestry		
Professionals	Profitable forestry: forest industry and private forest owners	Ecological sustainability: multiple use, biodiversity, conservation, the ratio of growth and logging	Social sustainability: work and livelihood, every man's rights, inclusion of different user groups in decision making	Knowledge, skills and research	Acceptable forestry: national and international acceptability
Forest owners	Economical profitability of forest ownership	Employment and vitality of rural areas	Good silviculture	Increasing the "forestry spirit" and appreciation of forestry in youth	Multiple use, for example energy and recreation
Multiple users	Untouched bogs, wetlands, border areas, "wastelands" (biodiversity)	Diversity of trees and other vegetation	The rates of protected and commercial forest areas	Population density of different game species	Rehabilitated bogs, wetlands, meadows
The Mauricie					
Professionals	Continuous wood supply	Biodiversity and integrity of forest ecosystems, old growth forests	Quality and quantity of water (sedimentation)	Protection of soils and their productivity	Diversity of fauna (protection)
Central Labrador					
Environmentalists	Biodiversity	Carbon sink	Local people can still hunt, fish, pick berries, trap, enjoy scenery (social/cultural)	Small scale forestry, secondary processing, ecotourism, local markets (economic)	Non-timber economic values: berries, birch bark, birch syrup, medicinal plants, dried flowers, etc.
Professionals	Sustained ecosystem integrity: integrated inventory (for measuring), includes protected areas, habitat, BD, etc.	Socioeconomic opportunities: includes local processing, commitment of local input, tourism, non-wood forest products	Maintenance of cultural/ spiritual values: includes scenery, recreation, hunting and trapping, relics/special places	Commitment: funds, staff, legislation, methodology	
Multiple users	Environmental protection	Protection of wildlife habitat and species	Aesthetics	Sustainable forest for industry	Maximum local job creation
Metis	Habitat	Traditional use	Recreation	Tourism	Preservation
Innu	Animal habitat	Medicinal plants and trees, berries	Natural forest	Big dry trees for firewood	Big birch for canoes and snowshoes

They are the result of consensus based group work summarizing and putting together indicators identified by each participant.

decisions were made. For example, jobs were included in the social component because they are important for human well being, whereas silvicultural work aimed at enhancing the productivity of the forest was considered an economic component (Table 3). The regeneration of the forest was also considered to be part of the economic component since it represents the traditional market economy-based perception of sustainability (Table 3).

Differences in the answers of different interest groups within regions and the same interest groups across regions were tested using the non-parametric Kruskall–Wallis test because of the ordinal scale of the data and the heterogeneity of the variances between the regions. The test was complemented by the comparison of all pairs using the Tukey–Kramer test. Statistical tests were carried out using JMP (SAS institute).

5. Results

5.1. Comparison between regions

When the points for the three components of sustainability, environment, economy and society, for each individual are plotted in three-dimensional space, a clearly different pattern can be seen in each of the study areas (Fig. 3). In Southeastern Finland and in the Mauricie, the social dimension was low, while in Central Labrador it was relatively high for some individuals, mostly from First Nations. In Southeastern Finland, individuals are widely distributed along the economy–environment dimension. Forest owners and forestry professionals assigned the greatest weight to the economy, while the greatest weight assigned to the environment was by environmentalists and multiple users. In the Mauricie

