Models for Adaptive Forest Management

D5.4 A report on stakeholder approaches to and views on ways and options for handling uncertainty and change

Persson, Erik; Norman, Johan; Götz, Stefan; Pacheco Faias, Sónia; Hanewinkel, Marc; Tomé, Margarida; Blennow, Kristina

2011

Project no. 226544

MOTIVE

Models for Adaptive Forest Management

D5.4 A report on stakeholder approaches to and views on ways and options for handling uncertainty and change

Submission date: 10/06/2011

Start date of project: 01.05.2009
Duration: 4 years
Project Coordinator: Marc Hanewinkel

Document Properties

Document number	FP7-226544-MOTIVE / D5.4
Document title	D5.4 A report on stakeholder approaches to and views on ways and options for handling uncertainty and change
Lead beneficiary	SLU
Authors	Erik Persson, Johan Norman, Stefan Götz, Sónia Pacheco Faias, Marc Hanewinkel, Margarida Tomé and Kristina Blennow
Date of last revision	18/05/2011
Status	Final
Version	1.0
Dissemination level	PU
Embargo	Dissemination restricted until 09/12/2011
WP	WP 5
Relation	related to WP 3, WP 4, WP6, WP 7

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 226544.

Abstract:

MOTIVE investigates and develops AFM-strategies for climate change and land-use change under variability and uncertainty based on simulation and optimization techniques complemented by a bottom-up approach in which the social part of the system is addressed. This report presents a survey addressed to forest owners sampled in Portugal, Germany, and Sweden. Preliminary results indicate substantial differences in attitudes between the areas. This calls for different solutions in different areas.

Keywords:

Risk perception, adaptive management, motivation to adapt, adaptation, forest owner, land use, mitigation

Table of contents

1. Introduction

The dynamics and behaviour of a social-ecological system is uncertain and difficult to predict. These are the challenging circumstances under which management decision are always made. When faced with changing conditions the challenge of good decision-making gets even bigger. MOTIVE investigates and develops Adaptive Forest Management (AFM)-strategies that address climate change and land-use change while recognizing variability and uncertainty.

Not only is the changing climate affecting the environmental conditions for forestry in the form of changing temperature, precipitation, storms, etc., it is also affecting forestry in the form of new expectations from the surrounding society. In connection with climate change we often distinguish between mitigation and adaptation. Apart from the obvious need to adapt to the changing climate, forestry also faces new expectations from the society in the form of contributions to the mitigation of climate change. To meet these expectations and make use of the new opportunities they present for the forest owners, some adaptation of the forest management will be necessary. This means that not just the changing climate, but also the expectations on forestry to play a role in the mitigation process, calls for adaptations. To a large extent this means increased opportunities for forest owners, but also challenges. The challenges are partly made up by conflicting demands. Both the society and the forest owners already want the forest to deliver a whole range of different kinds of goods and services. Climate change mitigation is one more thing on an already long list of often conflicting services and entities we want from the forest. The big challenge is thus twofold: Climate change mitigation has to be added to the list of conflicting demands on the forest, and the different demands have to be fulfilled in a changing climate.

Since we do not have any previous experience of the impacts of the changes that we are facing, relying on past experience alone does not provide enough support to decision- and policymaking. To this end, simulation and optimization techniques are being used to develop AFM-strategies in MOTIVE. In this “top-down” (Figure 1.1) approach several scenarios of world development determine different greenhouse gas emissions that serve as input to a chain of models that in turn are used to provide adaptive management solutions to meet the predefined goals for different types of stakeholders. In the most recent IPCC report (IPCC, 2007) the human capital is recognized as an important component of the capacity to adapt to climate change (e.g. Grothman & Patt, 2005; O’Brien & Wolf, 2010). As shown by Blennow & Persson (2009), the beliefs and desires held by decision makers are indeed crucial components of the capacity to adapt. Thus, the decision-makers are expected to strongly influence the success of the implementation of the AFM-strategies developed in MOTIVE.

Therefore, to be relevant the AFM-strategies provided by MOTIVE need to be compatible with the beliefs and desires held by the decision-makers. Furthermore, the concept of adaptive management implies that learning is taking place continuously (Holling, 1978). In MOTIVE, the "top-down" approach is complemented with a "bottom up" approach (Dessai & Hulme, 2003) (Figure 1.1). In this bottom-up approach the adaptive capacity of the social part of the system is addressed. Compared to Figure 1, MOTIVE directly investigates the beliefs and desires held by the decision makers in European forestry and their sources of learning, rather than relying on indicators of adaptive capacity only.

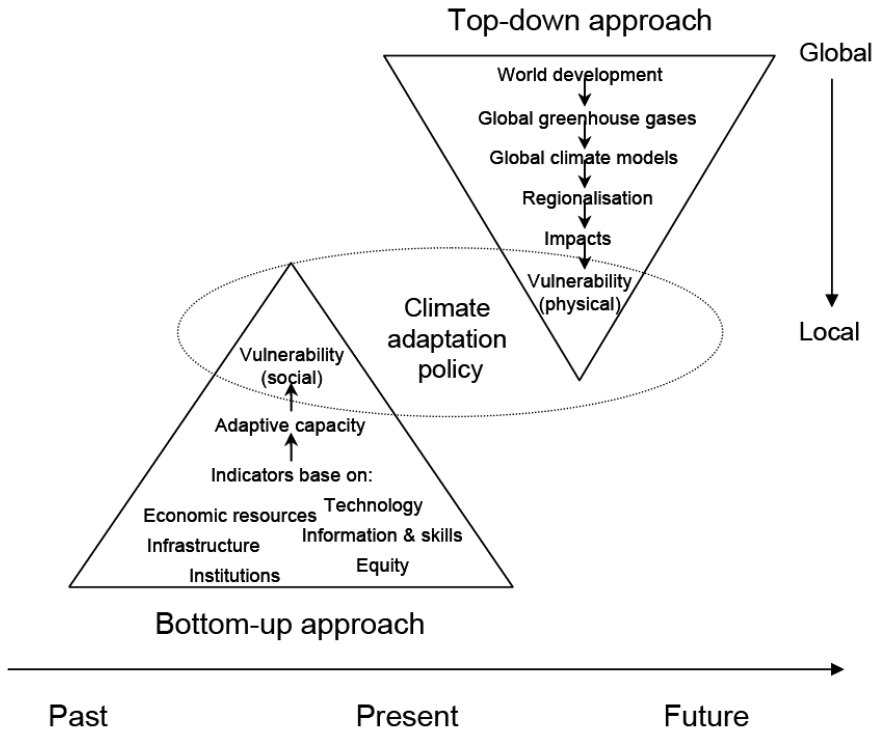


Figure 1.1. Top-down and bottom-up approaches to inform decision-making and policy formation. (From Dessai & Hulme, 2003.)

This is the second official report of work package 5 "Evaluating and selecting good adaptive forest management strategies" lead by UCPH. It is a direct result of task 5.4: "A report on stakeholder approaches to and views on ways and options for handling uncertainty and change", lead by SLU and carried out in collaboration with FVA and ISA. The task includes assessment of stakeholder attitudes to climate change, risks associated with climate change, and also to forest values and different ways of taking measure to adapt forestry to climate change. Furthermore, different ways of learning about climate change and options for adaptation is also investigated. In WP5.4 the investigation is especially aimed at individual private forest owners who make up a large and important stakeholder group. In the European Union we have 16 million mostly small-scale, private forest owners, owning 60% of the forest

acreage.[1] Information on the attitude among forest owners in three different European countries along a south-north gradient – Portugal, Germany and Sweden – has been collected in a mail survey. The questionnaire included questions related to climate change, and of what the forest owners are prepared to do in order to adapt to the changes, including the societal demands for climate change mitigation. In this report we give some examples of results to supply an indication of what considerations affect the attitudes of the forest owners to different kinds of adaptation.

2. Materials and Methods

2.1. Case study areas

Questionnaires were sent to forest owners in Portugal, Germany, and Sweden. The case study areas are chosen to represent a south-north gradient through Europe, and also to represent forest owners who work under different forest policies. Questionnaires were sent to one area in Portugal (Chamusca) and one area in Germany (Black forest), whereas in Sweden questionnaires were sent to forest owners in three different areas across the country to cover also a latitudinal gradient within Sweden. In this report we compare responses from one area in Sweden (Kronoberg) with responses from forest owners in Germany and Portugal. These three areas have all experienced recent climate related disasters (fire in the case of Chamusca,and storms in the case of Black forest and Kronoberg).

[1] http://ec.europa.eu/agriculture/fore/characteristics/index_en.htm

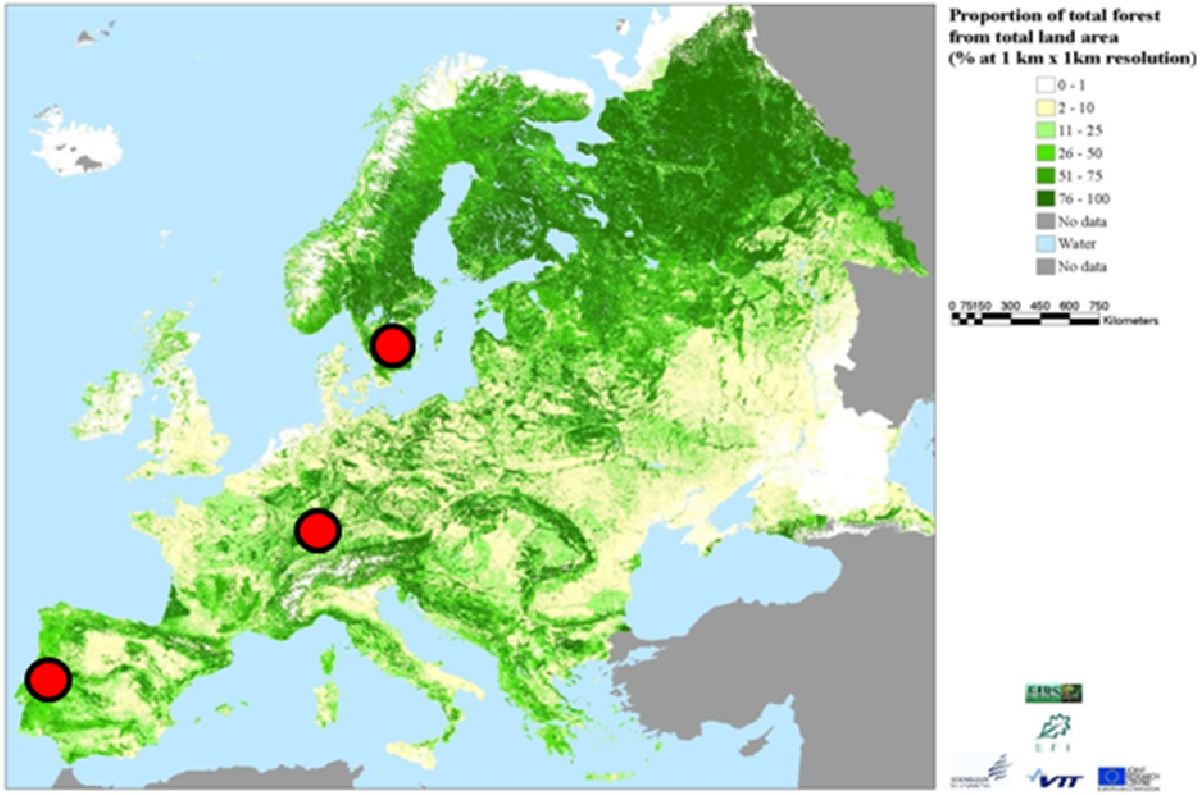


Figure 2.1. The three study areas are situated along a south-north gradient: Chamusca (Portugal), Black forest (Germany), Kronoberg (Sweden).

2.1.1. Portugal, Chamusca forest

Chamusca County is a rural region located in the center of Portugal. It covers a total of 74,599 ha. Its edafo-hydrological characteristics distinguish two main regions: Campo and Charneca. Agriculture prevails in Campo, while agro-forestry and forestry are predominant in Charneca.

Forest and Shrubs together represent almost 80% of Chamusca area, according to 2007 land use. Forests occupy 51% of the area. The main species are cork oak, eucalyptus, maritime pine and stone pine. These species appear in pure and mixed stands, with the larger area corresponding to stands of cork oak followed by eucalyptus, having both an important area of new plantations.

