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Why do forest owners fail to heed warnings?
Conflicting risk evaluations made by the Swedish forest agency and forest owners

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RESEARCH ARTICLE

Why do forest owners fail to heed warnings? Conflicting risk evaluations made by the Swedish forest agency and forest owners

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In the aftermath of a hurricane in Sweden that felled some 250 million trees, the Swedish Forest Agency advised forest owners to reduce forest vulnerability by planting different tree species. This paper analyses why forest owners failed to heed the Forest Agency’s recommendation, thereby reproducing a forest vulnerable to storms. This paper focuses on the deliberations and risk evaluations of forest owners when deciding which tree species to plant. The analysis identifies three main categories of reasoning that guided the forest owners’ decision-making process: short-term economic reasoning caused by the pressing situation they faced; an understanding of windstorms as natural catastrophes that are impossible to influence; and the uncertainties associated with alternative forest management practices. Furthermore, given their risk-averse strategy, their approach to understanding and coping with uncertainty was crucial in determining their responses. This paper concludes that the forest owners primarily employed experience-based, practical and embodied knowledge, implying that abstract risks and theoretical knowledge regarding future developments were not deemed relevant. An additional conclusion is that even if a huge storm felling shows the need to change forest management practice, it does not provide the most favourable social conditions for achieving change.

Keywords: forestry; vulnerability; storms; embodied knowledge; uncertainty; climate change

Introduction

On 8 January 2005, the storm Gudrun swept across the south of Sweden with wind gusts of up to 42 m/s, making it the worst storm to affect Sweden on record. It resulted in dramatic destruction: 14 people were killed; 250 million trees were windthrown (75 million m³); and more than 30,000 kilometres of power lines were destroyed, resulting in power outages for 730,000 customers. Furthermore, 260,000 households suffered from telecommunication disruptions, and public transport (railways, buses and ferries) was suspended in southern and western Sweden. The catastrophe caused significant economic damage, with direct costs estimated at 2.5 billion Euros. (For an overview of the disaster and its aftermath, see Eriksson2009; Guldåker 2009; Linné 2011; Sellerberg 2011; Svensson et al. 2011) Prior to Gudrun, no single storm had caused such extensive forest damage in modern Swedish history (Holmberg 2005). In total, 75 million m³ of wood were damaged, representing nearly an entire year’s harvest. At the regional level (Kronoberg county), 18% of the total standing volume was felled (Blennow and Eriksson 2006). In total, approximately 270,000 hectares were damaged by the storm, while between 110,000 and 130,000 hectares required replantation (Svensson et al. 2011, p. 11).

One reason for the storm’s substantial detrimental effects was that the forest primarily consisted of spruce (80% of the trees felled by the storm were spruce), which is more vulnerable to storms than other tree species (Persson 1975; Peltola et al. 2000; Valinger et al. 2006). This led the Swedish Forest Agency to recommend that forest owners plant different tree species to make the forest less vulnerable to storms. The Forest Agency’s recommendation was also motivated by the implications of climate change. While current conditions favour conifers, recent predictions indicate that after 2050 southern Sweden will no longer be a suitable environment for conifers (Felton et al. 2010). Milder winters may increase the overwintering of the bark beetle and its eggs, and warmer and longer summer periods may give the beetles an opportunity for mass flight as well as to produce two generations per year (Jönsson et al. 2009). Also a warmer climate may favour pests such as bracket fungus. Milder winters will also increase the probability of windthrow, as the trees will be less well anchored in the soil due to reduced or absent frost (Peltola et al. 1999). These considerations formed the basis for the Forest Agency’s recommendation that forest owners plan for a shorter rotation, increased regeneration felling, earlier thinning and replanting of different tree species, particularly more broadleaved

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species. The Forest Agency also subsidised replantation, and larger grants were made available to those planting tree species other than spruce, in an effort to make the decision between spruce and other tree species cost neutral. Based on their recent experience of extreme windthrow, the forest owners requested advice and subsidies from the Forest Agency.