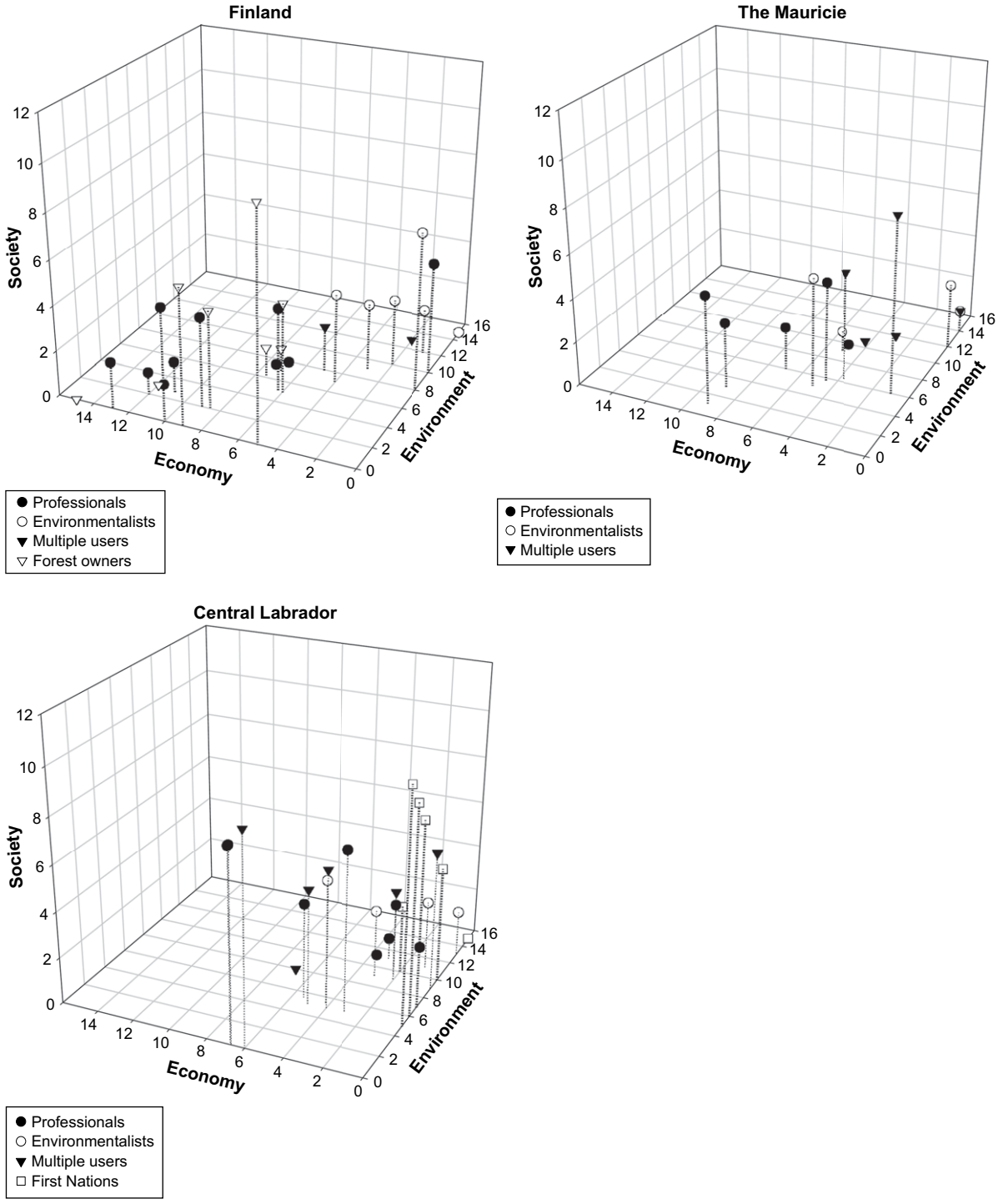

Fig. 3. Individual answers from the three study areas placed in a three-dimensional space, where the dimensions represent the environmental, economic and social components of sustainability. Each point represents the answers of one individual. The scale is the relative importance given to each component based on the respondents' ranking. The total score of the three components is always 15. The most important aspects receive the most points.

area, most of the individuals are in the middle range of the economy–environment axis, although there are some professionals who weigh the economy highly. In Central Labrador, almost all individuals from all groups weigh the environment higher than the economy.

In Central Labrador, one broad topic, the importance of nature, dominated most individual answers in all the interest groups, with a total of 23 first rankings (82%) and 19 second rankings. Other indicators ranked first included: creating jobs, keeping logs and wood processing in Labrador, avoiding large clear cuts, maintaining traditional use and the availability of qualified forestry professionals. Another important topic, which was given a high ranking, was multiple use of the forest, including recreation and tourism. When the topic of nature

was investigated in detail we observed that the most important issue was the maintenance of wildlife habitat, followed by protection of biodiversity and the maintenance of large undisturbed areas of forest. Table 3 gives examples of individual answers.

In the Mauricie area, the most important broad topic was also nature, receiving 9 first rankings (60%) and 7 second rankings. The second most important issue was the permanence of forests receiving 2 first rankings and 5 second rankings. Other first rankings were given to multiple uses of the forest, productivity of the forest, employment and wood supply. Within the nature topic, the most important issues were protection of biodiversity and the protection of special places like rare forest types, wetlands and habitats of endangered species. The permanence of forests was more frequently present in the answers of forestry professionals, whereas maintaining nature was more frequent among multiple users and environmentalists. For examples of indicators, see Table 3.

