

We have the tools – How to attract the people? Creating a culture of Web-based participation in environmental decision making

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Abstract: The proliferation of the World Wide Web has opened new opportunities to support participatory decision making. We now also have a number of Web-based tools to support participation and decision analytical methods. This opportunity is of special interest in environmental applications where we always have multiple objectives and multiple stakeholders who are often geographically in different locations. In spite of the attractiveness of the tools, we still have very limited number of users. In this paper, we discuss the ways and requirements to apply decision analytical tools in Web-based public participation. We demonstrate a framework to support participatory processes, which includes Web-based tools for decision analysis and participatory feedback. The applicability of the framework is discussed in terms of experiences obtained from three lake regulation applications in Finland. Our main message is that there has to be a strong commitment to create a culture of Web-based participation by case projects before the public stakeholders and the authorities can accept this new approach.

Keywords: Multicriteria decision analysis, Decision support systems, Public participation, Environmental decision making, World Wide Web

1. Introduction

Environmental assessment is becoming more and more difficult and multifaceted field. The assessment practice is currently addressing several interrelated themes, such as public participation and involvement, participatory or social learning, sustainability, strategic environmental assessment, and adaptive management. Due to this diversity of themes, the practitioners have to meet multiple methodological and substantive goals (Armitage, 2005).

The importance of public participation in environmental assessment has increased during the last decade. At the same time, theory, practices and methods for participation have been developed. The role of public participation is changing from one-way communication between authorities, experts, stakeholders and citizens towards more intensive two-way interaction (e.g. Beierle, 2002). The quality of the planning process and active involvement of stakeholders have proved to be key issues in controversial consensus seeking processes (e.g. Renn et al., 1995; Daniels and Walker, 1999; Wondolleck and Yaffee, 2000; Lewicki et al., 2003).

The change in the planning culture sets new challenges for project planners and managers. Participants in the processes may have very different backgrounds, expectations and frameworks (Yankelovich, 2001). Therefore, the planning process should incorporate differences in the values and knowledge of different stakeholders. On the other hand, the decisions should be based on informed judgments not on opinions (Yankelovich, 1991). Increasingly, good decisions are characterized by the amount and nature of learning during the planning process (Daniels and Walker, 1999). The more complex the decision is, the more important and challenging the creation of the learning process is.

Multicriteria decision analysis (MCDA) is a structured approach to systematically analyze complex decision making problems. The aim is to identify different elements of the problem and, by combining these elements, to get a comprehensive view of the problem. In group decision making, this makes it possible to analyze different views in a unified setting to increase the transparency of the process and achieve a common understanding of the other stakeholders' objectives. Especially in environmental decision making the MCDA approach can be useful, as the views of the stakeholders

are typically diverse and even conflicting. MCDA has been successfully applied in many environmental applications including ones in water resources planning (Marttunen and Hämäläinen, 1995; McDaniels et al., 1999; Anderson et al., 2001; Gregory and Wellman, 2001), natural resources management (Gregory and Keeney, 1994; Kangas et al., 2001; Keefer et al., 2004) and energy policy evaluation (Hämäläinen, 1992; Greening and Bernow, 2004).

The Web provides new opportunities to support participatory processes. In the simplest form, it can act a communications channel for both informing the public and collecting the feedback. Web-based communication has been applied, for example, in forestry management (Kangas and Store, 2003), urban planning (Kingston et al., 2000) and watershed management (Voinov and Constanza, 1999). Recent development has also produced advanced Web-based tools to support MCDA. So far, the use of these has been rare, but the trend of increasing the sophistication of the supporting systems can be observed (Shim et al., 2002).

In this paper, we study the use of MCDA methods and the Web to support environmental participatory processes. We demonstrate a framework for Web-based participation, in which different kinds of tools are applied. The applicability of the framework is reflected with the experiences obtained from three real life cases on lake regulation in Finland, in which Web pages and Web-based software were used to support the public participation.

This paper is organized as follows. Section 2 discusses the opportunities of using MCDA methods and the Web to support participatory processes, and Section 3 presents a framework for Web-based participation in environmental decision making. In Section 4, we describe the lake regulation projects, and discuss the experiences collected from these projects. The applicability of the framework to support environmental participatory processes in general is discussed in Section 5, and Section 6 gives the concluding remarks.

2. Use of multicriteria methods and the Web in public participation

2.1. Public participation in environmental decision making

Public participation in environmental impact assessment and management varies widely from country to country according to local political and cultural traditions. In countries with Anglo-Saxon traditions, people associate democracy and opportunity to participate government decision making (Renn et al., 1995). The potential for public input is wide, as there are several key phases where public contribution is relevant (Morgan, 1998).

The importance of public participation in environmental decision making has been emphasized by the Aarhus Convention on Access to Information, Public Participation and Access to Justice in Environmental Matters (United Nations Economic Commission for Europe, 1998). Strengthening the role of public participation in the environmental impact assessment has also been addressed in Directive 2003/35/EC (EC, 2003). The ultimate goal of that directive is crystallized in the preamble which states: "Effective public participation in the taking of decisions enables the public to express, and the decision maker to take account of, opinions and concerns which may be relevant to those decisions, thereby increasing the accountability and transparency of the decision making process and contributing to public awareness of environmental issues and support for the decisions taken" (EC, 2003, para. 3). Also the EU Water Framework Directive (WFD) (EC, 2000) emphasizes the importance of public participation, for instance, when the river basin management plans are prepared.

Objectives of public participation are various. Beierle (1998) has presented a framework for evaluating the success of public participation programs in environmental decision making. The framework is based on six goals: (i) informing and educating the public, (ii) incorporating public values and knowledge into decision making, (iii) improving the substantive quality of decisions, (iv) building trust, (v) reducing conflicts, and (vi) achieving cost-effectiveness. Morgan (1998) and French et al. (2005) provide other perspectives, in which attributes such as fairness, openness, transparency and legitimacy of the process are used to characterize the success of a participatory process.