One of the biggest industries in the area is the pulp and paper industry with self-owned and rented forest areas.

The Chamusca County has very heterogeneous land-uses (Figure 2.1). Due to the land use, low population density and extreme weather conditions during the summer months (with high temperatures and very low precipitation levels) forest fires are common in Charneca. The

large encroachment of fires experienced in Portugal in 2003 consumed more than 20 10^3 ha of the county, thus affecting the majority of the landowners, in some cases with integral fire losses.

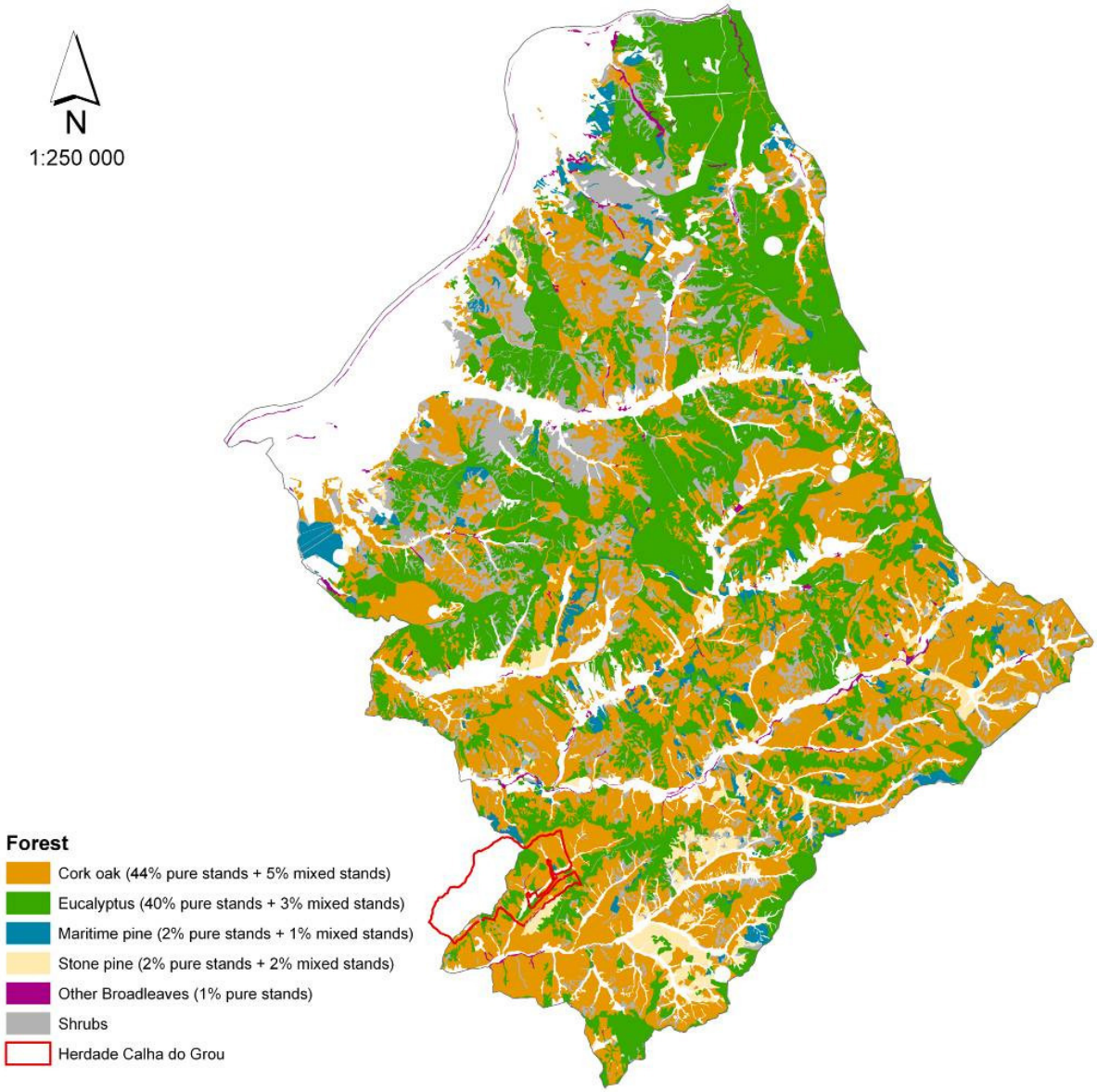


Figure 2.2. Chamusca county land-use distribution.

The forestland properties are spread among several landowners. This county is characterised by the heterogeneity and dispersion of the 2,263 landowners. Only 40 landowners hold 72% of the county in large scale properties (>500 ha), contrary to the majority of the landowners whose properties have less than 1 ha (Table 2.1).

Table 2.1. Landowner distribution by size of holding in Chamusca county.

Area class	*Landowners*		*Area*		*Average*
ha	*n*	*%*	*ha*	*%*	*ha*
<0.5	947	41.9	194	0.3	0.2
0.5 – 1	349	15.4	249	0.3	0.7
1 – 5	589	26.0	1286	1.8	2.2
5 – 10	116	5.1	823	1.1	7.1
10 – 50	127	5.6	2583	3.5	10.3
50 – 100	33	1.5	2354	3.2	71.3
100 – 500	61	2.7	12783	17.4	209.6
500 – 1000	23	1.0	15965	21.7	694.1
>1000	17	0.8	37452	50.8	2203.1
Total	*2262*	*100.0*	*73689*	*100.0*	*32.6*

The Chamusca forestland management decisions are complex to map, and emerge from a stakeholder's interactions and interdependencies network. The main decisions are undertaken by forestland owners acting individually, grouped into Forest Owners Associations.

ACHAR – "Associação dos Agricultores de Charneca" started in 1989 and is the main forest owner association. The association is responsible for the management of several areas for forest intervention (ZIF), with more than 50% of joint forest owners (Table 2.2).

Table 2.2 Fraction of joint forest owners in Charneca.

ZIF Name	*Total area (ha)*	*% joint area*
Chamusca; Pinheiro Grande e Carregueira	9 946	79%
Ulme e Vale de Cavalos	19 851	88%
Chouto e Parreira	18 261	69%
Almeirim e Alpiarça	14 283	52%
Baldios de Valverde Pé da Pedreira, Barreirinhas e Murteira	2 222	

2.1.2. Germany, Black forest

This Black Forest (Schwarzwald) case study includes the urban district of Baden-Baden and the rural district of Rastatt. Out of a total area of 83,000 ha, 46,852 ha consists of forest land. Spruce (17,155 ha) and Beech (6,833 ha) are the predominant species, followed by silver fir, pine, Douglas fir, oak and other broadleaves. At higher altitudes, forest conversion towards beech is continuing but mid-size spruce is economically more valuable when harvested. Fig. 2.2 gives an overview of the land use categories in the area.

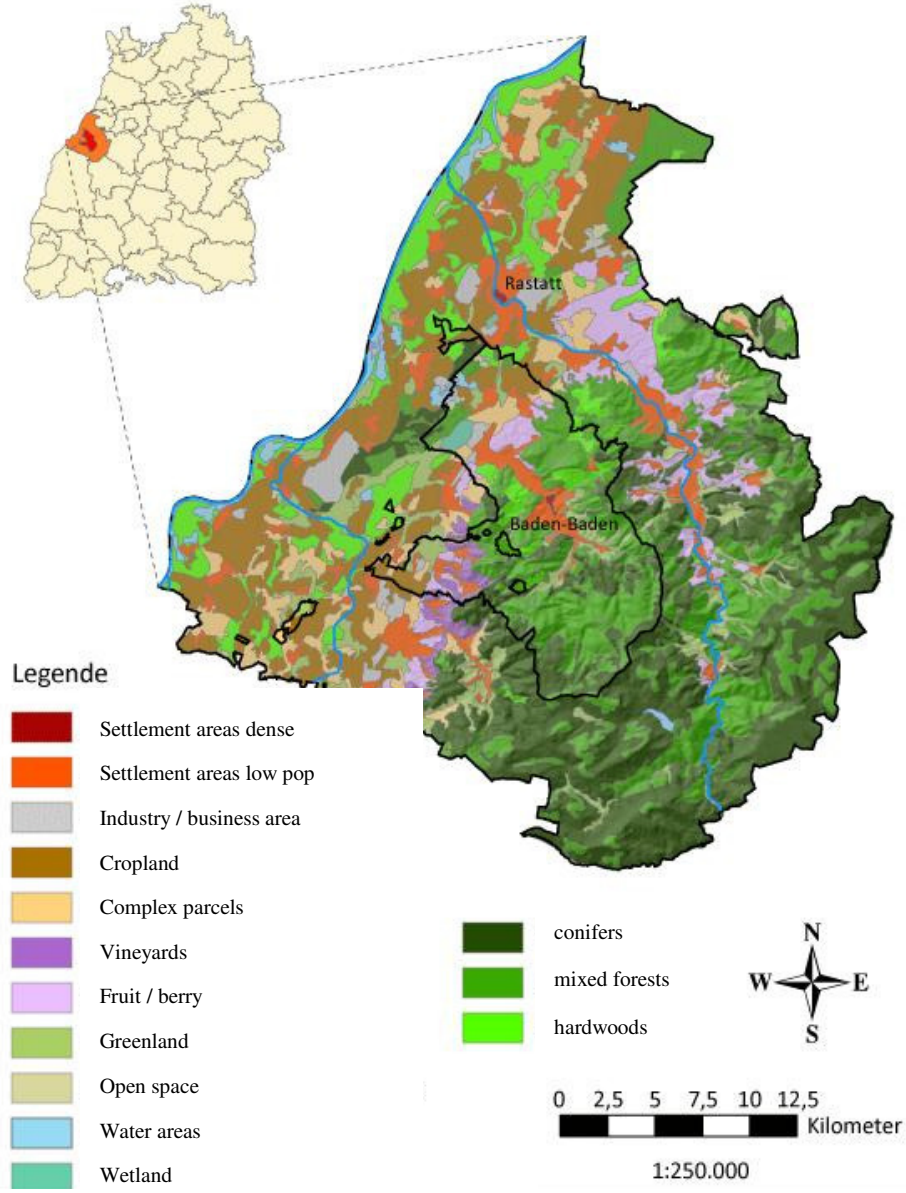


Fig. 2.2. Land use categories in the case study area Rastatt/Baden-Baden

Ownership of the case study forests is divided between the communities (60%), State (24%) and private owners (16%). The county (rural district) of Rastatt includes one State Forest Enterprise (9,900ha) and around 30 community forests with overall 21,600ha.

Private forests in the county of Rastatt cover an area of 6,700 ha, of which 5,450 ha are managed as a cooperative forest called "Murgschifferschaft". This old German cooperative accrued from a forest owner cooperative dating back to the 15th century. The former central activity of the cooperative was the timber trade using the river "Murg", an affluent of the Rhine, as the major means of transport ("Schifferschaft" can be translated as "shipping company"). Today, the Murgschifferschaft is run as a cooperative with 100,000 shares ("Forstrechte" – forest rights), from which 55% are owned by the State of Baden-Wuerttemberg. The goal of the cooperative is to achieve the maximum sustainable yield of valuable timber and benefit. The financial surplus of the cooperative is distributed among the shareholders on a yearly basis.

As the number of private forest owners in the case study area is rather limited, we extended the area for the survey to the whole Black Forest and neighboring counties. Table 2.3 shows a list of the counties in Baden-Wuerttemberg for which we got addresses from the address-database of the "Forstkammer Baden-Württemberg", the association of the non-state forest owners in Baden-Württemberg.

Table 2.3. Counties in Baden-Wuerttemberg with forest areas in the Black Forest - part of the survey within MOTIVE.