While individuals generally act in accordance with habit – for example, forest owners’ decisions regarding which tree species to plant are often made in keeping with previous decisions and patterns of action – sudden changes, crises and catastrophes may be crucial moments that afford opportunities to question previous decisions and patterns of action (Bourdieu 1977, p. 16; Giddens 1990). Studies on risk perception have found that the public are more concerned with risks that they are unfamiliar with and cannot control (Löfstedt and Boholm 2009; Lidskog and Sundqvist 2013). A survey conducted after the storm Gudrun found that 84% of private forest owners considered themselves aware or very aware of the risk of wind damage, compared to 48% before the storm (Ingemarsson et al. 2006). Thus, it is reasonable to believe that having directly experienced a large-scale felling of trees during a storm should create an opportunity for forest owners to reflect on prior patterns of action, change their habits and begin to plant other species of trees than spruce. However, this was not the case; despite increased risk awareness amongst the forest owners, more than 95% of the replantation in the affected area consisted of spruce (SFA 2013a).

Taking this situation as a starting point, this article aims to investigate the forest owners’ reasoning and deliberations when they decided to plant spruce thereby reproducing a forest vulnerable to storms. Special attention is devoted to how they evaluated the risks and uncertainties when selecting from the available options. The primary research questions are as follows: How did the forest owners acknowledge and respond to the recommendations made by the Forest Agency in their decision to plant spruce? Which risks and benefits did they consider when deciding which tree species to plant? Why did the individual forest owners nearly unanimously decide not to heed the Forest Agency’s recommendation?

The paper is organised into four parts, the first being this introduction. The second part outlines the design of the study and its setting: contemporary Swedish forestry policy, the Forest Agency’s replantation recommendations and how the Forest Agency attempted to guide forest owners’ replantation strategies by offering economic incentives. The third part investigates the forest owners’ reasoning, with particular emphasis on how they evaluated risks and rewards when making their replantation decisions. The fourth and concluding part explains why forest owners did not rely on the recommendations of the regulatory agencies and experts. The paper concludes by discussing the implications of the results, including lessons that can be learned from this case.

Materials and methods

The context of the study

In explaining the forest owners’ choice of species to plant, three aspects of the forest management system are of particular importance:

1. Spruce is the dominant tree species in the affected area. Today the standing volume of the Swedish forests comprises 42% Norway spruce, 39% Scots pine and 12% birch (SFA 2013a, p. 44). In the southern part of the country (Götaland), approximately 75% of the forest is composed of conifer species (45% spruce and 30% pine; SFA 2013a, p. 62). This means that unless planting habits change, spruce will tend to be chosen for replanting.

2. The affected area consists mainly of small-scale forest holdings. A unique feature of Swedish forestry is its ownership structure; approximately 50% of productive forestry land is owned by individuals; 30% is owned by private companies; and 20% is publicly owned (generally by state-owned companies; Lidskog et al. 2013). Individually held forestland generally takes the form of small parcels, with approximately 3% (327,000 persons) of the Swedish population owning forestland. Eighty-five per cent of the windthrown forests were owned by small-scale, private forest owners (defined as owning fewer than 5000 hectares of forestland or having fewer than 10 employees). This means that the responsibility for replantation was distributed across numerous forest owners.

3. The forest owners are free to select which species to plant. The Swedish forest management system assumes that forest owners will actively seek out the best available knowledge on the trade-offs between exploiting and conserving forest resources and act in accordance with it (Appelstrånd 2012). Individual forest owners have considerable latitude in how to manage their forests. In a governance system that relies rather heavily on social norms and guidelines to shape individual forest owners’ actions, forest consultants – employed by either the Forest Agency (at a regional level) or forest owner associations – play an important role in influencing forest owners’ practices. In addition to serving in an advisory capacity, the Forest Agency can influence actions via economic incentives (grants and subsidies).

Replantation grants

The state allocated 120 million Euros (SEK 1065 M) to the Forest Agency to address the consequences of the storm Gudrun. Of this amount, 50 million Euros were earmarked for economic support for replantation. The aim of the grant was to assist affected forest owners as a way to ensure replantation and to promote the planting
of species other than spruce, thereby creating forest areas that are less vulnerable to storms and are more favourable for biodiversity and recreation (SFA 2010, p. 34; SFA 2013b, p. 3). The grant mechanism was designed to support both production-oriented (spruce) and biodiversity-oriented (other tree species) plantations. Thus, even if there are other factors that determine the regeneration of the forest, such as natural regeneration (self-seed), clearing and thinning, replantation was seen as a central means to influence the composition of the forest.