2.2. Public participation process

A participatory process can vary from passive participation where the public is merely informed to processes where the public is actively involved in the different phases of process and decision making. Results of many studies suggest that the more intensive the stakeholder involvement process is the more positive results will be achieved as in intensive processes stakeholders provide more ideas, information and analysis (Beierle, 2002; Connick and Innes, 2003). In many cases, participants have been able to “expand the pie” and find solutions that were not obvious at the start of the process. Another important result is that the form of participation, public meetings, workshops, or citizen advisory committees, does not determine process or outcome success. More important is how the process has been carried out and how the methods have been applied (Chess and Purcell, 1999; Hartley and Wood, 2005).

There are many methods suitable for public involvement. Morgan (1998) divides the methods into four categories: (i) methods primarily for seeking public input, (ii) methods primarily for informing and educating, (iii) methods for promoting information exchange and interaction, and (iv) methods that aim specifically at finding commonly agreed upon solutions, for example, alternative dispute resolution (ADR) methods. The choices of the method and the participants depend on the project, its context and the goals set for the participation process. For a classification of various methods in terms of achieving objectives of participation, see French et al. (2005).

In this paper, we focus on processes in which a steering group is set up to represent different interest groups. This approach is well suited especially in cases concerning a large number of stakeholders. The work of the steering group is facilitated by the experts on multicriteria decision analysis and environmental issues. The aim is to get a shared understanding of the conflicting issues by identifying objectives and eliciting the group members’ preferences, for example, with MCDA methods and by discussing these collaboratively. The public is involved in the process by organizing public meetings and hearings in different phases of the project. Questionnaires and interviews are also an important source of information. Figure 1 shows the course of a typical participation process in a

case where a steering group is used. It also shows the methods applied in different phases of our lake regulation projects.

2.3. Multiattribute value theory

Multiattribute value theory (MAVT) is an MCDA approach for eliciting the preferences of the stakeholders. In MAVT, the alternatives are evaluated with respect to each attribute and the attributes are weighted according to their relative importance. Assuming that the attributes are mutually preferentially independent (see Keeney and Raiffa, 1976), an additive value function can be used to elicit the overall values of the alternatives. The overall value of alternative x is

$$v(x) = \sum_{i=1}^n w_i v_i(x_i), \quad (1)$$

where n is the number of attributes, w_i the weight of attribute i , x_i the consequence of alternative x with respect to attribute i , and $v_i(x_i)$ its score on 0–1 scale. The weight w_i indicates the relative importance of attribute i changing from its worst level to its best level, compared to the changes in the other attributes, and the sum of the weights is normalized to one. In practice, there are different procedures to elicit the weights (see, e.g. von Winterfeldt and Edwards, 1986; Belton and Stewart, 2002). Sensitivity analyses can be applied to study how the overall values change when varying the attribute weights or the ratings of the alternatives (see e.g. Belton and Stewart, 2002).

MAVT modeling is a laborious process and requires understanding the methods. Within the steering group, MAVT methods can be easily applied as a decision analyst typically facilitates the process. In decision analysis interviews (see e.g. Marttunen and Hämäläinen, 1995), the preferences of the steering group members, or some other stakeholders, are modeled one by one with an assist of the decision analyst. She assures that the modeling process is carried out properly and that all the different viewpoints are taken into account in the analyses. The obtained preference models are collectively analyzed within the steering group to get a view of the other stakeholders' preferences. The value trade-offs and the results can also be demonstrated in public meetings to illustrate the differences between the interest groups to the public. Another way to apply MAVT methods is decision

conferences or workshops (see e.g. Phillips, 1984; Phillips and Phillips, 1993; French, 1996). These are one to three-day events, where the problem is collectively modeled under facilitation of decision analyst. The obtained common preference model can be evaluated individually by the participants, and these models can be collectively analyzed.

2.4. Opportunities of the Web

The World Wide Web provides various opportunities to support participatory processes. In this paper, we deal with three types of support: (i) the use of the Web as an information distribution channel, (ii) the use of the Web to support the collection of the feedback and (iii) the Web-based support for modeling and analyzing the problem.

Communication support

The Web provides an easy and inexpensive way to distribute information. The information is instantly available to the users and it can be accessed at any time by anyone. The multimedia features of the Web make it possible to distribute different types of media. Web-based communication framework also allows two-way communication to collect feedback from the participants. Then, time and expenses can be saved both in distributing questionnaires to the public and in returning them back. The results of the questionnaires can also be made easily available on the Web.

In spite of these advantages, the use of the Web for supporting communications is not straightforward. The Web is inherently a pull media, which means that the users have to retrieve the information by themselves (Bhargava and Krishnan, 1998). Thus, the public has to be first informed about the existence of the information. Traditionally, this has been carried out with newsletters, or through general communications channels such as newspapers, television and radio (Morgan, 1998). Unfortunately, so far the Web does not provide any more effective way to do this. Recently, Web portals have been developed to act as push media, but these have not yet achieved such a position that we could use these to inform a very large number of people. E-mail lists provide an additional cheap and easy way to directly inform the public, but at the moment complete lists of e-mail addresses of all the stakeholders are not available. It is also questionable whether these will exist in the future.

Once the public has been informed that there is information available on the Web, they can access this information at any time they want. Thus, it is often worthwhile to invest in informing the public in early stages of the process, for example, by starting the process with an extensive newsletter campaign directed to all the possible stakeholders or citizens in the impact area. In this newsletter, the public can be asked to join an e-mail list providing information about the events of the project. This is especially important in long term projects, in which the interaction with the public is not frequent, and there is a risk that the public may stop following the Web pages.

Support for evaluation and modeling of the problem

Web-based MCDA software provides opportunities to support the modeling of the problem in participatory processes. These include the above-mentioned availability of the software at any time and place. In addition, Web-based software does not require any installations, which may make it easier to start using the software.