Counties (Landkreise) directly within the Black Forest Area	*Neighbouring counties with smaller forest areas in the Black Forest*	*Town areas within the Black Forest*
Waldshut	Konstanz	Freiburg
Lörrach	Tuttlingen	Baden-Baden
Breisgau-Hochschwarzwald	Zollernalb-Kreis	
Schwarzwald-Baar-Kreis		
Emmendingen		
Rottweil		
Freudenstadt		
Ortenau-Kreis		
Rastatt		
Calw		
Enzkreis		
Karlsruhe		

2.1.3 Sweden, the county of Kronoberg

Kronoberg County in southern Sweden is situated at the transition zone between the boreal forest zone of northern Europe and the mid-Europe deciduous forest zone (Figure 2.3). Out of a total of 845,000 ha, 645,000 ha is productive forest land (SFA, 2009). Most of the forest consists of Norway spruce and Scots pine but also birch and other deciduous species are present. The forest is among the most productive in Sweden with an average site quality of 8.8 m^3/ha and year. The forest terrain is rich in heritage and nature values, many of which are dependent on the land-use and management activities. The deciduous forest is productive, holds high nature values and is important for recreation for its owners as well as for the general public. The forest is mainly owned by private individuals but the Right of Public Access allows public access to the land, regardless of ownership.[2] Kronoberg County was the county in which the most extensive wind damage occurred in a major wind damage event on 8 January, 2005, when damage occurred on 14.1% of its forest acreage (SFA 2006).

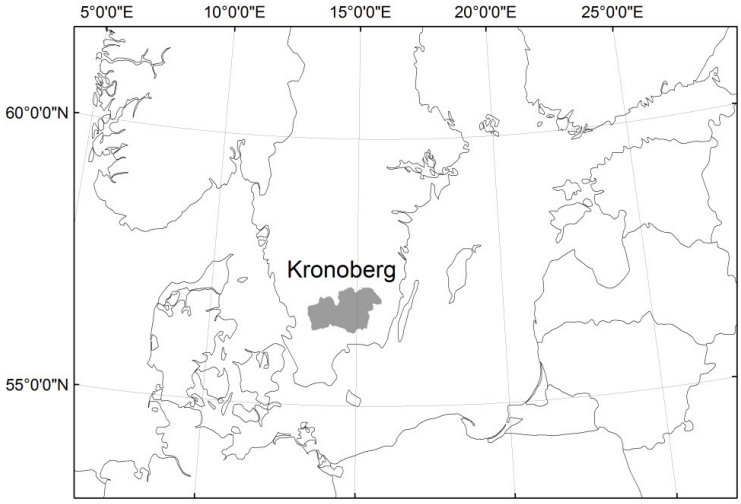


Figure 2.3. Kronoberg County in southern Sweden.

Between the 1950s and early 1990s the main objective of the Swedish forestry policy was production of timber and wood in a silviculture system of even-aged forest stands with clear-felling as the primary means of harvesting (Ekelund & Hamilton 2001). Through the 1993 revision of the Forestry Act, the objective of maintaining biodiversity took equal priority with production objectives. Other public interests are also taken into account in the management of the forest. In the revision, regulations requiring private forest owners to deliver high quantities of timber and wood at low costs to the forest industry were relaxed (Stjernquist 2001). To a larger extent than before the revision, owners are able to influence the management of their

[2] The Right to Public Access is constituted in Chapter 2. § 18 Constitution Act. The details are partly constituted in different laws, primarily the environmental code, and partly a matter of common law.

forests. The clear-felling silviculture system is applied on almost all productive forest land. However, according to current regulations planting or measures for natural regeneration must have been completed by the end of the third year after felling or when agricultural land falls into disuse (SFS 1979:429). Regeneration felling must not be carried out until the forest has reached a certain age. Forest certification systems have been developed to promote responsible use of forests. Owners wishing to follow the rules may certify their forestry on a voluntary basis. In Sweden a vast majority of the productive forest land is certified (www.pefc.se; www.fsc-sverige.org).

The Right of Public Access is part of the Swedish constitution and allows the general public to roam the land and to pick wild berries, mushrooms and flowers (not protected by the species protection law), regardless of land ownership (Bengtsson 2004). Approximately 50% of the 22.7 million ha of Swedish forest is owned by private individuals (SFA 2009). Swedish individual private forest owners on average get approximately 12 % of the household income from their forestry (Mattsson et al. 2003), which indicates that they also have other motivations for owning a forest than merely the financial return. In Kronoberg County 79% of the productive forest land is owned by 13 696 private individuals (SFA 2009) (Figure 2.4), of whom 37 % are females and 63% are males. Altogether, they own 11 643 management units. Sixty-four percent of these are locally owned, 29 % are owned by non-residents and 8 % partly by non-residents (SFA 2009). With few exceptions, the size of each land holding range from a few ha to a thousand ha.

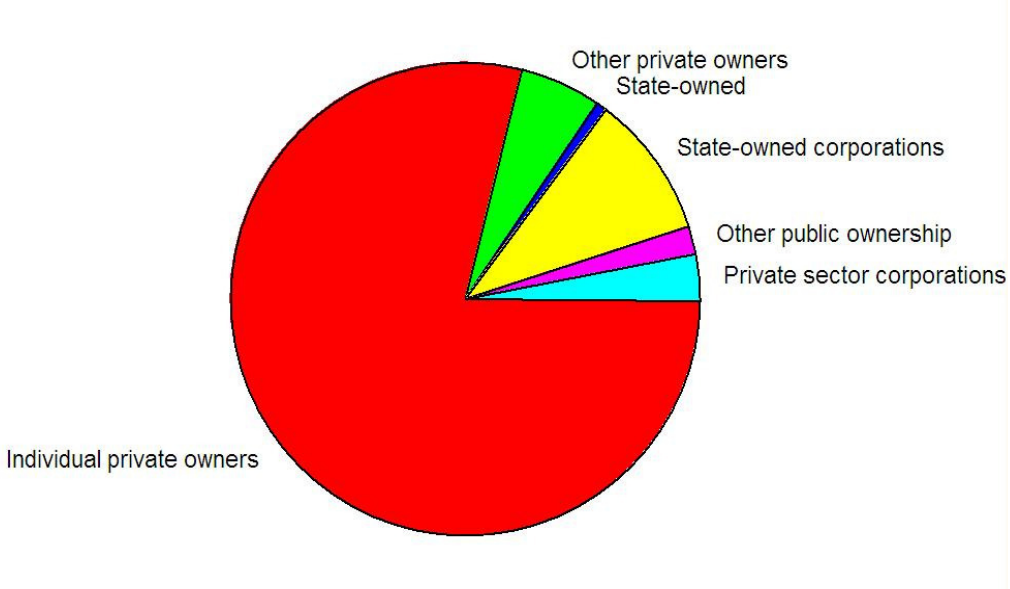


Figure 2.4. Fraction of Kronoberg county forest land owned by different owner categories in 2008 (SFA, 2009).

The forest provides a wide range of services to its owners as well as to the general public. The harvested forest provides raw material for the forestry industry and is used for timber,

pulpwood and forest bio-fuel. The forest landscapes of Kronoberg County are important for recreation and activities such as berry and mushroom picking (Sandell & Sörlin 2008). Hunting rights belong to the land-owner, and can be leased out. The forest grower culture has been characterized by Törnqvist (1995) as a rural type of self-employer lifestyle. At the heart of the lifestyle lies a high priority for independence. According to Hugosson & Ingmarsson (2004) the services from the forest to land-owners may be classified into production of game, berries, mushrooms and forest grazing, nature-, culture-, water- and soil conservation, emotional ties, upholding of forestry tradition, challenge of silviculture, aesthetics, financial return and liquidity, and tax planning.

2.2. Methods

A questionnaire with 76 questions (some of the questions are further divided into sub-questions) was compiled. The questions were originally written in English, and then translated into German, Portuguese and Swedish. We wanted the questions to be in the native language of the respondent for two reasons. One reason was that we wanted to avoid a situation where some of the respondents did not answer because of the language barrier. This would have brought down the total number of respondents, and it would also have a selection effect in that it would have favored respondents with better language skills, which in turn might imply a bias in favor of respondents with higher education. The result would thus not be representative for the whole population we wanted to reach. The other reason why we wanted the questions to be in the native language of the respondents was that we saw it as important that all respondents as far as possible understood the questions in the same way. We believe that we can increase the probability for that if the translations are performed by a small group of people who were also involved in formulating the questions and the aims of the investigation, rather than if each respondent makes his/her own translation of the questions. An English version of the questionnaire is added to this report (Appendix 1).

The Portuguese version of the questionnaire was sent out in April 2010 to a total of 253 forest owners in the Chamusca region. The respondents were found through “Associação dos Agricultores de Charneca” (ACHAR), which is the main forest owner association in this area. As a reminder to respond to the questionnaire, the forest owners were contacted personally by mid-May. The response rate was 27 percent.

The German version of the questionnaire was sent out on 22nd of February 2010 to a total of 652 forest owners in the Black forest region. The respondents were found through the Forstkammer Baden-Württemberg, an association of non-state forest owners. Two reminders were sent to all recipients of the questionnaire on 3rd of March and 24th of March 2010. The response rate was 65 percent.

The Swedish version of the questionnaire was sent on 1 March 2010 to a total of 3,353 owners of small forest holdings in three study areas in Sweden. The respondents were sampled among forest owners acting as contact persons towards Swedish authorities for their holding in the Swedish forest data register. Each holding is of a size that corresponded to a taxation value of at least 20,000 EUR in 2008. 1,000 forest owners were randomly sampled by the Swedish Forest Agency in each of the three Swedish study areas: The northern counties of Västerbottens län and Västernorrlands län (in the boreal bio-climatic zone), the southern counties of Kronobergs län, Jönköpings län, and Kalmar län (currently mainly in the hemi boreal bio-climatic zone), and the southernmost study area including the counties of Hallands län, Blekinge län, and Skåne (mainly in the nemoral bio-climatic zone). An additional sample was made of 353 individuals among forest owners in the county of Kronobergs län. In the northern Swedish study area, the threshold minimum taxation value of 20,000 EUR corresponded to approximately 20 ha of productive forest land, and in the two southern study areas this taxation value corresponded to approximately 5 ha of productive forest land, based on data from the Swedish Forest Agency (SFA, 2009). In the investigation reported here, a subset of 683 respondents from the county Kronobergs län in the southern study area was used. Two reminders were sent out. The first reminder was sent out 10 Mars, the second reminder was sent out 23 Mars. The response rate from the Swedish forest owners was 53 percent.

For the analysis presented in this report, we chose to use a subset of the Swedish respondents made up of forest owners in Kronobergs län who are also members of a forest owners association. The reasons for choosing this particular subset were: 1. The area was hit by a weather related disaster in the form of extensive storm damage to the forest in 2005. This is important with respect to some of the questions dealing with how personal experiences of weather disasters affect the attitudes of the forest owners. 2. The respondents from Germany and Portugal were found by using address lists from forest owner associations. Berlin et al. (2006) have showed that Swedish forest owners who are members of forest owner associations value some services differently than those who are not members. This is important to the investigation, and in order to make the results from the different areas comparable we therefore needed to make the same selection among the Swedish forest owners.

The answers from all three areas have then been digitalized for statistical analysis. The digitalized answers have been quality checked by comparing a sample of 16 randomly chosen sub-questions (thereby covering 20% of the questions and 5% of the sub-questions) in every tenth digitalized questionnaire to the paper originals. No systematic errors were spotted.

In those cases the answer options were given in the form of an interval scale and not as a set of discrete options (boxes), different respondents have chosen different degrees of precision.

We found three different strategies: One group of respondents systematically placed their answers at the 10-degree marks on the scale. Another group chose to put their marks either at one of the end points, in the middle, or between the middle and one of the end points (thus using a scale with five degrees dividing the scale into four equidistant intervals). The last group made use of the possibility to put marks anywhere on the scale including between the 10-degree marks. In order not to infer any false sense of precision we chose to transform all answers to questions where the answer options were in the form of scales to fit the strategy with least precision, i.e. the one with only five degrees (4 intervals).

We did not use the answers where someone else (according to their answers to question 76, see Appendix 1) than the intended respondent answered the questionnaires.

In this report we present results from 4 questions in the questionnaire for all three areas to supply an indication of what considerations affect the attitudes of the forest owners to different kinds of adaptation (Table 2.2).

Table 2.2. Sub-set of questions in the questionnaire (Appendix 1) used in this report.

Question No.	*Question*
30	"Do you think that the climate is changing to such an extent that it substantially will affect your forest?"
37	"Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?"
40	"Would you be willing to change your land-use to counteract climate changes? If that is the case, how?"
Sub-question h	"Grow forest on grazing land"
66	"Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?"