In Southeastern Finland, three topics were equal, each receiving 9 first rankings: silviculture, economy and nature. These three topics together correspond to 93% of the first rankings. Other first rankings were given to soft logging practices and maintenance of the forest cover. The most important issues within the topics of silviculture, economy and nature were forest regeneration activities, private forest owners' economy and the protection of biodiversity, respectively. Examples of indicators within these categories are provided in Table 3. The interest groups were clearly divided into two groups: forestry professionals and forest owners who ranked the economy and silviculture the highest, whereas environmentalists and multiple users ranked nature the highest.

The analysis of the most important topics in the individual answers illustrates qualitative differences between the three research areas. Nature was important in all three areas, but most important in Central Labrador. In Southeastern Finland and the Mauricie, the most important issue within the nature topic was biodiversity, while in Labrador it was wildlife habitat. This reflects the importance of hunting in Labrador. People from the Mauricie area were the most concerned about the permanence of forests. Southeastern Finland was the only place where economy and silviculture were ranked high.

During the group work, different topics were discussed in each region. In Central Labrador, a strong topic in the discussions during the group work was local processing of wood. People were unhappy about logs being transported outside the region for transformation preferring to see timber processed locally to create more jobs and local economic benefits. In the Mauricie area, where the group discussion was only done among the forestry professionals, the concern was about the sustainability of wood supply, and in Southeastern Finland the primary concern was the need to import logs from Russia to feed the various pulp mills in the region.

5.2. Interest groups within and across regions

When different interest groups within a region are compared, in Southeastern Finland differences can be observed between forest owners and forestry professionals on one side supporting economic values and environmentalists and multiple users on the other side supporting the importance of nature (Fig. 3). Environmentalists differed from both forestry professionals and forest owners both in economic (Kruskall–Wallis test $p = 0.0060$, Tukey–Kramer $p = 0.05$) and environmental scores (Kruskall–Wallis test $p = 0.0057$, Tukey–Kramer $p = 0.05$). In Central Labrador, all groups shared similar weightings except the First Nations who weighted social aspects more than the economy. The economic scores given by the First Nations participants differed significantly from those of multiple users and professionals (Kruskall–Wallis test $p = 0.0043$, Tukey–Kramer $p = 0.05$). In the Mauricie area the economic scores of the professionals differed significantly from those of environmentalists and multiple users (Kruskall–Wallis test $p = 0.023$, Tukey–Kramer $p = 0.05$).

When patterns between the three interest groups common to all three study areas are studied, the biggest differences between the three areas are among the forestry professionals (Fig. 4). The economic scores of the professionals from Southeastern Finland differed significantly from those of Central Labrador (Kruskall–Wallis test $p = 0.0057$, Tukey–Kramer $p = 0.05$). Multiple users are rather similar along the economy–environment axis, but the social component is stronger in Central Labrador than in the other two areas. Environmentalists have similar weightings with respect to all three components across all three regions. No significant differences were detected across regions for multiple users or environmentalists.

The group opinions that were formed as a result of group discussions show qualitative differences and similarities among the different interest groups in the three research areas (Table 4). These results support the individual results described above. As in the individual results, the biggest difference between the three areas is among the forestry professionals. The professional foresters in Southeastern Finland are the most concerned about the profitability of forestry activities, and the Quebec professionals about continuous wood supply, whereas the professionals from Labrador talk about ecosystem integrity.

The environmental groups from Southeastern Finland and Labrador had very similar views at a regional level, although the Labrador group also took up the global issue of carbon sequestration. Multiple users from Southeastern Finland had a nature-oriented view, but it was restricted to their own individual benefits and they were against the development of new conservation areas. In contrast, the Central Labrador multiple users group also included industry and jobs in their list of important issues. These differences can at least partly be explained by the composition of the groups: the group from Southeastern Finland consisted only of hunters while the Central Labrador group also included local politicians.