With Web-based software anyone can independently create and evaluate her preference models. However, with general public this is not easily applicable, as the use of MCDA methods requires understanding of decision modeling. There is a high risk for biased results if the theory behind the method is inadequately understood (see e.g. Weber and Borcherding, 1993, or Pöyhönen and Hämäläinen, 2001). This could consequently decrease the participants' trust and commitment to the obtained results. Thus, a fully independent use of decision analytical software can be considered to only apply for experienced users. Yet, the public can use the Web-based MAVT software, for example, to analyze the preference models of the steering group members in order to increase their understanding of different stakeholder groups' preferences. Also this mode requires understanding of the methods, and may thus not be applicable.

3. Framework for the Web-based participation

In this paper, we present a framework for the use of the Web in participatory processes in which a steering group has been set up to represent the different interest groups (Figure 2). In this framework,

the steering group works under guidance of decision analysis experts with technical assistants driving the software and maintaining the Web pages, and the public participation is carried out through the Web. The independent use of the Web resources is based on the above classification of three different types of support. That is, (i) information is distributed through a static Web page, (ii) feedback is collected with a Web-based survey software and (iii) the problem is modeled and evaluated with a help of Web-based decision analytical software. The first two of these can be carried out fully independently, but as mentioned above, it is questionable whether the public can operate with Web-based decision analytical software independently. Thus, these have been marked as optional in the framework (the dotted lines).

In practice, it is not likely that the proposed Web-based framework could be applied as purely Web based, but traditional ways are needed in parallel. One of the main aims of this paper is to study how effectively the objectives of public participation described in Section 2.1 can be met with this framework, and in which respects traditional approaches still outperform Web-based approaches.

4. Lake regulation projects

The majority of Finnish large water courses are regulated. The total area of lakes is 32,600 km², of which approximately one third is regulated, and all the largest rivers are harnessed by the hydro power plants. The main objectives of the regulation are flood prevention and hydro power production. Most regulation projects were started during the 1950s and early 1960s without any major environmental impact assessment. Since then the use of water courses has changed, for example, the recreational use of water courses has increased remarkably. Wider environmental awareness has altered also values of society and the attitudes of water course users. As a result, there has been a great pressure to modernize the old water level regulation projects. At the same time, the opportunities to diminish harmful impacts of regulation have also improved, as the knowledge of the ecological impacts and how to diminish them have advanced. In addition, hydrological information systems and hydrological forecasting methods have progressed.

We study the applicability of the framework presented in Figure 2 to support public participation in the development of the existing lake regulation policies. The experiences are collected from three large lake regulation projects on Lake Päijänne, Lake Kallavesi-Unnukka and Pirkanmaa lakes (see Table 1). We do not describe the projects in detail, but focus on studying different ways of involving the public and the stakeholders. Especially, we study what are the requirements for the use of Web-based tools to support participatory planning in these types of projects.

4.1. Web tools in use

Besides static Web pages, two Web-based software were used in these projects: Opinions-Online (Hämäläinen and Kalenius, 1999) as a survey software and Web-HIPRE (Hämäläinen and Mustajoki, 1998; Mustajoki and Hämäläinen, 2000) as an MCDA software. Both tools are available on the Decisionarium Web site for global decision support (Hämäläinen, 2000, 2003). Opinions-Online is a platform for global participation, voting, surveys and group decisions. One can quickly create and edit questionnaires providing different ways of collecting data, such as multiple choice questions, approval voting, ranking of the alternatives and multiattribute rating of the alternatives. Written comments can also be collected. One can also sample the opinions according to any set of the fields in the survey. This makes it possible to study, for example, the differences in the opinions between the interest groups.

Web-HIPRE is a multicriteria decision analysis software, which supports both MAVT and the analytical hierarchy process (AHP) (Saaty, 1980, 1984; Salo and Hämäläinen, 1997). It is a Web-based successor of HIPRE 3+ software (Hämäläinen and Lauri, 1995). Of the MAVT methods, Web-HIPRE supports SMART (Edwards, 1977; von Winterfeldt and Edwards, 1986; Edwards and Barron, 1994), SWING (von Winterfeldt and Edwards, 1986) and SMARTER (Edwards and Barron, 1994; Barron and Barrett, 1996). In addition, Web-HIPRE allows the aggregation of individual preferences in the group preferences with weighted arithmetic mean method (Keeney and Raiffa, 1976; Ramanathan and Ganesh, 1994; Salo, 1995). It is also possible to import HIPRE 3+ models to Web-HIPRE.

4.2. Public participation in the projects

The core of the participatory process was basically the same in all these projects. The initial screening was carried out by a mail questionnaire. A steering group was set up, and preference modeling and the evaluation process was carried out in collaboration with the group. The public was involved in the process by arranging public meetings and hearings and by carrying out questionnaires among them in different phases of the process. We also tested different ways of participating the public through the Web following the process flowchart in Figure 1.

In the use of MCDA methods, there were differences between the projects. In the Lake Päijänne project, the preferences of the steering group members were modeled with MAVT by using HIPRE 3+ in interactive and individual decision analysis interviews. The results of these analyses were presented in the closing workshop to illustrate divergent opinions between various stakeholders and to show that the opinions are most conflicting in normal water conditions and less conflicting in dry and wet water conditions (Marttunen and Hämäläinen, 2005). Draft recommendations were also presented. In the Kallavesi-Unnukka project, no MCDA methods were used, and in the Pirkanmaa case, an MCDA based Excel spreadsheet model was developed in order to create and study target regulations for the representatives of the steering group (Marttunen and Suomalainen, 2005).

The projects differed from each other also with respect to the use of the Web. In the Lake Päijänne case, the example preference models obtained in the decision analysis interviews were put available in Web-HIPRE for the public to analyze them independently. These were mainly used to demonstrate the opportunities of new technology (see Mustajoki et al., 2004). The case was also an example case to test the opportunities of using electronic negotiation in environmental decision making (see Hämäläinen et al., 2001). In the Lake Kallavesi-Unnukka case, the initial questionnaire was sent by mail to randomly selected stakeholders, but it could also be filled on the Web by other stakeholders. The results of both the mail and Web questionnaires were put available on the Web.