3. Results

3.1. Perceptions of risks and climate change

A majority of the respondents in all of the three areas taken together (66.5%) answered “Yes, definitely” or “Yes, perhaps” to the question “Do you think that the climate is changing to such an extent that it substantially will affect your forest?” (Figure 3.1). The largest proportion of the respondents was found in the “maybe”-sections (i.e. who answered “yes, perhaps” or “No, probably not”). The percentage of respondents who answered “No, definitely not” and thus expressed a high degree of certainty that the climate is not changing to such an extent that it will affect their forest turned out to be as low as 1.7%.

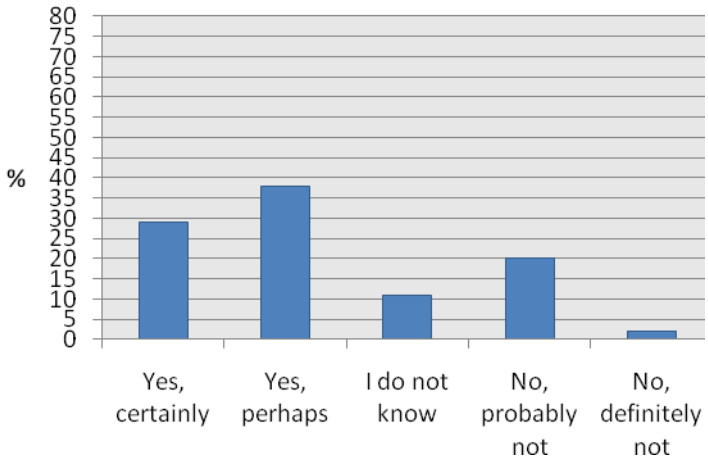


Figure 3.1 Question 30: “Do you think that the climate is changing to such an extent that it substantially will affect your forest?” Distribution of answers from Chamusca, Black forest and Kronoberg (n=744).

In the Chamusca area the confidence that the climate is changing to such an extent that it affects the forest, is very high (Figure 3.2). 93.1% answered ”Yes certainly” or ”Yes, perhaps” to this question, while only 1.7% answered ”No, probably not” or “No, definitely not”. The confidence that the climate will change to such an extent that it will affect the forest seems to be higher in Chamusca than in the Black forest where 72.5% answered ”Yes certainly” or ”Yes, perhaps”, and especially in relation to Kronoberg where 54.5% answered ”Yes certainly” or ”Yes, perhaps” (Figure 3.3). This is still a majority, but a much smaller majority than the 93.1% in Chamusca, and the 72.5% in the Black forest.

Those who felt certain in Chamusca were in majority (Figure 3.2). 65.5% answered ”Yes certainly” or “No, definitely not”, while those who expressed a larger degree of uncertainty, i.e. the percentage of respondents who answered ”Yes, perhaps” or ”No, probably not” were much lower, 29.3%. This is also different from Black forest were 54.6% belonged to the more

cautious category (Figure 3.3), and to Kronoberg with 68.2% in this category (Figure 3.4). To find explanations for this south-north gradient is outside the scope of the investigation.

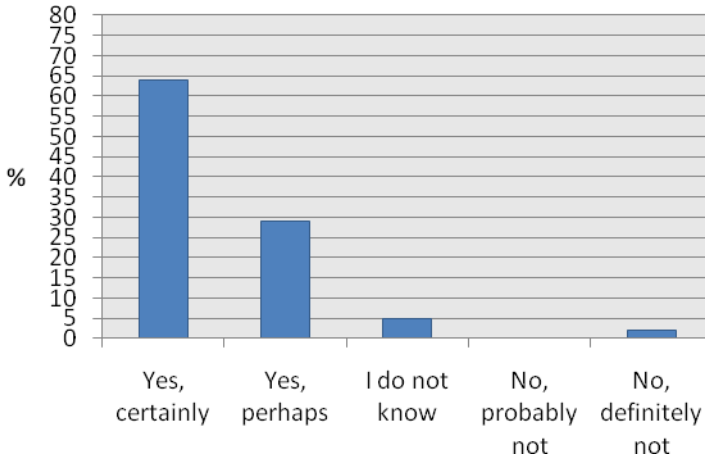


Figure 3.2. Question 30: "Do you think that the climate is changing to such an extent that it substantially will affect your forest?" Distribution of answers from Chamusca (n=58).

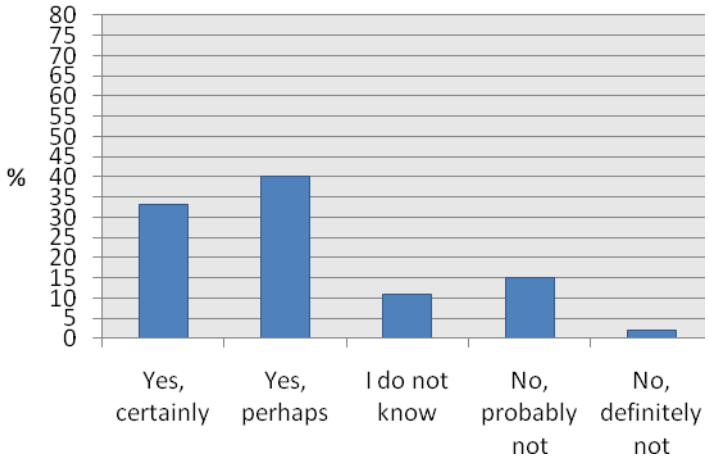


Figure 3.3. Question 30: "Do you think that the climate is changing to such an extent that it substantially will affect your forest?" Distribution of answers from Black forest (n=374).

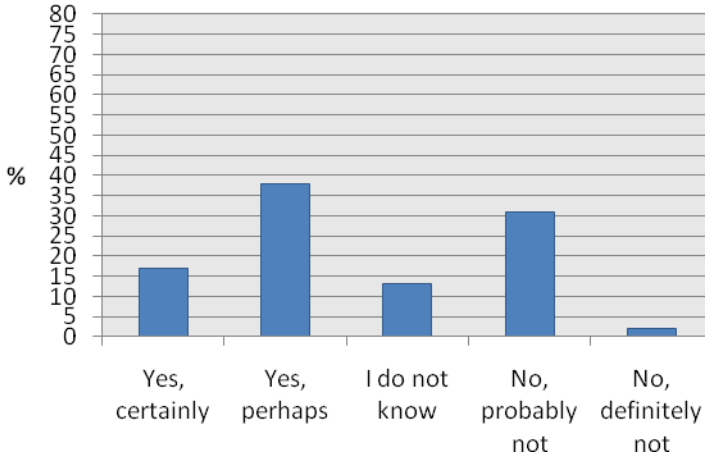


Figure 3.4. Question 30: "Do you think that the climate is changing to such an extent that it substantially will affect your forest?" Distribution of answers from Kronoberg (n=312).

3.2. Experiences from earlier serious events

The percentage (46.3%) of respondents who answered "Yes, definitely" or "Yes, perhaps" to the question "Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?" was higher than the percentage (37.3%) who answered "No, probably not" or "No definitely not" (Figure 3.5), which indicates that personal experiences has an effect on the belief. However, 53% of the respondents express uncertainty by answering "Yes, perhaps" or "No, probably not", contrary to the 30.6% who seem more certain by answering "Yes certainly" or "No, definitely not". This question also has a higher fraction of respondents that answers "Don't know" (16.4%) compared to question 30 (11.3%, Figure 3.1). This indicates that the average respondent does not want to rely too much on their personal experiences as indicators of climate change.

The respondents from Kronoberg appear to be less prone to connect their own experiences to a long term global climate change than those from Black forest and those from Chamusca (Figures 3.6 – 3.8). 28.8% of the respondents from Kronoberg answer "Yes certainly" or "Yes, perhaps" compared to 57.6% of the respondents from Black forest, and 67.9% of the Chamusca respondents.

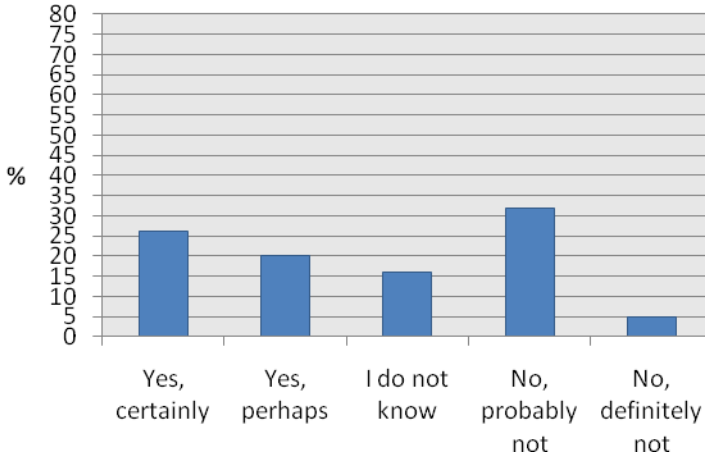


Figure 3.5. Question 37: "Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?" Distribution of answers from Chamusca, Black forest and Kronoberg (n=730).

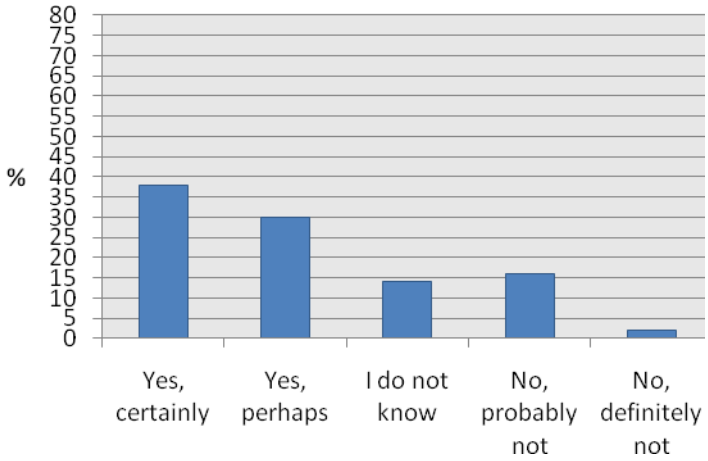


Figure 3.6. Question 37: "Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?" Distribution of answers from Chamusca (n=56).

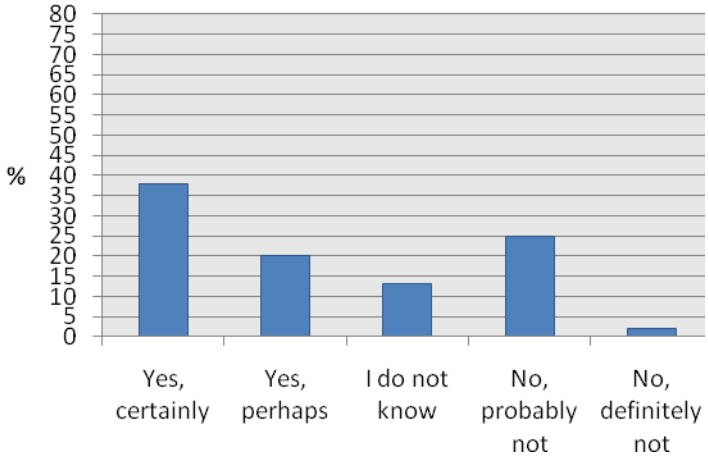


Figure 3.7. Question 37: "Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?" Distribution of answers from Black forest (n=368).

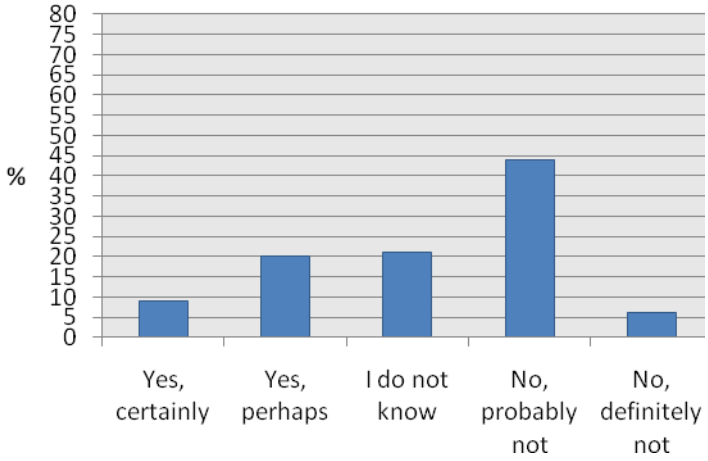


Figure 3.8. Question 37: "Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?" Distribution of answers from Kronoberg (n=306).