In terms of groups with specific affiliation to one of the study regions, both the Metis and the Innu in Central Labrador were most concerned about wildlife habitat, traditional use of the forests and conservation of natural forest. In Southeastern Finland, the forest owners talked at length about the

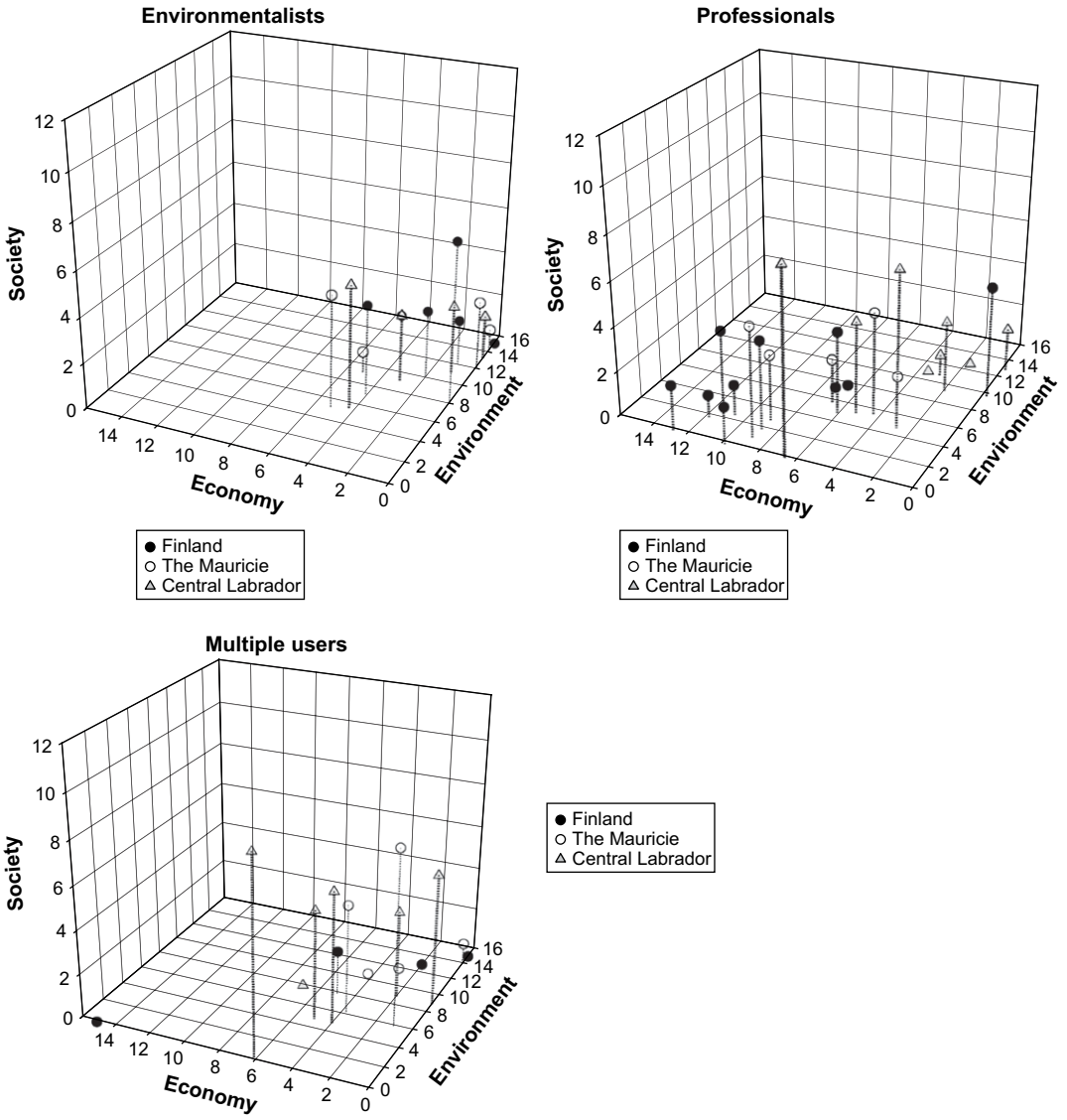

Fig. 4. Individual answers of different interest groups placed in a three-dimensional space, where the dimensions represent the environmental, economic and social components of sustainability. Each point represents the answers of one individual. The scale is the relative importance given to each component based on the respondents' ranking. The total score of the three components is always 15. The most important aspects receive the most points.

profitability of forest ownership, maintaining the vitality of rural areas and the lack of interest from the youth to continue forestry activities.