In the Pirkanmaa lakes case, we tested using the Web as a primary way to collect opinions before making the final policy recommendations. The suggestions for the recommendations and reasoning

behind these were described on the Web pages of the case, and Opinions-Online was used to collect public feedback about them. The possibility to reply on the Web was extensively advertised on the major local newspapers and on local radio and television. In addition, information about the Web-questionnaire was submitted to various e-mail lists of different stakeholder groups (e.g. the steering group members and of the representatives of local boating clubs) with a request to pass on this information to other stakeholders too. The questionnaire was also advertised, for example, on the Web pages of the local environmental institute and on some Web sites of the fishermen. An alternative way to participate was to return the mail questionnaire available at request by phone from environmental institutes, but the use of the Web was recommended.

4.3. Experiences on the use of the Web

In the surveys during the projects, we asked public opinion both on the issues concerning the regulation policies and on different ways to participate the public. Here, we focus on the latter ones. The results for a selection of related questions are presented in Table 2. In the following discussion, the numbers in parentheses refer to the corresponding questions in this table.

Information distribution

In the Web questionnaire of the Pirkanmaa case, we asked in which way the public received word about the questionnaire (Q-11). The aim was to get a view about the coverage of the different ways of informing the public. The majority of the respondents (55 %) named newspapers as their information source, which indicates that traditional ways to inform the people are still needed. However, 11% of the respondents received word about the questionnaire from an e-mail list, and as much as 25% from their friends. This suggests that communications through e-mail lists with a request to further spread the word around can provide considerable additional support for the newspapers.

In spite of the extensive information campaign, we cannot assume that all the local citizens and stakeholders became aware of the questionnaire. This view came up in participants' written comments, and is supported by the fact that almost a third of the respondents got the information

about the questionnaire from their friends or found it by accident. This is primarily a problem of traditional ways of informing the public, but naturally also concerns Web-based participation.

We also asked in which way the stakeholders want to get further information (Q-12). Newspapers were the primary way for 41% of the respondents, but the Internet (27%), and the newsletters (23%) were also named by many respondents. This suggests that several different ways are needed in parallel to get all the stakeholders involved into the process.

Collecting the feedback

In general, the participants' interest in giving feedback on the Web remained low. In the Pirkanmaa case, only 333 stakeholders responded to the final Web survey, although the total number of people receiving a word about the questionnaire can be estimated to be several thousands. In the Kallavesi-Unnukka case, the Web questionnaire was an additional option for the mail questionnaire, but only 28 responses (16%) came through the Web.

On the other hand, the response rates in all the mail questionnaires were very high. For example, in the initial questionnaire of the Päijänne case, it was 79%, which can be seen as exceptionally high. As a main reason for this we believe that personally sent mail makes the stakeholders feel that their opinion, in particular, is important, which consequently increases their willingness to reply. E-mail can be used to personally contact the people, but it can be experienced more impersonal than traditional mail. The ever-increasing amount of junk mail can also lower the credibility of this approach.

In spite of the low attractiveness of the Web-based participation, the respondents considered it easy to give the feedback on the Web. For example, 94% of the respondents in the Pirkanmaa Opinions-Online questionnaire at least partly agreed this (Q-10). Only 6 of 339 respondents replied by mail, which indicates that most of the people not having a Web access did not bother to answer the questionnaire at all, as at the time of the questionnaire 30% of the Finnish population had still not used the Web (Q-16). Especially, the share of the respondents in the age groups '55-64' and '65-' was considerably lower in the Web questionnaire (Q-15) than in the initial mail questionnaire (Q-7).

One should, however, note that the mail questionnaire cannot be assumed to reflect on the true age distribution of the stakeholders either, as it was sent to the owners of the real estates located by the lake, who mainly are elderly people.

Another issue that came up in the studies was the quality of the feedback. In general, the understanding of the other stakeholders' views is a key to a successful participatory process, and the stakeholders should have adequate knowledge about each others' views. In the Pirkanmaa Web questionnaire, the public was asked to independently study the material about the recommendations provided through Web links on questions to learn of the other stakeholders' views. However, the utilization rate of this material remained low, for example, only 9% of the respondents visited the material on all the questions, and 23% did not visit it at all (Q-13). Thus, we cannot assume that all the stakeholders had adequate knowledge to be able to carefully consider, for example, a question about the fairness of the suggested recommendations (Q-9). In this respect, Web participation can be seen even too easy, as the public may purposefully or unconsciously neglect some point of views. Naturally, there would be a same problem in a mail questionnaire, if such one was carried out at this stage of the process. However, for example, in public meetings, the participants are intimidated to get familiar with all the different point of views of the stakeholders, as these are brought up in balance by the administrators of the meeting.

Evaluation and modeling of the problem

The studies showed that the general understanding of the problem can be increased by clearly interpreting the results of the applied MCDA models to the public. In the Päijänne case, the preferences of the different stakeholder groups obtained with HIPRE models were used as a ground for the draft recommendations. These were demonstrated to the public in the closing workshop with an aim to show how different opinions the stakeholders in the steering group had before the compromise seeking phase of the project. The results suggest that the participants' understanding of the difficulty of the process is likely to have improved (Q-1)–(Q-6). For example, 80% of the respondents at least partly agreed that the recommendations for the regulation were able to combine

the different interests of the stakeholders (Q-4). In the Pirkanmaa case, the corresponding evaluation of the regulation recommendations was carried out independently on the Web, but only 35% at least partly agreed that the recommendations were able to combine the different interests (Q-9). One reason for this can be that the Web material was presented as separate Web pages on each question, which may have hindered getting a comprehensive overall view of the problem. In addition, most of the respondents did not study all the material and therefore probably did not adequately take the other point of views into account. One should also note that in the Päijänne case approximately 30% of the respondents were representatives of steering group, which may partly explain the difference in the stakeholders' satisfaction between the cases.