Because replantation with deciduous trees and pines is more costly than with spruce (not least because these species require fences to reduce the damage caused by grazing pressure from wildlife), the grants were differentiated to make the selection of tree species cost neutral for the forest owners. (The grants ranged between 330 and 4000 Euros per hectare.) In 2006, 15,000 forest owners were contacted and encouraged to apply for grants. The Forest Agency’s goal was for 80,000 hectares to be replanted with spruce and 10,000 with deciduous trees, but the result was 88,000 hectares with spruce (+10%) and less than 3000 hectares with deciduous trees (−70%). Thus, although the choice between tree species was intended to be cost neutral for the forest owners, nearly all of them chose to replant spruce.

Clearly, there were ample reasons for forest owners to plant other species than spruce, but they chose spruce nonetheless. Their awareness of the risk of storm felling had increased; most of them had contacted forest consultants for advice, and the Forest Agency made non-spruce options economically viable. However, these efforts do not seem to have led to any substantial change in the practices of the forest owners, who continued to replant spruce. What explains this seemingly irrational behaviour on the part of forest owners?

**Research design**

Materials from the Forest Agency provide us with data for describing the consequences of the storm Gudrun (Blennow and Eriksson 2006; Ingemarsson et al. 2006; SFA 2006; Svensson et al. 2011) and the replantation efforts (SFA 2013b). The investigation of the forest owners’ risk assessments and deliberations on what tree species to replant is based on a secondary analysis of a number of studies on forest owners in the affected areas. This material consists primarily of interviews conducted in 2005–2006 (Guldaker 2009), 2006 (Sellerberg 2011) and 2009 (Linne 2011), but to some extent also a survey conducted in 2005 (Ingemarsson et al. 2006). These studies have partially different foci, but all include aspects of how forest owners understood and evaluated the situation after the storm Gudrun, and some also include how the forest owners deliberated over what tree species to replant (Sellerberg 2011; Linne 2011). Secondary analysis means studying a specific problem through the analysis of existing data. It could involve answering the original research questions with better techniques, answering new research questions with old data or extracting knowledge on topics other than those which were the focus of the original study (Hewson 2006; Smith 2008). In this case, we focus on those parts of the material which concern forest owners’ thoughts on replantation: the risks and benefits they attach to different options and how they evaluated forest consultants’ recommendations. By reading through the literature to find places where this topic was analysed and discussed, we have found relevant material for this study. The findings of the reviewed studies are compiled, analysed, compared and reinterpreted to provide a coherent explanation of the forest owners’ decisions to replant spruce.

A limitation of this study is that the secondary analysis is not based on the primary material itself (the transcribed interviews) but the published analyses. This means that even if the literature (in the form of monographs and Ph.D. theses) present numerous, long quotations relating to how forest owners reason, we do not know what has been excluded in presentations of the interviews and to what extent there exist interview excerpts that contradict the authors’ interpretations. To ameliorate this limitation, we have compared the different studies which allow us to identify any contradictions and tensions between different interpretations of how forest owners reason.

Another limitation is that forest owners are treated as a homogenous group. This is because of the character of the empirical material (the surveyed interview studies do not address the heterogeneity of forest owners). Thus, it is not possible to differentiate the forest owners in terms of gender, age, years of forest ownership, economic importance of the forest for the household, character of the forest property and the like. However, even if there probably will be differences in ways of reasoning, it is important to note that most forest owners (84%) are aware of the risk of wind damage and that more than 95% of the replantation in the area consisted of spruce. Thus, even if there may be some variation in ways of reasoning and some differences in management practices, there is a very strong general pattern that needs to be explained.

**Results**

In the direct aftermath of the storm, the most important concerns were to clear the forest of windfall, transport the trees to temporary storage and decide whether trees that were damaged but remained standing should be felled. Further, many of the forest owners resided in the affected area, requiring that substantial time and effort be devoted to coping with interruptions to electricity and telephone services. The forest owners only began to make their replantation decisions a year after Gudrun.
struck. In light of this situation, the Forest Agency’s reforestation grant programme remained open for applications between 2006 and 2010.