There appears to be differences also in certainty. From Kronoberg, only 14.4% of the respondents answered "Yes certainly" or "No, definitely not", while the respondents from Chamusca and from Black forest were more certain with 39.3% and 42.3%, respectively. Kronoberg also had the highest rate of respondents who answered "Don't know" to this question with 21.2%, compared to 14.3% for Chamusca and 12.8% for Black forest.

3.3. Forest owners' beliefs regarding demand for forest biofuel

The questionnaire also contained questions regarding other beliefs than the belief in whether the climate is changing in such a way that it affects the forest. One such question was: "Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?" To this question 93% of the respondents answered "Definitely yes" or "Probably yes". Only 2% answered "Probably not" or "Definitely not" (Figure 3.9). It is thus quite clear that there is a strong belief in a steady or increased demand for forest biofuel.

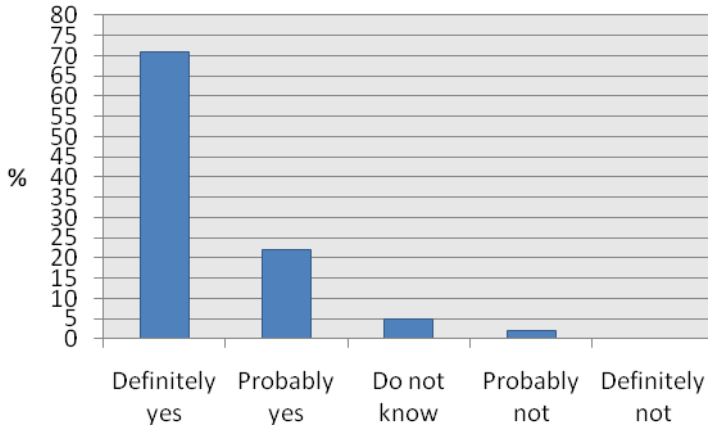


Figure 3.9. Question 66: "Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?" Distribution of answers from Chamusca, Black forest and Kronoberg (n=734).

The "yes"-group is in majority in all three areas though there is a difference in how large the majority is (Figures 3.10-3.12). The respondents from Chamusca are the least convinced with 67% "yes" and a relatively large degree of "Do not know" (25%). The respondents from Black forest have the highest percentage of "yes" with 96%. Kronoberg is not far behind on 93%, though the "yes"-sayers from Kronoberg seem somewhat less certain (68% "Definitely yes" versus 25% "Probably yes") compared to the respondents from Black forest (80% versus 16%).

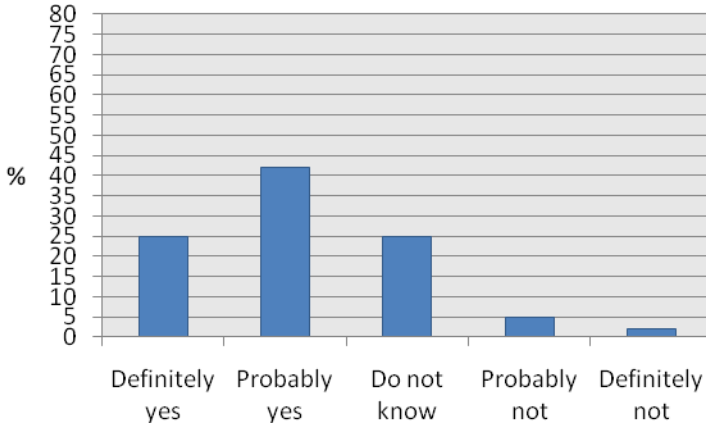


Figure 3.10. Question 66: "Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?" Distribution of answers from Chamusca (n=56).

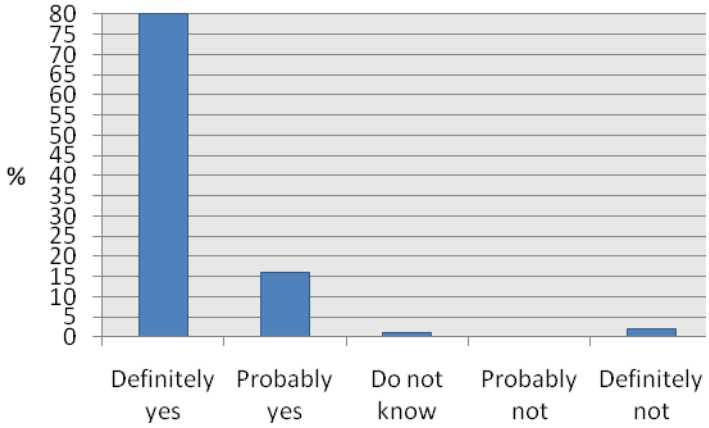


Figure 3.11. Question 66: "Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?" Distribution of answers from Black forest (n=369).

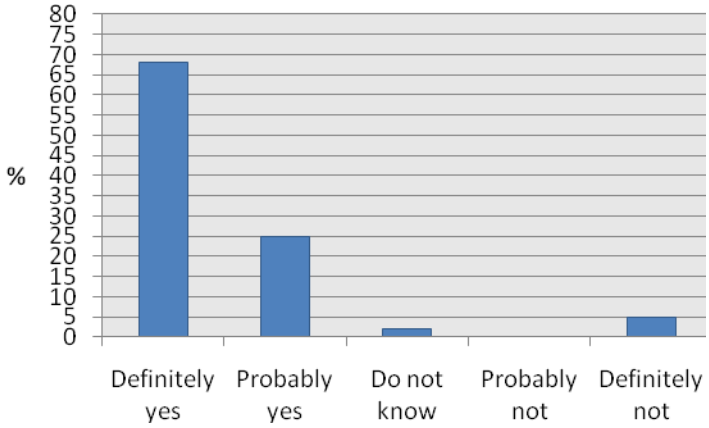


Figure 3.12. Question 66: "Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?" Distribution of answers from Kronoberg (n=309).

3.4. Forest owners' views and land use change

About the same percentage of respondents answered "Yes definitely" or "Yes, perhaps" (44.7%), as who answered "No, probably not" or "Definitely not" (47.5%) to the question "Would you be willing to change your land-use to counteract climate changes? If that is the case, how?" Sub-question 40h: "Grow forest on grazing land" (Figure 3.9). We should also note however that only a small part of the respondents (10.3%) was definitely prepared to make this land use change, while about a third of the respondents (34.4%) might consider it. Among those who are negative it is the opposite pattern, in that the percentage of respondents who are definitely against (26.6%) is higher than the percentage that is probably against this land use change (20.9%).

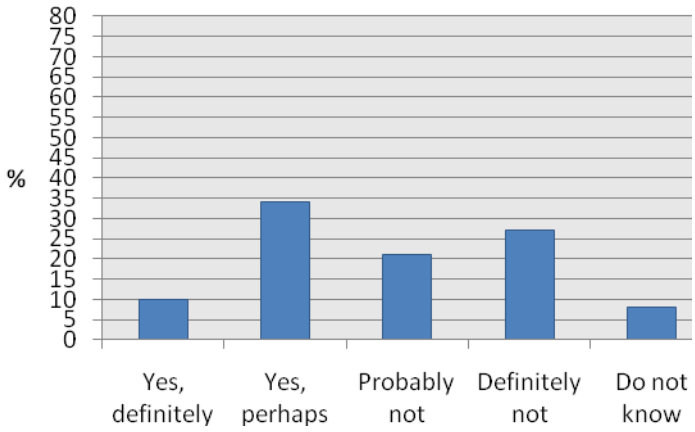


Figure 3.13. Question 40: "Would you be willing to change your land-use to counteract climate changes? If that is the case, how?" Sub-question 40h: "Grow forest on grazing land" Distribution of answers from Chamusca, Black forest and Kronoberg (n=680).[3]

In all three areas those definitely in favor are in minority (Figures 3.14 – 3.16). In Black forest the most frequent answer was "Definitely not" (34.2%), but only slightly ahead of "Yes, perhaps" (32.7%). In the other two areas "Yes, perhaps" was the most frequent answer (45.1% for Chamusca, and 34.5% for Kronoberg). Kronoberg appear to differ from the others by the high percentage of respondents who answered "Probably not" (32.4%).

[3] For this question the "Don't know" answer should not be seen as the mid-point on the scale since it is an epistemic statement while the other alternative answers to this question are value statements. We have therefore placed it at the side and not in the center as with the previous questions.

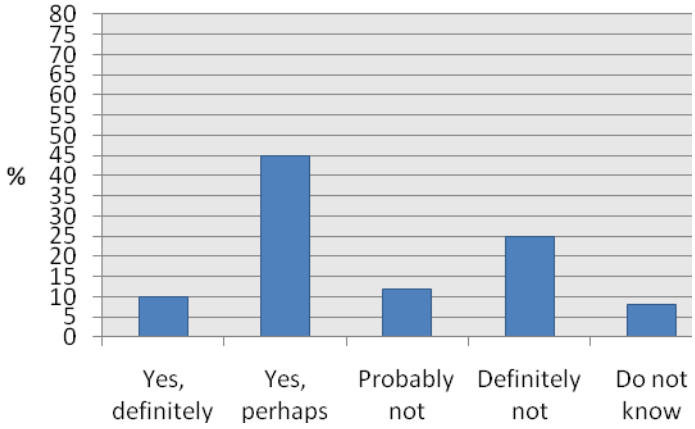


Figure 3.14. Question 40: "Would you be willing to change your land-use to counteract climate changes? If that is the case, how??" Sub-question 40h: "Grow forest on grazing land" Distribution of answers from Chamusca (n=51).

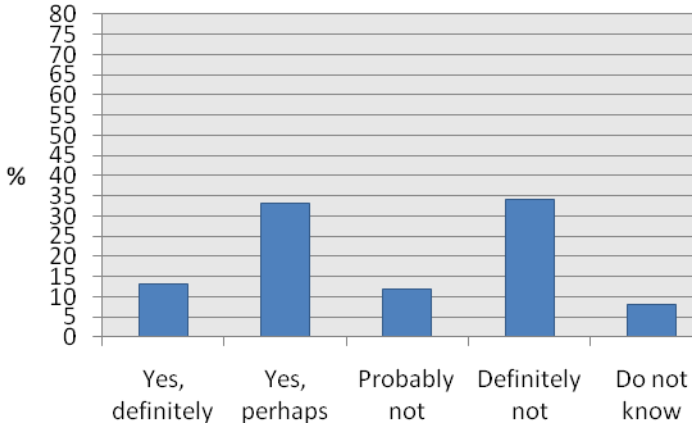


Figure 3.15. Question 40: "Would you be willing to change your land-use to counteract climate changes? If that is the case, how??" Sub-question 40h: "Grow forest on grazing land" Distribution of answers from Black forest (n=339).

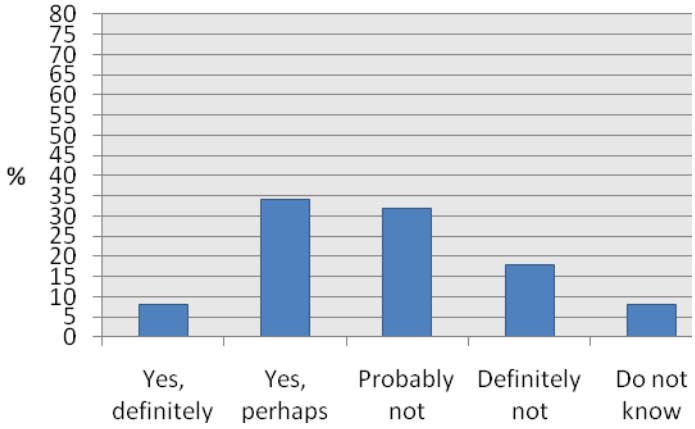


Figure 3.16. Question 40: “Would you be willing to change your land-use to counteract climate changes? If that is the case, how??” Sub-question 40h: “Grow forest on grazing land” Distribution of answers from Kronoberg (n=306).