In the Päijänne case, we demonstrated an opportunity to allow the public to analyze Web-HIPRE models on the Web, but this was not widely advertised among the public, and remains as a subject of further research. It would be interesting to study, for example, whether the knowledge about the existence of these models already would increase transparency and consequently the public commitment to the process, even if the public does not analyze the models by themselves.

The use of Web-HIPRE would also have allowed carrying out remote decision analysis interviews in which the interviewee uses the software according to the decision analyst's guidance given through the Web. However, in terms of the credibility of the modeling, we consider this approach not very applicable, as in face-to-face interviews the decision analyst can observe the possible hesitation in the use of the method much better than in the Web-based approach. Thus, the personal presence of the decision analyst is often needed.

5. Discussion

5.1. The applicability of the framework in public participation

Our experiences on the lake regulation projects suggest that the proposed framework provides an effective approach to meet the objectives of Beierle (1998) and those of Directive 2003/35/EC (EC,

2003) assuming that some traditional approaches are applied in parallel. In Table 3, we have evaluated the effectiveness of the different methods used in our cases in terms of these objectives.

The steering group approach applied together with multicriteria decision analysis interviews provides a convenient way to clarify the facts and values of different stakeholder groups, and consequently, to improve *the substantive quality of decisions*. These methods are also highly effective ways to *reduce conflicts* among the members of the steering group through understanding the other stakeholders' preferences. In many cases, there is also great need for wider dialogue and consultation with local citizens and stakeholders. In our projects, different kinds of public meetings and workshops were arranged to meet this need.

The approach also provides an effective way to *incorporate public values* into the process, assuming that steering group members and decision analysis interviewees are appropriately chosen to represent the variety of the different stakeholder groups. However, mail and/or Web questionnaires should be used in parallel to also provide the general public a possibility to take part in the decision making process.

Several different approaches are needed to effectively *inform and educate the public*. Especially in informing the public, the variety of the methods is important, as none of the methods alone provides a comprehensive way to inform all the stakeholders. By applying different methods we can also increase the openness and transparency of the process and consequently *build trust*. One should, however, note that to successfully educate the public with Web-based approaches, a committed interest to comprehensively learn the material distributed through the Web is an essential requirement.

In general, we think that all the methods considered are *cost-effective* ways to carry out the task for which they are designed to. Especially, the Web-based approaches are very economical ways to present information and to carry out the participation. However, there are problems related to, for example, how well these approaches catch the target groups and how to activate people to participate. In these respects, traditional approaches provide some advantages, for example, through a mail questionnaire one can also inform large number of people.

Independent use of Web-HIPRE models requires such skills and activity that people will probably never do that. Therefore, it is important to develop user-friendlier approaches to help people identify and analyze their values and preferences on the Web. One possible way is to combine the ideas of Opinions-Online and Web-HIPRE and to develop a more structured and controlled MCDA analysis which arrives at the result by using a step-by-step approach.

We consider it especially important that decision analysis researchers collaborate with the policy support administrators. In this way, we can take the needs of both parties into account in the practical development of the approach, which we consider as a basis for creating a sustainable framework for public participation. We also emphasize that public meetings or workshops should be organized in a systematic way. For example, value-focused thinking (Keeney, 1992) can be applied in order to analyze and organize the values and objectives of local people and stakeholders.

5.2. How to attract people?

In spite of the applicability of the proposed framework, our cases demonstrated that Web-based participation does not attract people. It is not enough to have tools, as technology push does not work. As a main reason for the lack of interest we think that although the public is heard, they often feel that their opinions are not taken into account in the planning process. This also came up in many participants' written comments during our projects. However, we believe that in most cases this feeling originates from the fact that the effects of public participation on planning process and decisions are not clearly reported. In this respect, the interest in participation grows from positive experiences. That is, when introducing, for example, the final policy recommendations, the authorities should also clearly describe how these reflect the public opinions. It is also important to describe the learning process happened in steering group meetings. The challenge is, however, to understandably and effectively describe this learning process to the public.

The lack of interest can be a problem with the traditional ways of participating as well. In this respect, the Web does not give any added value, as Web-based participation can be considered even more voluntary than traditional approaches. The Web-based approaches are not very personal, and in

the current culture they are often associated with entertaining purposes that do not require commitment to the process. Consequently, when asking public opinion in serious issues, the public may not be able to regard these with full commitment.

We believe that in practice the approach should be taken into use with small steps. That is, we should first apply plain Web-pages for delivering information and simple Web-based tools for carrying out surveys. When the public has received enough positive experiences on these, we can move on for advanced tools. However, if we immediately start applying advanced tools, this may frighten the stakeholders away from participating at all.

With respect to the credibility of the process, it is also important that the participants can trust the information available on the Web. In this respect, updating of the pages is important to keep the role of the participants active.

5.3. Can we speed up the process?

The stakeholders' activity of using the Web depends highly on their age. In our Web-questionnaire, the response rate decreased strongly on age groups from 55 upwards (Q-15). In this respect, speeding up the process of adapting Web tools is extremely difficult, as in these age groups, most of the people who do not use the Web are not likely to start using the Web in the future either. Thus, it would take another 20-30 years until a new generation of the Web users has grown up in place of these people.

On younger age groups the Web is nowadays used commonly, and the challenge is to get these people to committedly participate in the process. In practice, this may be very difficult because, for example, in the lake regulation context, young people are not as interested in the water course regulation issues as elderly people who usually are more active recreational users. Therefore, their willingness to participate questionnaires may also remain low, even if they were aware of the impacts of giving an opinion.