6. Discussion

Some general trends can be noted that reflect the differences and similarities between the regions and various interest groups even though the sample size is small. Moving from a region where industrial forestry is of great importance to a region where it is less important, our study suggests that forest values tend to be more environmentally and less economically oriented, and more uniform among groups. The results support the first hypothesis that there are differences in weightings of sustainability components and topics included in SFM across regions. Most previous studies have not sought regional differences, but have concentrated on one country or a region within a country. However, there are European studies that use spatial variations in forest cover across Europe or across regions in one country to explain differences in local forest attitudes (Elands et al., 2004; Selby et al., 2007). Our results also suggest that people are mainly concerned about changes from the existing condition, whatever it is. As the existing situation is well known, it is considered to be the safest alternative in contrast to the unknown outcomes of a changing situation. Our results also reflect the fact that peoples' views strongly depend on the forestry foundation of the local society. The forest sector is of great economic importance in Southeastern Finland (see Table 1). Whereas in Labrador, where there has been little historical industrial forestry activity, the most important uses of the forest are based on non-timber forest products and services.

The results partially support the second hypothesis that weightings of sustainability components and topics included

in SFM in the same interest groups across regions are similar and the third hypothesis that the weightings of sustainability components and topics included in SFM differ between groups in the same region. In Southeastern Finland the views of the different interest groups seem to be more polarized than in the two study areas in Canada. This polarization of views was also noted in the discussion on national forest policy in Finland (Rantala and Primmer, 2003). There is evidence that conflicts between the various interest groups in Finland are intense in comparison with other countries (Hellström, 2001). New voluntary nature protection measures like trading in natural values have been suggested as a way to bring the conflicting views closer to each other (Berninger, 2006).

The social component of sustainability was weak in the weightings in Southeastern Finland and the Mauricie, but came up in discussions, for example, the forest owners' concern about the lack of interest from the youth to continue forestry activities. The weakness of the weightings of the social component may partially be explained by the polarization between economic and ecological components in Southeastern Finland and the Mauricie that may have pushed social issues to the background. In this case less structured methods like group discussions are better suited to elicit these topics. On the other hand, the weakness of the social component detected in the results can partly be explained by the difficulty in defining social sustainability at both a national and an international level compared to the greater conceptual understanding of ecological and economic sustainabilities. People either do not necessarily understand what social sustainability means or they may consider themselves and their viewpoints to be the social component. This result is consistent with surveys conducted in Canada indicating that people value ecological conditions of the forests over direct social aspects such as jobs and recreation possibilities (Meitner et al., 2001; Tindall, 2001). Sheppard (2003) states that the satisfaction of local people with forestry is an important part of social sustainability, and that satisfaction can be reached, at least partially, by showing that forestry is ecologically sustainable. It is also possible that the concept of indicators that we used in the questions is not as effective in capturing social values as in capturing ecological and economic values or alternatively that the social values are indirectly represented by the forest conditions people wish to maintain.

In this study we compared peoples' weightings of sustainability components and themes included in SFM in three different regions. Our results show a clear pattern across our study regions. Despite other differences between the regions, our conceptual model (Fig. 1) suggests that an important part of the variation across regions comes from the gradient of historical and current differences in the importance of commercial forestry. In contrast, it could be argued that the results are a stronger reflection of the cultural differences between the regions than the differences in the importance of industrial forestry. However, we observe forest management and forest use factors to strongly influence the cultural models about forests and forest values (see Fig. 1). For example, the Finnish view of their forests is based on a long history of intensive forestry. The Finns prefer a relatively open forest where it is easy to move. Although this kind of forest is normally a result of rather intensive management, old natural pine forests are also open and hence highly valued (Karjalainen, 2001). The forest we see around us and the activities we are used to do in the forest both shape our cultural models about what forests should be like and how they should be managed.

7. Conclusions

By focusing on three regions with different forest uses we were able to evaluate trends in perceptions about SFM that escape traditional case study evaluations. Our study shows that the definition of Sustainable Forest Management is rather elastic and varies not only between interest groups, as shown elsewhere, but among the same interest groups in different regions. Although foresters always valued the economic benefit of forests more than the other interest groups, differences between the groups were smaller in regions where commercial forestry is less important. This illustrates that local natural and socio-cultural conditions, public discourse and individual forest experiences interact in such a way that creates localized subcultures with distinct cultural models about forests. It should be remembered that the present study is only a beginning and more research will be needed with larger sample sizes in multiple regions to confirm the results obtained here.

