Regional management planning of natural resources in Metsähallitus – the Forest and Park Service

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Abstract

Metsähallitus – the Forest and Park Service (the FPS) has introduced a multi-target approach in its forest planning during the last few years. As a result, a model of regional management planning of natural recourses, presented in this paper, has been developed. Public participation, decision analysis and modern forest planning tools are utilised in interactive planning processes. The aim of the planning model is to support decision making in practical forestry on the strategic level. Two plans have been accomplished using the model so far. The experiences show that the planning model provides a more comprehensive figure about the planning problem and supports the FPS in making holistic decisions in practical forestry.

Keywords: natural recourses, public participation, decision analysis, multi-target forest planning, regional management planning

1 Background

Metsähallitus - the Forest and Park Service is a state enterprise, which is holding and managing the forests owned by the Finnish government. The total area of the parcel is about 8.7 million hectares, which covers about 25 % of the total forestry area of Finland. Also about 3.3 million hectares water is included. The forests are located mainly in the northern part of the country.

The tasks of the FPS are defined in legislation. The FPS has to manage its natural resources in an ecologically sustainable and economically profitable way. Especially the

FPS has to take care of biodiversity and it has also to take into account the interests of the local people and industry. In practice the FPS is carrying out multi-target forestry, its main goals being nature conservation, wood production and recreation. In the northernmost part of the country it is also important to take the cultural inheritance and the special rights of the local people into concideration. All functions of the FPS are realised along the ISO 14001 environment standard.

From the total area of 8.7 million hectares about 3.2 million hectares are commercial forests, used mainly for wood production with multi-use principle. Poorly productive forestry lands with no forestry operations account to about 1.4 million ha. The rest are protected areas (1.2 million ha), wilderness areas (1.5 million ha) and other special areas (1.5 million ha), such as high-elevation forestry areas and areas reserved for future conservation.

On the basis of the international agreements (Rio 1992, Helsinki 1993...), the strategy of the sustainable forestry in Finland (Ministry of Agriculture and Forestry, 1994) and the recent development of forest planning methods and tools, the FPS launched in 1994 a project aiming at integrating its thematic forestry planning with participatory and multi-target forest planning on the strategic level. The project was finished in 1995 and the first two new plannning projects were started in 1995 and completed in 1997.

2 Goals of the regional management planning of natural resources

The purpose of the regional management planning of natural recourses is to find out the best strategy for the region for the next period. The basic idea is to evaluate the consequences of the alternative strategies in order to work out a strategy that best meets the goals of the FPS and the objectives of the environment. This approach stresses the role of strategic planning as a foundation for traditional (tactical) forest management planning .

Another main objective is to get the acceptance of the environment to the operations of the FPS by involving the environment in the planning process and taking its objectives into account in the plan. The expertise and opinions of the (local) people, communities and customers are gathered by means of public participation and this information (goals, objectives, comments, wishes and hopes) is included in planning.

3 Planning model

The regional management planning of natural recourses integrates public participation and decision making analysis with modern forest planning tools. The planning process consists of five main stages. PATI or GIS System, the MELA System, decision support analysis and the methods of

public participation are key tools of planning. The stages are:

1. analysis of the starting point;
2. goal analysis;
3. predictions;
4. selection of the strategy, and
5. implementation schedule.

1. Analysis of starting point

The planning process is launched with the analysis of the starting point. The quantity and quality of the natural resources of the region are assessed through the SWOT anlysis (Strengths, Weaknesses, Opportunities, Threaths). The analysis is carried out separately from the points of view of nature conservation, forestry, recreation and from those of local people and local economy. The results are also reported from each of these standpoints.

In order to find out a total picture of the resources, analyses are compiled for regions with all different kinds of forests involved: commercial forests, protected areas, recreational areas, etc. The area of the regions is ranging from about 0.4 million hectares in the south to about 2.5 million hectares in the north.

An updated database is utilised in the analysis of the starting point. The standwise database of the FPS is today updated continuously by operations and yearly by growth simulation. The database covers all lands of the FPS and contains in addition to standard forestry data also information about nature conservation and recreation. The SWOT analysis of the starting point is carried out mainly by enquiries and summaries compiled by the PATI System.