As one way to meet the challenge of the public independently using advanced multicriteria software, we have developed Web-based material for learning the use of the methods and software

(Hämäläinen, 2002). This material includes illustrative tutorials and example cases demonstrating, for example, how to avoid the possible biases. However, also in this approach the participants' commitment to learn the material is essential, and more research is needed, for example, on how devotedly the public would go through this material in real cases.

6. Conclusions

In this paper, we have demonstrated a framework for supporting participatory processes, which includes Web-based tools for decision analysis and participatory feedback. Our experiences obtained from lake regulation applications support the applicability of the framework, but traditional approaches are still needed to fully meet the objectives of the public participation. In addition, there has to be a strong commitment to create a culture of Web-based participation by case projects before the public stakeholders and the authorities can accept this new approach.

We believe that there are no shortcuts to speed up the process, but the culture grows from positive case studies. The challenge is to create a new tradition for electronic democracy in which the public can have a true impact in important social matters. However, much of the success depends on how well the authorities can implement the different tasks of the project. In this respect, collaboration between decision analysis researches and policy support administrators is extremely important. Yet, more research is needed to find out, for example, how the different ways of presenting information on the Web affect to the learning process of the public, and how the use of the Web as a communications channel affects to the commitment of the participants.

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Table 1. The lake regulation projects.

	Päijänne	Kallavesi-Unnukka	Pirkanmaa lakes
Years	1995–1999	1999–2001	2000–2003
Steering group	22 members 13 meetings 20 decision analysis interviews	20 members 6 meetings	40 people 7 meetings 36 decision analysis interviews
Initial screening	Mail questionnaire - sample 2511 - response rate 79 %	Mail questionnaire - sample 387 - response rate 39 % - Opinions-Online an alternative to mail questionnaire - 28 replies - results available on the Web	Mail questionnaire - sample 3216 - response rate 36 %
Workshops and public meetings	10 public meetings 24 working group meetings - included interactive DA session	7 public meetings - 84 participants	6 workshops
Feedback	Questionnaire in the closing seminar - 51 replies		Opinions-Online the primary way to collect public feedback - Web questionnaire and material broadly advertised on e-Mail lists, Web pages, and on local newspapers, radio and TV - Possibility to alternatively reply by mail - 333 replies on the Web - 6 replies by mail
Other special characteristics	- Typical Web-HIPRE models available on the Web		
Web-page	www.paijanne.hut.fi	www.kallavesi.hut.fi	www.pirkanmaa.hut.fi

Table 2. Results of the questionnaires.

The Lake Päijänne case (51 participants) Questionnaire at the closing workshop	Strongly agree	Partly agree	No opinion	Partly disagree	Strongly disagree	
Q-1. There are more beneficial than adverse impacts in the regulation of Lake Päijänne.	18 (35%)	21 (41%)	3 (6%)	7 (14%)	2 (4%)	
Q-2. The development project has produced a significant amount of new information about the effects of the regulation both on Lake Päijänne and on River Kymijoki and about the ways to diminish the adverse impacts of regulation.	37 (73%)	9 (18%)	0 (0%)	5 (10%)	0 (0%)	
Q-3. It has been paid enough attention to hearing and participation of local people during the development project.	25 (51%)	13 (27%)	3 (6%)	7 (14%)	1 (2%)	
Q-4. The recommendations for the regulation have been able to combine the different and conflicting interests of both the people living on the Lake Päijänne and the downstream water system.	12 (24%)	29 (57%)	4 (8%)	6 (12%)	0 (0%)	
Q-5. Implementing the recommendations would reduce the adverse impacts of the regulation and dissatisfaction of the recreational users to the regulation.	19 (37%)	21 (41%)	6 (12%)	5 (10%)	0 (0%)	
Q-6. My view about the possibilities to improve the regulation of Lake Päijänne has considerably changed during the development project.	11 (22%)	27 (53%)	8 (16%)	3 (6%)	2 (4%)	
The Pirkanmaa lakes case (1146 participants) Initial mail questionnaire						
Q-7. Age in years?	Under 25 (1%)	25-34 (3%)	35-44 (12%)	45-54 (29%)	55-64 (28%)	Over 64 (27%)
The Pirkanmaa lakes case (339 participants) Web questionnaire at the closing stage of the project						
Q-8. It has been paid enough attention to hearing and participation of local people during the development project.	20 (7%)	73 (27%)	62 (23%)	76 (28%)	42 (15%)	
Q-9. The recommendations for the regulation have been able to combine the different and conflicting interests of the people living on the Pirkanmaa lakes.	11 (3%)	103 (32%)	58 (18%)	89 (27%)	66 (20%)	
Q-10. It was easy to answer this questionnaire.	122 (37%)	188 (57%)	2 (1%)	17 (5%)	0 (0%)	
Q-11. From where did you hear about this questionnaire?						
	Newspaper	Radio / TV	E-mail list	From friends	Found by accident	
	182 (56%)	13 (4%)	36 (11%)	81 (25%)	16 (5%)	
Q-12. In which way do you would like to get further information?						
	Radio / TV	Newspapers	Newsletter	Internet	Some else	
	22 (8%)	114 (41%)	63 (23%)	75 (27%)	3 (1%)	
Q-13. In how many questions did you get familiar with the material available through a Web link?						
	0	1 – 4	≥5	In all	Replied by mail	No opinion
	74 (23%)	187 (58%)	29 (9%)	28 (9%)	6 (2%)	1 (0%)

	Very much	Much	Some	A little	Not at all	No opinion
Q-14. How much new information about the regulation did this questionnaire gave to you?	16 (5%)	78 (24%)	176 (54%)	40 (12%)	16 (5%)	2 (1%)
	Under 25	25-34	35-44	45-54	55-64	Over 64
Q-15. Age in years?	4 (1%)	43 (13%)	78 (24%)	118 (36%)	66 (20%)	21 (6%)
The Internet Tracking Research (3000 participants) (Taloustutkimus, 2004)		All	Ages 15-24	Ages 25-34	Ages 35-49	Ages 50-79
Q-16. The Internet penetration in Finland (A share of population that have used Internet)		(70 %)	(99 %)	(92 %)	(83 %)	(41 %)

Table 3. Effectiveness of the public involvement methods used in our cases. Assessment scale is from very low to very high.