Our results illustrate that the dichotomy of economy versus nature that has often been used in discussions on SFM is too simplistic to give a full picture of different local conditions. In regions where forestry is economically relatively important, like Southeastern Finland, this dichotomy may work, but in regions like Central Labrador, where the current economic role of forestry is marginal and where First Nations play an important role in the use of the forests, the social dimension of sustainability is of higher importance. The three-pillar approach gives a more complete picture of the different aspects of SFM.

Acknowledgements

We most warmly thank the people who participated in this study and those in the three research areas who made this research possible: Timo Weckroth from the Regional Forestry Centre of Southeastern Finland; Caroline Lacasse from Abitibi Consolidated in Shawinigan Quebec; Neal Simon and Frank Phillips from the NL Department of Natural Resources; Valerie Courtois from the Innu Nation and Bryn Wood from the Labrador Metis Nation. We thank the two anonymous reviewers for valuable comments. We thank Lana Ruddick for English proofing, Mélanie Desrochers for help with maps, and the Sustainable Forest Management Network as well as the Finnish Helsingin Sanomat Fund for funding.

References

Adamowicz, W.L., Burton, P.J., 2003. Sustainability and sustainable 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, Ottawa, pp. 41–64.

Adamowicz, W., Beckley, T., MacDonald, D.H., Just, L., Luckert, M., Murray, E., Phillips, W., 1998. In search of forest resource values of indigenous peoples. Soc. Nat. Resour. 11, 51–66.

Berninger, K., 2006. Millaisia teemoja ja painotuksia sisältyy kaakkoissuomalaisten mielestä kestävään metsätalouteen? (Which themes and rankings do forest users in Southeastern Finland include in SFM? Thoughts of four interest groups, in Finnish). Metsätieteen aikakauskirja 3, 399–410.

Brown, K., Adger, N.W., Tompkins, E., Bacon, P., Shim, D., Young, K., 2001. Trade-off analysis for marine protected area management. Ecol. Econ. 37, 417–434.

Brunson, M.W., Shindler, B., Steel, B., 1997. Consensus and dissension among rural and urban publics concerning forest management in the Pacific Northwest. In: Steel, B. (Ed.), Public Lands Management in the West. Greenwood Publishing, Westport, Connecticut, pp. 83–94.

Canada's Model Forest Program (CMFP), 2000. A User's Guide to Local Level Indicators of Sustainable Forest Management. Natural Resources Canada. CMEP.

Elands, B.H.M., O'Leary, T.N., Boerwinkel, H.W.J., Wiersum, K.F., 2004. Forests as a mirror of rural conditions. For. Policy Econ. 6, 469–482.

Goodland, R., 1995. The concept of environmental sustainability. Annu. Rev. Ecol. Syst. 26, 1–24.

Hellström, E., 2001. Conflict cultures. Silva Fennica Monogr. 2.

Horne, P., Koskela, T., Ovaskainen, V., Karppinen, H., Naskali, A., 2004. Metsänomistajien suhtautuminen yksityismetsien monimuotoisuuden turvaamiseen ja sen toteutuskeinoihin. In: Horne, P., Koskela, T., Ovaskainen, V. (Eds.), Metsänomistajien ja kansalaisten näkemykset metsäluonnon monimuotoisuuden turvaamisesta, Finnish Forest Research Institute Report 933, Vantaa, pp. 47–73.

Kant, S., Lee, S., 2004. A social choice approach to sustainable forest management. For. Policy Econ. 6, 215–227.

Karjalainen, E., 2001. Metsänhoitovaihtoehtojen arvostus ulkoilualueilla. In: Kangas, J., Kokko, A. (Eds.), Metsän eri käyttömuotojen arvottaminen ja yhteensovittaminen, Finnish Forest Research Institute Report 800, Kannus, pp. 183–185.

Leskinen, P., Leskinen, L.A., Tikkanen, J., 2004. Assessing objectives of regional forest policy in Northern Finland. Scand. J. For. Res. 19, 180–190.

Linnros, H., Hallin, P., 2001. The discursive nature of environmental conflicts: the case of the Øresund link. Area 33, 391–403.