2. Goal analysis

In the goal analysis the objectives of the local citizens, communities, industry and other interested parties are gathered through various methods, such as meetings, open house gatherings, working groups, questionnaires, letters, telephone and the internet. The general goals and tasks of the FPS are specified for this particular region and for this special planning case. The resulting combined goal information characterises the desired future management policy of natural resources for the next period in the region.

3. Predictions

Production functions between inputs and outputs illustrate what is possible to attain and the trade-offs between different outputs show how the outputs depend on each others.

Production functions and trade-offs are estimated by the results of alternative strategies. Some (3 to 4) feasible alternative strategies with different emphasis on various goals are fixed. The results are measured by the set of the selected variables (criteria and indicators). The predicted future development of the variables estimates the production functions and the trade-offs.

One of the alternative strategies is that one carried out during the past period, the so-called basic strategy. The alternative strategies compose of feasible land use alternatives accompanied with changes in silviculture and cutting schedules. The PATI and MELA Systems are the key tools of the FPS to find out the state of its

forestry resources today and to seek answers for "what - if" questions of the future development of the forestry resources.

The land use differentiation for alternative strategies is made by the PATI. The projections of the alternative strategies are compiled by the MELA. These projections provide numerical values for the selected indicators and criteria. The calculations are based on the standwise data from the PATI. For calculations the stands with similar characteristics are aggregated into a same stratum. In optimisation also subdomains can have their own restrictions. The main MELA sensitivity analysis used in the FPS are changes in the rate of return and in the rotation age.

The MELA System of the Finnish Forest Research Institute is a well known forest planning tool. Its special strengths are a powerful simulation and optimisation and effectiveness in handling large quantities of data. In the MELA planning procedure several feasible management schedules (programmes of silviculture and cuttings) are simulated for every stand. The optimum solution for the forestry unit is then worked out by means of the JLP Optimisation. The optimum solution provides also the standwise management schedules. (For more information about the MELA the reader is referred to, for example, Siitonen et al. 1996).

4. Selection of the strategy

When selecting the strategy the results of the alternative strategies are evaluated against the goals of the FPS and against the objectives of the environment. The desired future balance between wood production, nature conservation, recreation and other perspectives is judged by the means of the values of the selected set of criteria and indicators and with the help of decision making analysis.

The selected strategy fixes the land use pattern and the silvicultural and cutting guidelines. Also other principles (such as those concerning buying and selling the land, making cottage zoning maps, taking gravel...) are decided. The levels of main outputs and inputs are confirmed in quantity, some in quality too.

If the consequences of any of the compiled strategies do not provide a balance good enough, the strategy to be implemented is formulated by an iterative process.

The main decision support technique utilised in the FPS so far is interactive decision analysis (IDA). The method is based on the utility theory and the idea of the analysis is to make things expressed in different terms comparable in one single term: utility. In the FPS the IDA contains three steps (Pykäläinen et al. 1998):

1) finding out the parties' preferences and describing them in the form of an additive utility function;
2) formulating the overall utility function by integrating the parties' utility functions, and
3) evaluating the alternative strategies by means of the overall utility function. The sensitivity analysis is an essential part of this step.