4. Discussion and conclusion

One important result of the investigation is that a majority of the private forest owners in the three areas believe with some confidence that the climate is changing to such an extent that it will affect their forest (Figure 3.1 – 3.4). Very few forest owners are definitely convinced that the climate is not changing to such an extent that it is affecting their forest. On the other hand, we also found a large degree of uncertainty. Only in the Chamusca region did we find a clear majority who were definitely convinced that the climate is changing to such an extent that it affects their forest (Figure 3.2). In Kronoberg and Black forest, the largest percentage of respondents were found in the ”Yes, perhaps”-section (Figures 3.3 and 3.4).

The result from the question regarding perception of risks and climate change appear to differ somewhat from the results regarding how the respondents interpret personal experiences (Figures 3.5 – 3.8). Here too, a larger percentage of respondents are found in the “yes”-sections than in the “no”-sections though the difference is not as big here as for the previous question. The “maybe”-sections made up the majority in both this and the previous question. The “No, definitely not”-category is the smallest one for both questions, but it is still noticeably bigger in the latter question.

Among the questions asked about what the private forest owners in the three chosen areas are willing to do in order to mitigate climate change, one was about whether they were willing to convert pastoral land into forest (Table 2.2). Here the largest percentage was found in the ”Yes, perhaps”-category (Figures 3.9 – 3.12). However, the respondents were distributed quite evenly between the “yes”- and the “no”-sections, with a slight majority in the “no”-sections. The “no”-sayers also seemed to be more certain than the “yes”-sayers.

When looking at how the answers differed between the countries, we can note that Kronoberg rather saliently differ from the other two areas, in all questions but the one on the persistence of a bio-fuel demand, by having a lower percentage of respondents answering ”Yes certainly” compared to the two other areas (Figures 3.1 – 3.12). We do not know the reason for the deviation among the Kronoberg respondents but for the purpose of our investigation it is enough to conclude that climate change plays a smaller role in their expectation regarding their forest than is the case among forest owners in Black forest and Chamusca. This implies that decision support for climate change mitigation is perceived of as less relevant to forest owners in the Kronoberg area than to forest owners in the Chamusca and Black forest areas. On the other hand, the results indicate that individual private forest owners in all areas, in particular in the Black forest and Kronoberg areas, potentially could be motivated to take adaptive measures to meet a long-term demand on forest bio-fuel raw material.

The results so far indicate that further statistical analysis of these and the other questions will reveal interesting conclusions of relevance for the investigation and that clearly illustrate the relevance of addressing stakeholder beliefs and desires for the construction of relevant decision support for European forestry.

References

Bengtsson, B. (2004) *Allemansrätten – vad säger lagen?* Swedish Environmental Protection Agency, Stockholm

Berlin, C., Lidestav, G. & Holm, S. (2006) Values Placed on Forest Property Benefits by Swedish NIPF Owners: Differences between Members in Forest Owner Associations and Non-members. *Small-scale Forest Economics, Management and Policy*, 5:83-96.

Blennow, K. & Persson, J. (2009) Climate change: motivation for taking measure to adapt. *Global Environmental Change*, 19:100–104.

Dessai, S. & Hulme, M. (2003) *Does climate policy need probabilities*? Tyndall Centre for Climate Change Research Working Paper 34. UK.

Ekelund H & Hamilton G (2001) *Skogspolitisk historia*. Rapport 8A, 45–78. Jönköping:Swedish Forest Agency.

Grothmann, T. & Patt, A. (2005) Adaptive capacity and human cognition: The process of individual adaptation to climate change. *Global Environmental Change*, 15:199–213

Holling, C.S. (1978) Adaptive environmental assessment and management. London: John Wiley. 377 p.

Hugosson, M., & Ingemarsson, F. (2004) Objectives and motivations of small-scale forest owners; theoretical modelling and qualitative assessment. *Silva Fennica*, 38:217–31.

Mattsson L, Boman M & Kindstrand C (2003) *Privatägd skog: värden, visioner och forskningsbehov*. Brattåsstiftelsen: SUFOR.

O'Brien, K. & Wolf, J. (2010) A values-based approach to vulnerability and adaptation to climate change.*WIREs Climate Change*, 1:232-242.

Sandell, K. & Sörlin, S. (eds.), (2008) *Friluftshistoria – från härdande friluftslif till ekoturism och miljöpedagogik.* Carlsson bokförlag. Stockholm.

SFA, 2009 *Swedish Statistical Yearbook of Forestry*. Swedish Forest Agency.

Törnqvist, T. 1995. *Skogsrikets arvingar. En sociologisk studie av skogsägarskapet inom privat, enskilt skogsbruk*. Forskningsrapport 6. Uppsala: SAMU.

Executive summary

MOTIVE investigates and develops Adaptive Forest Management (AFM)-strategies that address climate change and land-use change while recognizing variability and uncertainty. An approach to develop AFM strategies based on simulation and optimization techniques is complemented by a bottom-up approach in which the adaptive capacity of the social part of the system is addressed. In this bottom-up approach an assessment of stakeholder attitudes to climate change, risks associated with climate change, and also to forest values and different ways of taking measure to adapt forestry to climate change is made. Furthermore, different ways of learning about climate change and options for adaptation are investigated. The results will be essential to provide AFM strategies that are relevant to the decision makers. Hence, they will improve opportunities to design strategies that will be used.

In the European Union 16 million mostly small-scale, private forest owners, own 60% of the forest acreage. This report presents some examples of results of a questionnaire study addressed to private individual forest owners sampled along a latitudinal gradient in one area in each of the countries Portugal, Germany, and Sweden. The results have been selected to supply an indication of what considerations affect the attitudes of the forest owners to different kinds of adaptation. Preliminary results indicate that

- a majority of the respondents believe that the climate is changing to such a degree that it affects their forestry though they also show a high degree of uncertainty,
- those respondents who connect recent experiences of catastrophic events to climate change are in majority over those who do not make this connection, though this majority is not absolute,
- a large majority of the respondents believe in a continued strong demand for forest biofuel,
- about as many respondents are willing to consider converting grazing land into forest land as those who are unwilling, and
- substantial differences in attitudes between forest owners in the three areas. These differences call for different solutions to provide effective AFM strategies for the different areas.

This report is produced under grant number FP7 226544, Models for adaptive forest management.

Appendix (Questionnaire)

First a few questions about you and your property

1. My answers concerns the management unit* in the municipality of _____

   * Enter the definition of a management unit for Germany/Portugal here!

2. What is the acreage of your management unit?

   Approximately _____ hectares

3. What is the acreage of land for different land uses on your management unit?

   ❑ Forest land ⇨ Approximately _____ hectares

   ❑ Grazing land ⇨ Approximately _____ hectares

   ❑ Crop land ⇨ Approximately _____ hectares

   ❑ Other land use, what? _____ approximately _____ hectares

4. Do you farm all of the grazing land and farm land yourself?

   ❑ Yes
   ❑ No ⇨ Approximately _____ hectares of grazing land is leased out

   ⇨ Approximately _____ hectares of crop land is leased out

   ⇨ Approximately _____ hectares are not managed actively

5. Are you the sole owner of the management unit or do you own it together with other persons?

   ❑ I am the sole owner of the management
   ❑ I own the management unit together with other persons

   ⇨ We are _____ owners (including myself)

6. What year did you become the owner/joint owner of the management unit?

   Year _____

7. How did you become the owner of the management unit?

   ❑ Heritage or gift
   ❑ Bought it from a family member or relative
   ❑ Bought it from another person/organization/company

8. Do you live on the management unit?

(mark with one cross)

- ❑ Yes
- ❑ Yes, but I am planning to move from the management unit
- ❑ No
- ❑ No, but I am planning to move to the management unit

If you answered no, how far is it between the management unit and your home?

Approximately _____ kilometers

9. What kind of relationship did you have to forest and forestry when you grew up?

- ❑ I grew up on the management unit
- ❑ I spent a lot of time on the management unit during my childhood
- ❑ I worked on the management unit
- ❑ I worked on another management unit
- ❑ I lived on another management unit
- ❑ I lived on the countryside or in a small town that had connections to forestry
- ❑ I lived on the countryside or in a small town that had no connections to forestry
- ❑ I lived in a city or bigger town that had connections to forestry
- ❑ I lived in a city or bigger town without connections to forestry

10. How often do you visit the management unit on average?

(mark with one cross)

- ❑ More than 3 times per week
- ❑ 1-3 times per week
- ❑ 1-2 times per month
- ❑ 2-4 times per year
- ❑ 1-2 times per year
- ❑ Less than one time per year

11. How is the responsibility mainly distributed when it comes to decisions regarding the forestry on the management unit?

(mark with one cross)

- ❑ I am making the decisions alone
- ❑ My husband/wife is making the decisions alone
- ❑ My husband/wife and I are making the decisions together
- ❑ A person (outside the household) is making the decisions alone
- ❑ A person (outside the household) and I are making the decisions together
- ❑ Husband/wife and another person are making the decisions together

12. Who do you think will take over the management unit in the future?

(mark with one cross)

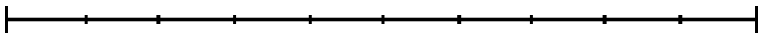
- ❑ My own children
- ❑ Another close relative
- ❑ Another person than a relative
- ❑ No opinion/it is not relevant right now

13. Do you carry out any forestry operations (pre-commercial thinning, thinning, harvesting etc.) by yourself on your management unit?

- ❑ Yes ⇨ Approximately _____ workdays per year
- ❑ No, but a family member/relative does ⇨ Approximately _____ workdays per year
- ❑ No, I hire a forest company/contractor for all forestry operations

14. How large share of the forest acreage of your management unit is conifers and broadleaves, respectively?

100 % conifers 0 % broadleaves	50 % conifers 50 % broadleaves	0 % conifers 100 % broadleaves



15. How do you wish that the forest on your management unit will develop in the future?

- ❑ More spruce forest
- ❑ More mixed forest
- ❑ More exotic tree species (examples..)
- ❑ Smaller departments (forest stands)
- ❑ More pine forest
- ❑ More broadleaved forest
- ❑ Larger departments (forest stands)
- ❑ No change
- ❑ Other, how? _____

16. If you wish to change the tree species composition on your management unit, what is the main reason?

(mark with one cross)

- ❑ Yes, because of expected climate change effects
- ❑ Yes, because of new goals with my/our forestry
- ❑ Yes, because I think that the wood market will change
- ❑ Yes, because I think a different composition will seize the growing opportunities better
- ❑ Yes, because I think that my private financial situation will change
- ❑ No, because I am satisfied with the tree species composition on my management unit

❑ No, because it is not possible to change the current tree species composition (by practical reasons)

❑ No, because I do not have enough knowledge about what tree species I can change to

❑ Other reason: _____

A few questions about risks and climate change

17. What is the risk of financial consequences for you and your household because of the following events?

(mark with <u>one</u> cross for each event)

Events	No risk	Low risk	High risk	Very high risk
Root rot damages	❑	❑	❑	❑
Bark beetle damages	❑	❑	❑	❑
Pine weevil damages	❑	❑	❑	❑
Browsing damages	❑	❑	❑	❑
Storm damages	❑	❑	❑	❑
Frost damages	❑	❑	❑	❑
Increased logging costs because of absence of ground frost	❑	❑	❑	❑
Snow damages	❑	❑	❑	❑
Drought damages	❑	❑	❑	❑
Flooding damages	❑	❑	❑	❑
Forest fire damages	❑	❑	❑	❑
Increased competition from ground vegetation	❑	❑	❑	❑
Reduced revenues from forestry	❑	❑	❑	❑
Increasing interest rates	❑	❑	❑	❑
Increasing property taxes	❑	❑	❑	❑

18. How certain were you when you assessed the risks in question 17?

(mark with <u>one</u> cross for each event)

Events	Certain	Fairly certain	Fairly uncertain	Uncertain
Root rot damages	❑	❑	❑	❑
Bark beetle damages	❑	❑	❑	❑
Pine weevil damages	❑	❑	❑	❑
Browsing damages	❑	❑	❑	❑
Storm damages	❑	❑	❑	❑
Frost damages	❑	❑	❑	❑
Increased logging costs because of absence of ground frost	❑	❑	❑	❑
Snow damages	❑	❑	❑	❑
Drought damages	❑	❑	❑	❑
Flooding damages	❑	❑	❑	❑
Forest fire damages	❑	❑	❑	❑