While it was not an urgent issue – there was ample time to reflect and deliberate on what species to plant – it was nevertheless a difficult and demanding decision for the forest owners. Most, if not all, of them, had never made a decision regarding replantation on this scale; for 10% of the forest owners (7500), the windthrown trees corresponded to 10 years’ worth of harvest or more (Blennow and Eriksson 2006). Furthermore, the loss of trees in the storm plunged many forest owners into a precarious economic situation, partly because they had regarded the trees as a safe and guaranteed source of long-term income and partly because they were forced to make large investments in the aftermath of the storm (Linné 2011; Sellerberg 2011).

Prior investigations of the forest owners’ thoughts and actions in response to the storm provide a rather heterogeneous and fragmented picture of the forest owners’ reasoning when deciding what to replant. This is largely due to the different objectives of previous investigations. The aim of most of these studies was to explain the general implications of Gudrun for the forest owners, while devoting limited attention to the issue of reforestation.

In our analysis of the deliberations and decision-making processes regarding replantation, we observe three primary types of reasoning that guided the forest owners: their economic evaluations, their framing of windthrow and the uncertainties associated with alternative options.

**Economic rationale**

The effects of the storm Gudrun brought increased economic costs for the forest owners. Only 27–40% of them had storm insurance. Reasons for not having storm insurance include low-risk awareness regarding the consequences of storms, low availability of insurance policies and a weak insurance market and the cost of insurance (Guldåker 2009, p. 148; Ingemarsson et al. 2006, p. 25; Svensson et al. 2011, p. 40). However, regardless of whether they had insurance, the windthrow damage meant that many of them would need to make investments earlier than planned (e.g. for machines and vehicles), hire workers and repair damaged buildings. Moreover, large areas needed to be replanted, which entailed considerable costs. (The cost of replanting was approximately 1100 Euros per hectare, including the Forest Agency’s subsidy.)

Thus, the forest owners faced economic pressure that influenced their decision-making regarding what to plant. In the short-term economic perspective caused by the effects of Gudrun, alternative tree species were associated with higher costs and increased economic risk. These species were more vulnerable to wildlife grazing, and although the Forest Agency’s grant included the costs of constructing fences, these alternative options were perceived to increase the forest owners’ workloads in an already pressing situation. Other tree species were also considered more vulnerable to pests and disease, in many cases diseases with which the forest owners were rather unfamiliar. Moreover, the forest owners were uncertain about the suitability of the soil for deciduous tree species (Linné 2011, p. 126–130, 157).

Thus, they perceived other tree species as more risky than spruce, and due to their difficult economic situation, they attempted to avoid taking risks. Accordingly, they chose to plant spruce, as they had a good understanding of the management practices required for this type of forest. Many forest owners stated that they would have liked to plant deciduous trees, but the increased demands for profitability after the storm made them feel compelled to replant spruce (Linné 2011, p. 58).

Thus, the storm diminished economic flexibility, which made planting spruce seem a rational and safe option. In the long term, however, replanting monocultures of spruce is an economically questionable option. Such forests are sensitive to storm damage, and the risk of wind felling would further increase under the global warming scenario projected for southern Sweden, which is believed to entail both wetter soils and less frost.