McDonald, G.T., Lane, M.B., 2002. Forest management systems evaluation: using ISO14000. J. Environ. Plann. Manag. 45, 633–652.

McFarlane, B.L., Boxall, P.C., 2000a. Factors influencing forest values and attitudes of two stakeholder groups. Soc. Nat. Resour. 13, 649–661.

McFarlane, B.L., Boxall, P.C., 2000b. Forest Values and Attitudes of the Public, Environmentalists, Professional Foresters, and Members of Public Advisory Groups in Alberta. Canadian Forest Service, Northern Forest Centre Information Report NOR-X-374.

Meitner, M., Sheppard, S., Harshaw, H., Wilson, N., 2001. Arrow Forest District Social Values Survey Final Report. Department of Forest Resources Management, University of British Columbia, Vancouver.

Messier, C., Kneeshaw, D., 1999. Thinking and acting differently for sustainable management of the boreal forest. For. Chron. 75, 929–938.

Morgan, D.L., 1997. Focus Groups as Qualitative Research). In: Qualitative Research Method Series, second ed., vol. 16. Sage Publications, Thousand Oaks, London.

Myers, G., McNaghten, P., 1998. Rhetorics of environmental sustainability: commonplaces and places. Environ. Plan. A 30, 333–353.

Petäjistö, L., Aarnio, J., Horne, P., Koskela, T., Selby, A., 2004. Hirvenmetsästäjien motiivit ja käsitykset sopivasta hirvikannan koosta. Finnish Forest Research Institute Report 928, Vantaa.

Pobihuschchy, S.I., 1986. A perspective on the Indian nations in Canada. Can. J. Native Stud. 6, 105–128.

Rantala, T., Primmer, E., 2003. Value positions based on forest policy stakeholders' rhetoric in Finland. Environ. Sci. Pol. 6, 205–216.

Robinson, J., 2004. Squaring the circle? Some thoughts on the idea of sustainable development. Ecol. Econ. 48, 369–384.

Schusler, T.M., Decker, D.J., Pfeffer, M.J., 2003. Social learning for collaborative natural resource management. Soc. Nat. Resour. 15, 309–326.

Selby, A., Koskela, T., Petäjistö, L., 2007. Evidence of lay and professional forest-based development discourses in three contrasting regions of Finland. For. Policy Econ. 9, 633–646.

Sheppard, S., 2003. Knowing socially sustainable forest when you see one: implications for results-based forestry. For. Chron. 79, 866–875.

Sheppard, S., Meitner, M., 2005. Using multi-criteria analysis and visualisation for sustainable forest management planning with stakeholder groups. For. Ecol. Manag. 207, 171–187.

Shore, B., 1996. Culture in Mind. Oxford University Press, New York and Oxford.

Smith, P.D., McDonough, M.H., 2001. Beyond public participation. Soc. Nat. Resour. 14, 239–249.

Stedman, R.C., 2003. Is it really just social construction? Soc. Nat. Resour. 16, 671–685.

Strauss, C., Quinn, N., 1997. A Cognitive Theory of Cultural Meaning. Cambridge University Press, Cambridge, New York, Oakleigh.

Tasanen, T., 2004. Läksi puut ylenemähän. Metsien hoidon historia Suomessa keskiajalta metsäteollisuuden läpimurtoon 1870 – luvulla. Summary: the History of silviculture in Finland from the Medieval to the Breakthrough of Forest Industry in 1870s. Finnish Forest Research Institute Report 920, Vammala.

Tindall, D.B., 2001. Variation in public values and visual quality preferences. In: Compendium of the Visual Resource Management Conference, Seeing beyond the Trees, Kamloops, BC, 17–19 April 2001, pp. 215–234.

Tindall, D.B., 2003. Social values and the contingent nature of public opinion and attitudes about forests. For. Chron. 79, 692–705.

Wang, S., 2004. One hundred faces of sustainable forest management. For. Policy Econ. 6, 205–213.

Watson, D.O.T., McFarlane, B.L., 2004. Stakeholder Considerations for Recreation and Forest Management in the Sunpine Forest Products Forest Management Agreement Area of Alberta. Canadian Forest Service, Northern Forest Centre Information Report NOR-X-400.

Xu, Z., Bengston, D.N., 1997. Trends in natural forest values among forestry professionals, environmentalists, and the news media 1982–1993. Soc. Nat. Resour. 10, 43–59.