Increased competition from ground vegetation	❑	❑	❑	❑
Reduced revenues from forestry	❑	❑	❑	❑
Increasing interest rates	❑	❑	❑	❑
Increasing property taxes	❑	❑	❑	❑

19. Rank only five (5) of the following risks from 1 to 5, where 1 is the risk that you are willing to pay the highest amount to reduce (by for example modified management or insurance)

Root rot damages	____	Drought damages	____
Bark beetle damages	____	Flooding damages	____
Pine weevil damages	____	Forest fire damages	____
Browsing damages	____	Increased competition from ground vegetation	____
Storm damages	____	Reduced revenues from forestry	____
Frost damages	____	Increasing interest rates	____
Increased logging costs because of absence of ground frost	____	Increasing property prices	____
Snow damages	____		

20. Do you take any actions <u>today</u> specifically in order to reduce the risks below?

(mark with <u>one</u> cross for each event)

Events	No	Do not know	Yes	If yes, how?
Root rot damages	❑	❑	❑	_____
Bark beetle damages	❑	❑	❑	_____
Pine weevil damages	❑	❑	❑	_____

Browsing damages	❑	❑	❑	_____
Storm damages	❑	❑	❑	_____
Frost damages	❑	❑	❑	_____
Increased logging costs because of absence of ground frost	❑	❑	❑	_____
Snow damages	❑	❑	❑	_____
Drought damages	❑	❑	❑	_____
Flooding damages	❑	❑	❑	_____
Forest fire damages	❑	❑	❑	_____
Increased competition from ground vegetation	❑	❑	❑	_____
Reduced revenues from forestry	❑	❑	❑	_____
Increasing interest rates	❑	❑	❑	_____
Increasing property taxes	❑	❑	❑	_____

Now, we would like to ask you some questions relating to the storm/fire of year XXXX

21. How large was the standing volume on the management unit <u>before</u> the storm/fire (date)?

    (State the number of cubicmetres)

    _____ m^3sk _____ m^3fub

22. How many cubicmetres of wood was damaged on the management unit in the storm/fire (date)?

    (State the number of cubicmetres)

    _____ m^3sk _____ m^3fub

23. How has the storms/fires (date) during recent years affected your relationship towards owning forest?

    (mark with <u>one</u> cross)

    ❑ I will continue to own forest in the future
    ❑ I will sell my management unit within 10 years because of other reasons than the storms/fires.
    ❑ Because of the storms/fires, I will sell the management unit within 1 year.
    ❑ Because of the storms/fires, I will sell the management unit within 10 years.
    ❑ I do not know/I have not decided

24. Was your forest insured against storm/fire damage at the time of the storm/fire (date)?

❑ Yes ❑ No

25. Is your forest insured against storm/fire damage today?

❑ Yes ❑ No⇨ Why not _____

26. If your forest was insured, what are your experiences from the insurance after the storm/fire (date)?

(mark with one cross)

❑ I was not affected by the storm/fire
❑ I was affected, but I have not tried to get compensation from the insurance
❑ I was affected and I have positive experiences from the insurance
❑ I was affected and have neither positive, nor negative experiences from the insurance
❑ I was affected and have negative experiences from the insurance

27. How aware were you of the risk for damages by storm/fire before the storm/fire (date) and how aware are you today?

	Not aware at all				Very much aware
Before the storm/fire	❑	❑	❑	❑	❑
Today	❑	❑	❑	❑	❑

28. Were any specific forestry operations carried out before the storm/fire to reduce the risk of damages from storm/fire? Do you carry out any specific operations now, after the storm/fire?

(mark with one cross per row)

	Yes	No
Before the storm/fire	❑	❑
Today	❑	❑

29. Would you like to change your forest management due to recent storm/fire damages in "the case study area" (example, date)?

❑ No change
❑ I would like to convert grazing land/crop land to forest land
❑ I would like to convert forest land to grazing land/crop land
❑ I would like to focus more on game management rather than timber production

- ❑ I would like to focus more on nature conservation rather than timber production
- ❑ I would like to focus more on timber production rather than game management
- ❑ I would like to focus more on timber production rather than nature conservation

❑ Other, what? _____

30. Do you think that the climate is changing to such an extent that it substantially will affect your forest?

(mark with one cross)

❑ Yes, certainly ❑ No, probably not
❑ Yes, perhaps ❑ No, definitely not ❑ I do not know

31. Has the climate change debate affected your forest management?

❑ Yes ❑ No

32. If you answered yes to question 31, in what ways have you adapted your forest management?

- ❑ I have increased the share of broadleaves on my management unit
- ❑ I have increased the share of conifers on my management unit
- ❑ I have increased the share of mixed forest on my management unit
- ❑ I make sure to get the timber out early from the forest while the ground is still frozen
- ❑ I manage for more variation in stand structure, stand age, and silvicultural treatments
- ❑ I have increased/introduced new (exotic) tree species

❑ Other: _____

33. If you answered no to question 31, what is the main reason?

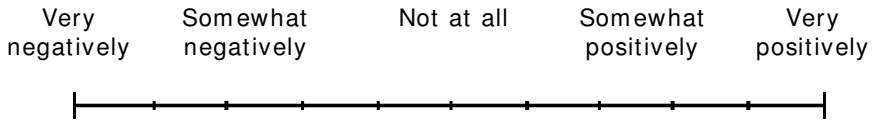
(mark with one cross)

- ❑ I have not thought about climate change and my own forest management
- ❑ I do not believe that the climate is changing
- ❑ I do not know how to modify my forest management
- ❑ I do not know how the climate is changing
- ❑ There is too much uncertainty as to whether the climate is changing
- ❑ There is too much uncertainty about how the climate is changing
- ❑ Too much uncertainty about what management measures reduce negative consequences of climate change
- ❑ Too much uncertainty about what management measures increase positive effects of climate change

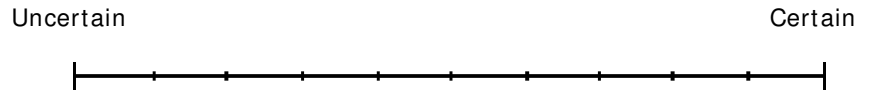
34. What is your main source of information about climate change?

- ❑ My forestry advisor (example of forestry advisors)
- ❑ Relatives, neighbors or friends
- ❑ The former owner of my management unit
- ❑ The owner of a neighboring management unit
- ❑ The owner of a management unit that has many similarities with my management unit
- ❑ Books, journals, TV, radio, internet etc.

35. Do you think the climate changes will affect the financial situation in your forestry?



36. How certain were you when you answered question 35?



37. Have you experienced any extreme weather conditions that you interpret as caused by a long-term and global climate change?

(mark with <u>one</u> cross)

- ❑ Yes, certainly ⇨ How? _____
- ❑ Yes, perhaps ⇨ How? _____
- ❑ No, probably not
- ❑ No, definitely not
- ❑ Do not know

38. Do you and your forestry advisor discuss management options that could:

	Yes	No
Reduce the negative effects of climate change	❑	❑
Increase the benefits from the positive effects of climate change	❑	❑

39. How do you believe climate change affects the risk of financial consequences for you and your household because of the events listed below?

(mark with <u>one</u> cross for each event)

Events	Much lower risk than today	Somewhat lower risk than today	The same risk as today	Somewhat higher risk than today	Much higher risk than today
Root rot damages	❑	❑	❑	❑	❑
Bark beetle damages	❑	❑	❑	❑	❑
Pine weevil damages	❑	❑	❑	❑	❑
Browsing damages	❑	❑	❑	❑	❑
Storm damages	❑	❑	❑	❑	❑
Frost damages	❑	❑	❑	❑	❑
Increased logging costs because of absence of ground frost	❑	❑	❑	❑	❑
Snow damages	❑	❑	❑	❑	❑
Drought damages	❑	❑	❑	❑	❑
Flooding damages	❑	❑	❑	❑	❑
Forest fire damages	❑	❑	❑	❑	❑
Increased competition from ground vegetation	❑	❑	❑	❑	❑
Reduced revenues from forestry	❑	❑	❑	❑	❑
Increasing interest rates	❑	❑	❑	❑	❑
Increasing property taxes	❑	❑	❑	❑	❑

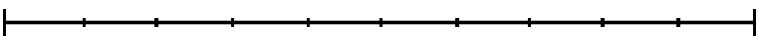
40. Would you be willing to change your land-use to counteract climate changes? If that is the case, how?

(mark with <u>one</u> cross on each row)

	Yes definitely	Yes perhaps	Probably not	Definitely not	Do not know
Receive subsidies from the government for converting unforested land to forest land in order to store more carbon	❑	❑	❑	❑	❑
Receive payments from companies for converting unforested land to forest land in order to compensate for their emissions of carbon dioxide	❑	❑	❑	❑	❑
Receive subsidies from the government for fertilizing forest land in order to store more carbon	❑	❑	❑	❑	❑
Receive payments from companies for fertilizing forest land in order to compensate for their emissions of carbon dioxide	❑	❑	❑	❑	❑
Getting paid to provide land for establishment of wind power plants	❑	❑	❑	❑	❑
Establish wind power plants myself on my own land	❑	❑	❑	❑	❑
Modify forest management to store more carbon even if it would affect biodiversity negatively	❑	❑	❑	❑	❑
Grow forest on grazing land	❑	❑	❑	❑	❑
Grow forest on crop land	❑	❑	❑	❑	❑
Use grazing land for some other purpose	❑	❑	❑	❑	❑
Use crop land for some other purpose	❑	❑	❑	❑	❑

41. How would you react if up to three wind power plants were established on neighboring management units?

Very positive — Neutral — Very negative



42. How would you react if more than three wind power plants were established on neighboring management units?

Very positive — Neutral — Very negative

A few questions about extension services

43. Do you consult a forestry advisor (example of forestry advisors)?

❑ Yes ❑ No

44. If you answered yes to question 43, which organization do you usually engage?

(mark with <u>one</u> cross)

❑ Forest Agency (or equivalent)
❑ Forest owners association
❑ Example of an important company in the region

❑ Other organization: _____

45. If you answered no to question 43, why not?

(mark with <u>one</u> cross)

❑ I do not know whom to contact
❑ I do not need to contact an advisor

❑ Other reasons: _____

46. Do you discuss risks (such as those mentioned in question 39) in forestry with a forestry advisor?

❑ Yes ❑ No

47. Have you gotten advice or have you given advice about any of the following risks?

(mark with <u>one</u> cross for each event)

Events	<u>Gotten advice</u> from an advisor	<u>Gave advice</u> to another forest

		owner
Root rot damages	❑	❑
Bark beetle damages	❑	❑
Pine weevil damages	❑	❑
Browsing damages	❑	❑
Storm damages	❑	❑
Frost damages	❑	❑
Increased logging costs because of absence of ground frost	❑	❑
Snow damages	❑	❑
Drought damages	❑	❑
Flooding damages	❑	❑
Forest fire damages	❑	❑
Increased competition from ground vegetation	❑	❑
Reduced revenues from forestry	❑	❑
Increasing interest rates	❑	❑
Increasing property taxes	❑	❑
Other: _____	❑	❑

48. Do you think that your forestry advisor knows enough to give you advice about the risks in the previous question?

❑ Yes
❑ Yes, for some of the mentioned risks, but not for: _____
❑ No

49. Was your forestry advisor your main source of information/ advice regarding the risk of damages by storm/ fire during a 5-year period before the storm/ fire (date – date)?

❑ Yes ❑ No ❑ I do not have any forestry advisor

50. If you have answered yes to question 49, did you yourself bring up the question?

❑ Yes ❑ No

51. If you have answered no to question 49, who/ what was your main source of information during that period?

❑ Relatives, neighbors or friends
❑ The former owner of my management unit
❑ The owner of a neighboring management unit
❑ The owner of a management unit that has many similarities with my management unit
❑ Books, journals, TV, radio, internet etc.

52. If your main source of information in question 51 was another person, did you yourself bring up the question?

❑ Yes ❑ No

53. If your main source of information in question 51 was another person, how do you think this person has gained his/ her knowledge about forestry?