**The framing of windthrow**

Another aspect of the forest owners’ reasoning concerns how they framed, categorised and understood the storm Gudrun. Prior investigations reveal that forest owners perceived the storm as a natural disaster, a phenomenon that would have occurred irrespective of human activities (Blennow and Eriksson 2006). Framing Gudrun as a natural disaster seems to have created few incentives to develop preventive measures (Blennow 2008; Linné 2011, p. 63). An interview study conducted eight months after the storm found that less than half of the forest owners in the affected region planned to take any management measures to minimise the risk of storm felling (Ingemarsson et al. 2006). As a forest owner put it: “We’ve always lived with the fact that we can only do what we ourselves have control over. It’s up to weather and winds to decide the rest. That’s what forestry is like” (quoted in Linné 2011, p. 202). It is also noteworthy that two years after Gudrun, a new storm (“Storm Per”) struck the area. While Per was not as destructive as Gudrun, it nevertheless had severe consequences for the forest, including power outages for 440,000 households and 16 million m³ of windthrown forest. Despite their experiences of the storms Gudrun and Per, the forest owners replanted spruce.
Large storms are rare occurrences in Sweden, and forest owners may therefore consider it unimportant to invest in new management practices that might not be needed in the future. Gudrun’s consequences for Swedish forestry could have been different if the storm had been understood as partly a man-made disaster – a disaster caused not only by the wind but also by the choice of tree species and cultivation and harvesting methods. This is in addition to the fact that planting wind-sensitive spruce, engaging in increased and more intensive wood production, having a larger area of standing trees and clear cutting will lead to greater risk of wind damage due to storms, even if the frequency of storms does not increase (Blennow and Eriksson 2006). Thus, framing storms as natural disasters that cannot be avoided or mitigated by humans – and viewing humans and society nearly exclusively in terms of the storm’s effects rather than its causes – seems to have resulted in the forest owners failing to change their tree-planting habits. In their view, storms such as Gudrun occur very rarely, and when one strikes there is nothing to be done about it.

**Uncertainties associated with other options**

The forest owners faced a difficult economic situation and had to replant large areas. In doing so, they sought risk-reduction strategies. One of their primary risk-reduction strategies was to rely on familiar management practices. This tendency was reinforced because the forest owners felt a great deal of uncertainty about the alternative strategies and the reasons why they were necessary. They perceived their current forest management practices as reliable and well understood, and viewed others – in this case planting deciduous trees – as uncertain. In particular, the forest owners stressed four aspects of uncertainty:

1. **Uncertainty regarding the implications of climate change.** Predictions of how future climate change will affect Swedish forests are uncertain. There is a lack of understanding or clear predictions about how the trees will be affected, what the growing conditions for spruce will be, how soil conditions will change and how the quality of the wood will be affected (Felton et al. 2010). Therefore forest owners had difficulty transforming warnings about a changing climate into practical action (Linné 2011, p. 111). The uncertainty about future effects of climate change and its practical implications for forestry made forest owners take the attitude that they cannot easily do anything about it, and that it is not possible to take climate change into account in forestry (Linné 2011, p. 8). In contrast to the uncertainty they expressed regarding the effects of climate change, and not least its implications for forestry, the forest owners were confident about how forestry currently operates and which forest management practices are efficient. Thus, they felt certainty about the current climate and its potential implications for forestry, but were uncertain regarding the particulars of the future climate.

2. **Uncertainty regarding alternative management practices.** As forestry and the forest industry in Sweden have long specialised in the cultivation of conifers (especially spruce) and clear cutting has been the dominant approach, there is a lack of knowledge about alternative tree species and other management methods. Both forest owners and forest consultants lack information on how different species grow, thrive and should be managed (Linné 2011, p. 67). There is also a lack of knowledge about the different types of diseases and pests that can affect alternative tree species. This lack of knowledge is even greater among the forest owners, who are responsible for making replanting decisions, than among the consultants. While theoretical knowledge on particular species is available, there is no experience to draw on regarding whether specific soil and weather conditions are suitable or how well a particular tree species would grow and thrive on the land where it would be planted. Some forest owners, however, performed small-scale tests:

   Yes, we’ll accept more deciduous in the first and second steps, that is, clearing and thinning. We’ll also accept more edges, in our way of thinking, we need to reinforce against the wind more than what we’ve done; for example, we might do a first thinning of a windward spruce edge, but then leave it alone. (forest owner quoted in Linné 2011, p. 59)

   These tests were limited in scope, and were done for the sake of learning, not to change the current management practices. Thus, the forest owners had detailed knowledge of current methods of spruce cultivation, while they had little understanding of how to manage other tree species or had negative experiences of planting tree species other than spruce (not least because of their sensitivity to wildlife grazing and pests). There were few reasons to believe that other tree species would not continue to be problematic in the future. Thus, there was uncertainty about the robustness of alternative tree species, but confidence in the methods of spruce cultivation.