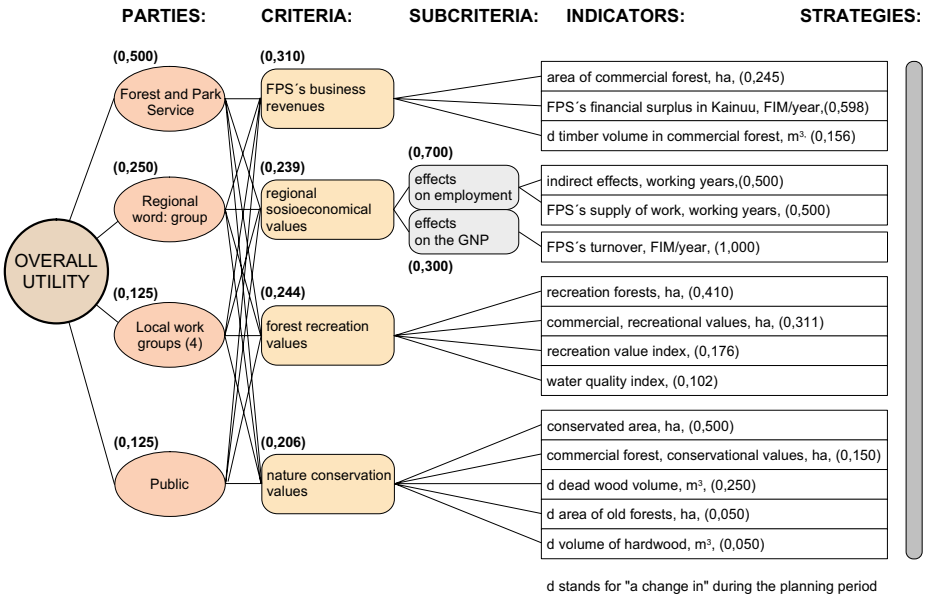

Fig. 1. The decision hierarcy applied by the FPS in the IDA in Kainuu region. The values in brackets comprise the local weights for the decision elements

The overall utility function ranks the strategies along the utility and the sensitivity analysis tells, how sensitive for changes in parametres is the solution (Fig. 1). A decision hierarchy applied in the FPS is an illustrative way to describe the overall utility function (Pykäläinen et al., 1998).

5. Implementation schedule

Implementation schedule is a tactical plan that puts the strategy into operational work. In the implementation schedule the land use is fixed spatially by the PATI and the other principles and guidelines are specified within land use classes. The amounts of the main outputs and inputs are also fixed within land use classes. Some inputs and outputs are defined also in quality.

4 Experiences

The first two regional plans have been accomplished for Kainuu in Central Finland and for Western Finland. The total area of the Kainuu plan is little less than 0.9 million ha and that of Western Finland about 0.4 million ha. The regions differ from each other both in geography and by the goals of the natural resources management. The emphasis of the various goals by different participants is shown in Table 1.

The objectives of recreation and nature conservation have relatively more emphasis in Western Finland, economic objectives in Kainuu.

The best strategies differ as wel (Table 2):

Table 1. The emphasis of the various goals of regional plans by different participants in Kainuu and Western Finland.

Emphasis of goals:	in Kainuu / in Western Finland		
Participants:	Citizens	Local Groups	the FPS
Local economy	0,25 / 0,10	0,28 / 0,28	0,20 / 0,14
Nature Conservation	0,13 / 0,30	0,25 / 0,23	0,20 / 0,23
Recreation	0,50 / 0,40	0,21 / 0,31	0,20 / 0,23
the FPS' economy	0,13 / 0,20	0,26 / 0,19	0,40 / 0,40

Table 2. The relative overall utility values of different strategies of regional plans in Kainuu and Western Finland.

Strategy:	Basic	Conservation	Economy	Recreation
		Emphasis on		
Overall Utility Values:				
*Kainuu	0.47	0,34	0,52	0,45
*Western Finland	0,64	0,66	0,66	0,77

Due to the different sub-utilities it is relevant to compare the relative values of strategies only within each region, not between the regions. In Kainuu the strategy emphasizing FPS' economy gets the highest relative value, in Western Finland the one emphasizing the recreational use of forests. Sensitivity analyses show that the solutions are rather stable.

5 Discussion

The planning model presented supports multi-objective decision making in practical forestry on the strategic level. All of us know that multi-target decision making in forestry is challenging. The decisions and selections are basically human judgements, but proper planning can provide valuable support in terms of diverse and valid information. There was a goal in the FPS to gain more comprehensive information for holistic decisions through the integrated approach. Key lessons learned so far include:

- citizens and interest groups are genuinely interested in the management of forests owned by the State;
- they have a lot of knowledge and expertise in the matter;
- goals of different groups can be quite conflicting also at the local level;
- non-wood values are hard to express meaningfully in numerical terms, which are most convenient to handle in planning procedure;
- more knowledge about production functions and trade-offs has been gained via the processes in the FPS;

– learning about the trade-offs between different outputs is a broadening process for most of participants;
– a lot of research is needed to gain more accurate production functions and trade-offs, especially in the fields of nature conservation and recreation;
– the decision analysis structures the problem into meaningful parts and stresses the focus on essential factors, on the other hand there is a danger of oversimplifying;
– the decision analysis needs to be developed to more "user friendly", free of method and forestry jargon; and
– recreation and nature conservation have a strong role in FPS' forest management planning.

There is quite a common opinion in the FPS that without the applied approach it would have been still harder to grasp a comprehensive picture of the decision problems and to find out solutions accepted by the FPS and the environment. And in spite of the shortcomings mentioned above the planning model has helped us to make holistic and concious selections.

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