Objectives Methods	Obj. 1		Obj. 2	Obj. 3	Obj. 4	Obj. 5	Obj. 6
	Informing ^(1a)	Educating ^(1b)	Public values ⁽²⁾	Decision quality ⁽³⁾	Trust building ⁽⁴⁾	Reducing conflicts ⁽⁵⁾	Cost-effectiveness ⁽⁶⁾
Methods primarily to seek public input							
Mail questionnaire	High	Low	High	Moderate	Moderate	Low	Moderate
Web questionnaire	Very low	Moderate	High	Moderate	Low	Low	Very high
Public hearing	Low	Moderate	High	Moderate	Moderate	Low	Moderate
Methods primarily to inform the public							
Web site	Low	Moderate	Low	Low	Low	Low	Very high
Newspaper	Very high	Low	Very low	Very low	Low	Very low	Very high
e-Mail list	Moderate	Low	Low	Very low	Moderate	Low	Very high
Local radio / TV	High	Low	Very low	Very low	Low	Very low	High
Methods to promote information exchange, interaction and learning							
Public meeting	Low	High	High	High	High	High	High
Decision analysis interviews	Very low	Very high	High	High	High	Very high	High
Stakeholder working group (Steering group)	Very low	Very high	High	Very high	Very high	Very high	High

^{1a)} Number of the people achieved

^{1b)} Impact on active participants' learning and understanding

²⁾ Impact on the public input and the scope of the public involved

³⁾ Impact on the participants satisfaction to the decision and the process, and on generating new information

⁴⁾ Impact on the public confidence to the process

⁵⁾ Impact on reducing the opposition towards the decision

⁶⁾ The costs of the method with respect to its performance in other objectives

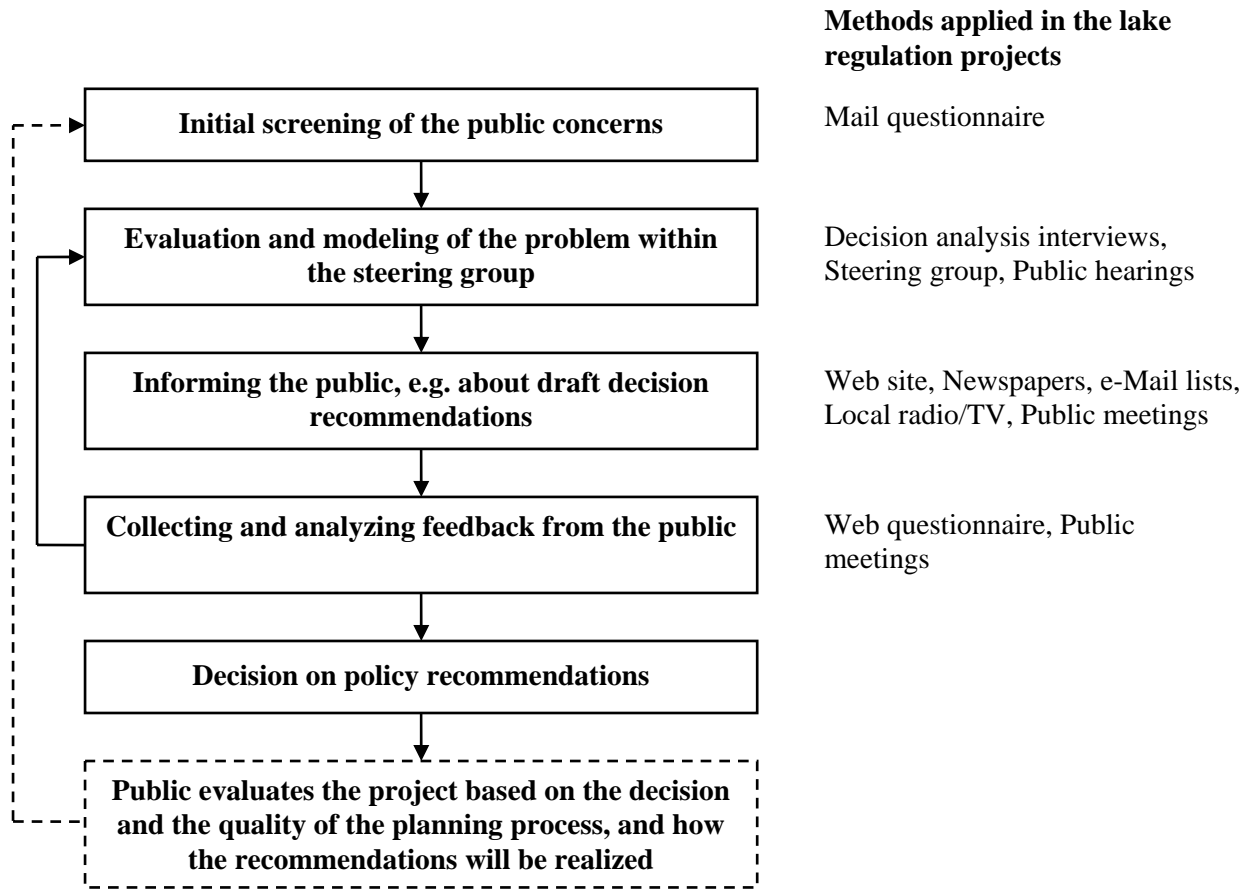


Figure 1. A flowchart of the public participation process.