3. **Uncertainty concerning the market for deciduous trees.** The Swedish forestry industry is almost exclusively focused on conifers (especially spruce), and there is a domestic demand for this tree species (not least from the Swedish paper and pulp industry). The demand for other tree species is more limited. Thus, there was considerable uncertainty among forest consultants concerning which alternative species would prove economically viable in the long term and whether there would be demand for these trees in the future. Three forest owners expressed this with the following comments: “You never quite know how much you’ll bring in with deciduous. / ... / Spruce,
you have figures for, so you know exactly how much you’ll make\textsuperscript{2}:

And you also don’t know what sort of trees will be in demand in forty or fifty years. It’s not easy to know\textsuperscript{4}; “Seventy, eighty years, that’s a long time. You don’t know what the market will be saying then, do you?” (quoted in Linné 2011, p. 70, 71 and 73).

(4) Uncertainty regarding the expert advice provided by forest consultants. Surveys and interview studies reveal that most of the private forest owners had frequent contact with forest consultants and trusted them (Blennow 2008; Ingemarsson et al. 2006). However, studies also show that the owners did not follow their recommendations (Blennow 2008, Linné 2011), which also is evident in their replantation strategy. This can be explained by the forest owners’ seeming to trust expert institutions overall while not being prepared to follow particular recommendations (cf. Gustafsson and Lidskog 2012). When the consultants’ recommendations conflicted with the forest owners’ experiences and perspectives, the forest owners seemed to regard the recommendations in relative terms, noting that expert recommendations in forestry change over time. As explained by two forest owners: “Every ten years or so, the Forest Agency changes its recommendations more or less” and “It swings back and forth like you wouldn’t believe. / … / So what’s wrong at one time is right a little later” (quoted in Linné 2011, p. 93, 96). An owner may receive certain recommendations on one occasion and conflicting recommendations on another. Also, the forest owners have found that some of the consultants’ knowledge had the character of textbook learning, and was of limited relevance when facing the practical realities of forestry (Linné 2011, p. 104). Thus, the owners perceive experience-based knowledge to be more relevant than expert-based knowledge.

Discussion

Although the forest owners did not follow the recommendations of the Swedish Forest Agency and the forest consultants, they did not ignore risks altogether. On the contrary, our analysis reveals that they made complex and well-informed risk evaluations but arrived at conclusions contrary to those of the Forest Agency. As observed above, the forest owners had to cope with several types of uncertainty when selecting the type of tree to use to reforest their land. Their starting point was a desire to avoid unnecessary risks. This was expressed in a risk-averse strategy whereby they trusted their own knowledge and experience, that is, the established forest management practices with which they were familiar. At the same time, they faced external pressure (especially from the Forest Agency) to replant with other tree species. As noted above, forest owners were ambivalent about using deciduous trees to replant their land. How did the forest owners justify their decision to use spruce despite this external pressure and their own feelings of ambivalence?

Risk minimisation strategy

The forest owners primarily justified their decisions and minimised their uncertainty through a threefold strategy in which expert knowledge was considered uncertain, practical (experience-based) knowledge took precedence over theoretical knowledge and abstract risks, and collective behaviour served as a crucial mechanism for reducing risk awareness.

First, the forest owners considered expert forestry knowledge to be variable. While they respected and trusted forest consultants (Ingemarsson et al. 2006, p. 22; Svensson et al. 2006, p. 63; Blennow 2008), they were aware that the directives and recommendations of the Forest Agency had changed radically over time, and that expert knowledge often has proven incorrect (Linné 2011, p. 213).

Second, from the forest owners’ perspective, the alternative with which they were familiar and had experience was preferred over the alternatives that they associated with substantial uncertainty. Because they lacked knowledge regarding deciduous trees, spruce was ultimately perceived to be the safest option (Linné 2011, p. 67). Forest owners have experience-based knowledge of growing spruce and selling the timber, and they consider spruce cultivation to be more predictable. Their familiarity with spruce and the management practices related to it caused the forest owners to regard this species as their best option.