❑ Little or no knowledge about forestry
❑ Experiences from older generations or from own work
❑ Books, journals and magazines about forestry (specialist literature)
❑ Courses and meetings
❑ Forestry education of 1 year or more
❑ Do not know

A few questions about the situation after the storm/ fire (date)

54. Have you, after the storm/ fire (date) gotten concrete advice by your forestry advisor regarding the risk of damages by storm/ fire?

❑ Yes ❑ No ❑ I have no advisor

55. If you have answered yes to question 54, did you yourself bring up the question?

❑ Yes ❑ No

56. If you have answered no to question 54, who/ what was your main source of information regarding the risk of damages by storm/ fire since the storm/ fire (date)?

❑ Relatives, neighbors or friends
❑ The former owner of my management unit
❑ The owner of a neighboring management unit
❑ The owner of a management unit that has many similarities with my management unit
❑ Books, journals, TV, radio, internet etc.

57. If your main source of information in question 56 was another person, did you yourself bring up the question?

❑ Yes ❑ No

58. If your main source of information in question 56 was another person, how do you think this person has gained his/ her knowledge about forestry?

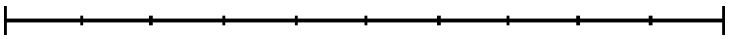
❑ Little or no knowledge about forestry
❑ Experiences from older generations or from own work
❑ Books, journals and magazines about forestry (specialist literature)
❑ Courses and meetings
❑ Forestry education of 1 year or more
❑ Do not know

59. Have you given advice to any other forest owner regarding the risk for storm/fire damages after the storm/fire (date)?

❑ Yes ❑ No

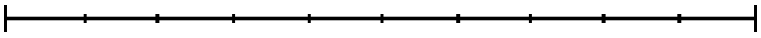
60. How has the storm/fire damages in (date) affected you emotionally?

Very negative Not at all Very positive



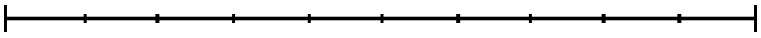
61. Are you worried about your private household economy because of the (storm/fire) damages after the storm/fire (date)?

Very worried No change Not worried



62. Do you think that the solidarity in the village/town where the management unit is located has changed after the storm/fire (date)?

Decreased No change Increased



63. Many European countries have given up clear-cut forestry in favor of continuous cover forestry without clear-cut areas. Would you be prepared to convert to continuous cover forestry?

(mark with <u>one</u> cross)

❑ Yes, certainly ❑ No, scarcely
❑ Yes, perhaps ❑ No, definitely not ❑ Do not know

64. What would you do if you had to make a very important decision regarding your forest management?

(mark with <u>one</u> cross)

❑ I would ask for advice from the former owner of my management unit
❑ I would ask for advice from an owner of a neighboring management unit
❑ I would ask for advice from an owner that has a management unit similar to mine
❑ I would ask my forestry advisor (examples of forest advisors)
❑ I would do like I always have done
❑ I would assess what the future may bring and base my decision on that

⇨ What would that assessment be based on?

_____

Some questions about different values in the forest

65. This question is about how you as a forest owner value different aspects of the forest and forest ownership. Please indicate how much value you assign to each aspect.

    0=no value, 10=very high value

a. In which ways and to what degree does your forest have value for you as a resource for timber production? (0=no value, 10=very high value)

   _____ The financial gain from selling the timber

   _____ Having access to your own timber

   _____ The money I save by not having to buy timber

   _____ The things I construct from the timber

   _____ Contributing to the society by providing timber

   _____ Contributing to the country's (national) finances

   _____ Other values: _____

b. In which ways and to what degree does your forest have value for you as a resource for production of pulpwood? (0=no value, 10=very high value)

   _____ The financial gain from selling the pulpwood

   _____ Contributing to the country's (national) finances

   _____ Contributing to the access to paper for books/newspapers/magazines/etc. in the society

   _____ Other values: _____

c. In which ways and to what degree does your forest have value for you as a resource for bio energy production (including firewood)? (0=no value, 10=very high value)

   _____ The financial gain from selling the raw material

   _____ The financial gain from producing and selling my own bioenergy

   _____ The money I save from not having to by form other suppliers

   _____ The money I save by not having to buy raw material for bioenergy

   _____ The money I save by not having to buy raw material for bioenergy

   _____ The contribution of bio energy to the country's national finances

   _____ The contribution of bio energy to decreased use of fossil fuels

   _____ Other values: _____

d. In which ways and to what degree does your forest have value for you as a place for taking walks? (0=no value, 10=very high value)

_____ Improved health

_____ Improved physical fitness

_____ Relaxation

_____ The sounds of the forest

_____ Absence of disturbing sounds

_____ Absence of disturbing impressions

_____ Absence of other people

_____ I appreciate the walking as such

_____ Being present in the forest

_____ The feeling of being in my own forest

_____ Helps me think

_____ Meeting the animals of the forest

_____ Getting inspiration for artistic creation

_____ Finding motives for artistic creation

_____ Experiencing the beauty of the forest

_____ Fresh air

_____ Contributing to the public access to areas for recreation

_____ Contributing to public health

_____ Giving the public opportunities to get in contact with nature

_____ Other values: _____

e. In which ways and to what degree does your forest have value for you as a place for hunting? (0=no value, 10=very high value)

_____ Relaxation

_____ Excitement

_____ The good fellowship within the hunting group

_____ Contributing to the country's (national) finances

_____ Meat for my own consumption

_____ My own financial gain from selling meat

_____ Being able to eat meat from my own forest

_____ My own financial gain from leasing hunting rights

_____ I appreciate the hunting as such

_____ Being present in the forest

_____ Meeting the animals in the forest

_____ Experiencing the beauty of the forest

_____ Fresh air

_____ Helps me think

_____ Other values: _____

f. In which ways and to what degree does your forest have value for you as a <u>place for picking berries and mushrooms</u>? (0=no value, 10=very high value)

_____ Relaxation

_____ Health promotion

_____ A way of spending time with the rest of the family

_____ Berries/mushroom for my own consumption

_____ The money I save by not having to buy berries/mushroom

_____ The financial gain I get from selling the berries/mushroom

_____ Contributing to the country's economy

_____ The satisfaction from eating berries/mushroom from my own forest

_____ Feels safer to eat berries/mushroom from my own forest

_____ Appreciates the picking as such

_____ Being present in the forest

_____ Meeting the animals in the forest

_____ Experiencing the beauty of the forest

_____ Fresh air

_____ Helps me think

_____ Other values: _____

g. In which ways and to what degree does your forest have value for you as a place for tourism? (0=no value, 10=very high value)

_____ My own financial gain from eco tourism

_____ Contributes to the country's (national) finances by providing a place for eco tourism

_____ Makes it possible for local people to make a living by eco tourism

_____ Providing recreation opportunities for the public

_____ Contributing to public health

_____ Providing the public with opportunities to get in contact with nature

_____ Contributing to increase people's appreciation of the values of the forest

_____ Feel the pride that people want to visit my forest

_____ Other values: _____

h. In which ways and to what degree does the owning, administration and management of your forest have value for you? (0=no value, 10=very high value)

_____ My own financial gain from the forest

_____ Contributes to the country's (national) finances

_____ The possibility to choose silvicultural treatments based on my own motives

_____ The possibility to manage the forestry business based on my own motives

_____ The satisfaction of working in the forest

_____ The satisfaction of working with forest economy/administration

_____ The satisfaction of seeing the result of my work

_____ Working with forestry is good for my physical health

_____ Working with forestry is good for my mental health

_____ Appreciates variation in my work

_____ Appreciates working outdoors

_____ Appreciates to be my own boss

_____ Maintain family traditions

_____ Wants to get interest from previously made investments

_____ Wish to do something that will last after my life time

_____ The status it gives me in the society

_____ Financial security for my children

_____ Ability to provide a secure environment for bringing up my children

_____ Influencing my own and family's local environment

_____ Other values: _____

i. In which ways and to which degree does your forest have value for you as a provider of one or more of the following services: clean water, protection against soil erosion and protection against air pollution? (0=no value, 10=very high value)

_____ The financial gain I get from subsidies for providing one or more of these services

_____ What one or more of these services give back to my forest

_____ The contribution of one or more of these services to my agriculture/other business: ...

_____ The contribution of one or more of these services to the surrounding society

_____ The contribution of one or more of these services to the future wellbeing of future generations in general

_____ The contribution of one or more of these services to the future wellbeing of my own children

_____ The contribution of one or more of these services to the ecosystem as such independently of what they contribute to humanity

_____ Other values: _____

j. In which ways and to what degree does your forest have value for you as a habitat for animals and plants? (0=no value, 10=very high value)

_____ The biodiversity of the forest

_____ The forest as a home for a particular species that I value, viz _____

_____ The knowledge that the species lives on my property

_____ The knowledge that the species exists at all

_____ The possibility to see/hear an individual of that species

_____ Concern for the individuals of the species

_____ The possibility to hunt/collect individuals of the species

_____ The possibility to show the species to others on my property

_____ The contribution the species has to the stability of the forest ecosystem

_____ The contribution of the species to the economy of the forest (pest control, etc.)

_____ Other values: _____

k. In which ways and to what degree does your forest have value for you as a carbon sink? (0=no value, 10=very high value)

_____ Its contribution to counteract climate change

_____ The value it provides my children by mitigating climate change

_____ The financial gain I might get from companies paying me to compensate for their emissions

_____ The financial gain I might get from government subsidies for keeping forest as a carbon sink

_____ Other values: _____

66. Do you think that the strong demand for biofuel (from forest products) will be persistent over the next 10 years?

(mark with one cross)

❑ Definitely yes ❑ Probably yes ❑ Probably not ❑ Definitely not ❑ Do not know

67. Would you be willing to increase your acreage of forest land (if you have the possibility) to meet the possibly increasing demand for biofuel by:

(mark with one cross on each row)

	Definitely yes	Probably yes	Probably not	Definitely not	Do not know
Growing forest on grazing land	❑	❑	❑	❑	❑
Growing forest on crop land	❑	❑	❑	❑	❑
Growing forest on other land	❑	❑	❑	❑	❑
Convert forest land to energy crop production	❑	❑	❑	❑	❑

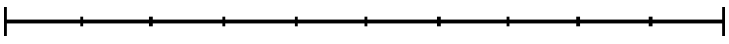
68. Assume that you have during several years invested time and money to keep the forest on your property well managed for timber production. Assume furthermore that you can improve the financial return by converting to production of raw material for bio-fuel production.

Is it more likely that you would continue manage the forest for timber production in the forest stands that you have started to manage for timber production, or that you would convert to production of raw material for bio-fuel production?

(mark with one cross on the scale)

Most likely that I would continue manage the forest stands for timber production

Most likely I would convert also these forest stands to production of raw material for bio-fuel production



Some question about you and your household

69. When were you born?

19___

70. Gender?

❑ Woman ❑ Man

71. What educations do you have?

❑ Elementary school or equivalent
❑ High school or equivalent
❑ University or equivalent
❑ Professional education or equivalent

72. How have you gained <u>your knowledge</u> about forestry?

❑ Little or no knowledge about forestry
❑ Experiences from older generations or from own work
❑ Books, journals and magazines about forestry (specialist literature)
❑ Courses and meetings
❑ Forestry education of 1 year or more
❑ Do not know

73. What was the total disposable income after taxes in your household during 2009?

(mark with <u>one</u> cross)

❑ 0 – 199 999 SEK ❑ 200 000 – 399 999 SEK ❑ 400 000 or more

74. How large share of the household's income (during 2009) came from the management unit?

(mark with <u>one</u> cross)

❑ Less than 5 % ❑ 16-25 % ❑ 51-75%
❑ 6-15 % ❑ 26-50% ❑ 76-100%

75. Are you a member of any of the following organizations?

❑ Forest owners association or equivalent
❑ Farmers association or equivalent
❑ I am not a member of any forest organization

76. If the questionnaire was addressed to someone else than you, and you have filled it in, please state the gender and age here or the person that the questionnaire was addressed to.

❑ Woman ❑ Man

Birthyear: 19____

If you want to comment or add something you can do that here:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for your participation in the survey!