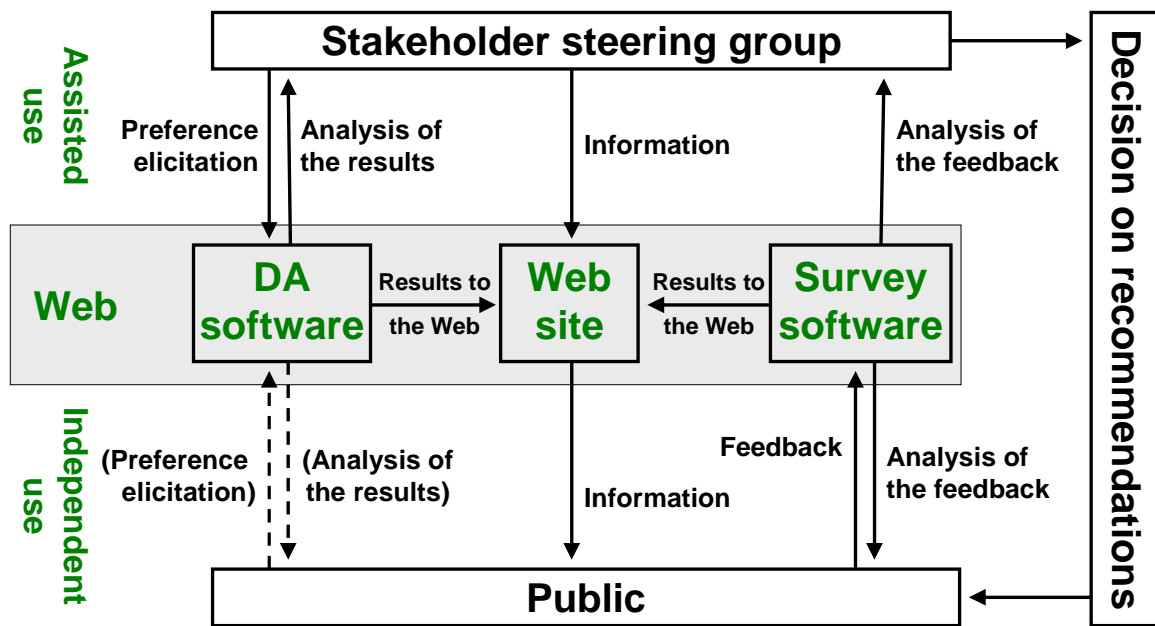


Figure 2. A framework for the use of the Web in participatory processes.

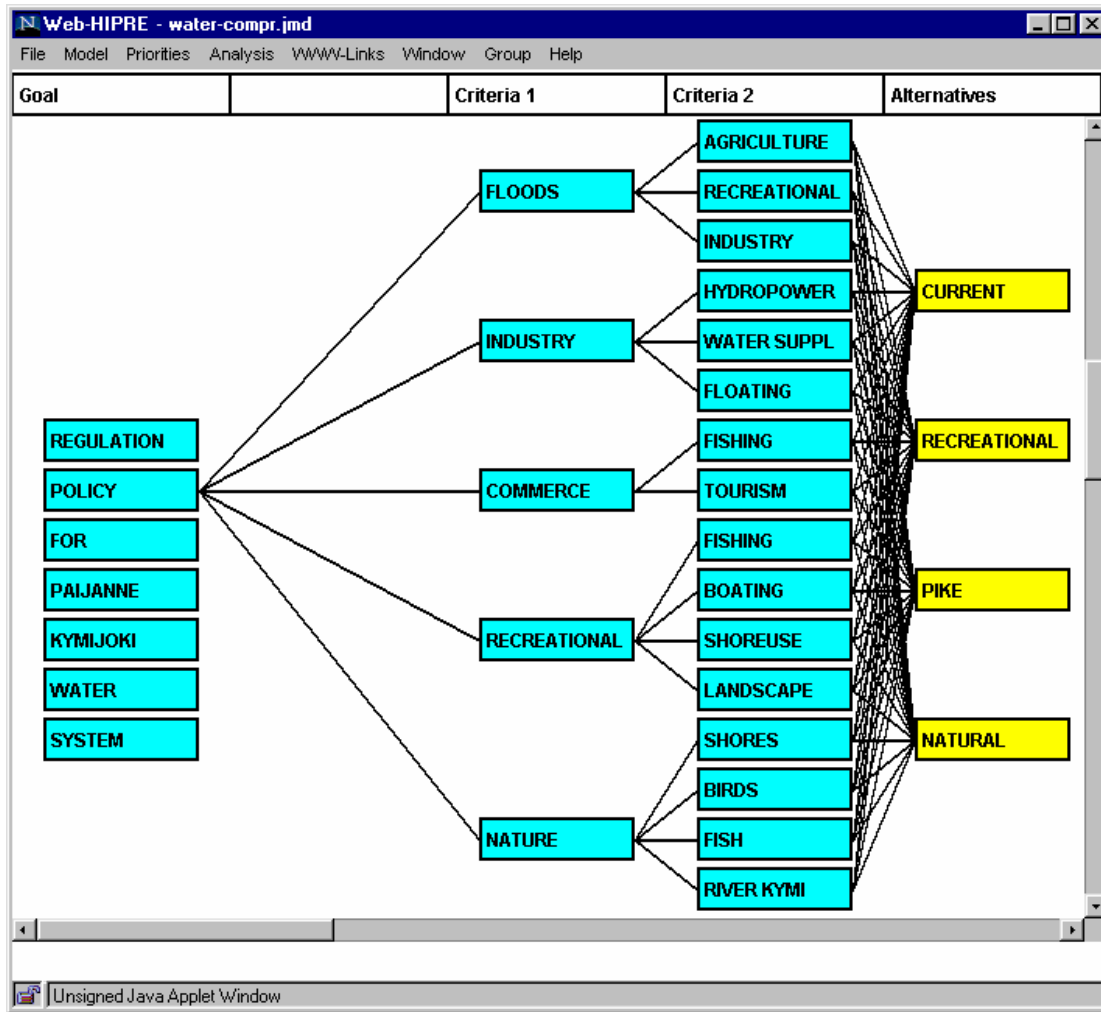


Figure 3. Value tree of the Lake Päijänne Case.