Third, in the aftermath of the storm, the forest owners exhibited a great deal of interest in what others were planting (Linné 2011, p. 80; Sellerberg 2011, p. 73). This collective behaviour – with all the owners planting the same tree species – functioned as a risk-reducing strategy; it provided social confirmation that their decisions were reasonable (in contrast to a situation where the forest owners would have made different choices) and meant that should the decision prove to have been a poor one, the individual forest owners would not stand alone (cf. Ojala and Lidskog 2011). This shared risk was thus perceived as a reduced risk. This was likely also reinforced by the social–psychological incentives of belonging to the forestry culture and sharing decisions and practices with others (Sellerberg 2011, p. 74). Interviews with the forest owners show that replantation was extremely important for them as a symbolic action, and that the forest owners were connected to each other in rather strong social network (Linné 2011, p. 142; Sellerberg 2011, p. 73, 96). As one forest owner put it: “Everything changed overnight. The estate will never be the same again ... You have
managed the forest, you have planned for generations and you have felled and planted and cleared, and then suddenly, overnight, everything changes” (quoted in Guldåker 2009, p. 154). It is reasonable to assume that the need to belong is stronger in a crisis situation like this, when a storm has destroyed one’s life’s work.

**Concluding remarks**

(1) An important conclusion is that the decision made by most forest owners, to replant their forestlands in a way that is vulnerable to storms, is understandable and rational, given their beliefs and the circumstances that prevailed in the aftermath of the storm, not least their difficult economic situation. What the Forest Agency and forest researchers regard as risk reduction – spreading the risk by planting different tree species – the forest owners consider a risky endeavour, a large-scale experiment with an uncertain outcome. Thus, when forest owners weighed the risks and rewards, they considered spruce to be a less risky alternative than other tree species.

(2) Another finding is the importance of different types of knowledge. In the shadow of uncertainty regarding future storms and climate change, it seems rational to reduce the impact of uncertainty by diversifying risk. A diversified forest, consisting of diverse tree species, appears to be a more viable option, ensuring that the worst scenario (substantial storm felling) can be avoided. However, this way of thinking conflicts with that of the forest owners, which is based on experience. Their knowledge is situated, practical and to a large extent unarticulated and embodied. It is transferred across generations and is based on a practical logic which in turn is founded on experience of what has proven to work on their forestland (cf. Sellerberg 2011, p. 23). Adopting management methods that depart from what they know is thus considered risky or even reckless. Therefore, the Forest Agency’s very efforts to reduce risk (by diversifying forested areas) were perceived as a form of risk-taking by the forest owners. Were the forest owners to embrace the forest consultants’ perspective that selecting diverse tree species when replanting forested areas is the optimal strategy for reducing risk, they would be forced to abandon their ways of thinking and feeling about their forests. Ultimately, this experience-based knowledge has proven effective over multiple generations, and the forest owners consider it more reliable than the forest consultants’ abstract theoretical knowledge concerning future risks. This also explains why the forest owners’ understanding of climate change had almost no effect on their forestry practices. In addition to the owners’ difficult economic circumstances and their resulting embrace of short-term economic rationality, their lack of practical knowledge about the implications that climate change would have for their forestry practices meant that climate change was not perceived as relevant when selecting tree species. Their embodied and practical knowledge of contemporary (spruce) forestry practices discouraged the consideration of predictions regarding possible and uncertain future developments, not least when these alternatives were associated with a number of well-known problems such as wildlife grazing and pests.

(3) A final conclusion is that these findings have something more general to say about the conditions for changing forest management practices. With the storm felling, the storm Gudrun provided an opportunity to create a forest that is more robust against storms as well as future climate change. Through economic incentives and forestry recommendations, the Forest Agency worked to get forest owners to replant other tree species than spruce. This did not happen and our analysis explains why. This result is also in line with much disaster research. This research has shown that even if a disaster opens up opportunities for behavioural and policy change, there is no straightforward connection between disasters, experience and change (Birkland 2006). Even if a disaster directs attention to an issue and makes it more salient, there is nothing that says it will imply a radical change in patterns of behaviour. On the contrary, habitual behaviour, social norms and established ways of thinking grounded in experience are common responses in a situation perceived as unfamiliar, uncertain and chaotic (Fischer 1998, p. 18). Instead, learning to mitigate disasters mainly occurs incrementally (Birkland 2006, p. 103). The implication of this is that even if a large-scale storm felling provides a major biophysical opportunity to change forest management practices (due to the need to replant trees), it does not provide the best social conditions for changing established forest practices and norms.

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