# Coping with the Long Term

*An Empirical Analysis of Time Perspectives, Time Orientations, and Temporal Uncertainty in Forestry*

**Marjanke A. Hoogstra**

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Marjanke Alberttine Hoogstra

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and Temporal Uncertainty in Forestry

Marjanke Alberttine Hoogstra

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*The Road goes ever on and on*
*Down from the door where it began.*
*Now far ahead the Road has gone,*
*And I must follow it, if I can,*
*Pursuing it with eager feet,*
*Until it joins some larger way*
*Where many paths and errands meet.*
*And whither then? I cannot say.*

Walking song from Tolkien's Lord of the Rings

*- For my grandparents -*

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# Summary

Uncertainty is an unavoidable fact of every decision and forms a problem for all decision-makers. In forestry, the problem of uncertainty is, however, exacerbated by the long time horizons involved. Rotation periods for oak and beech, for example, are up to 150-200 years. And even spruce, which is considered to be a fast-growing tree species, has rotation periods of 40-80 years before it is sufficiently mature for harvesting. No other industrial or land-based process encounters horizons spanning these time frames. Such far-off horizons make it, however, extremely difficult to rely on estimates about future values as a guide to current actions, because the further one projects into the future, the more variables interact and the more uncertainties arise.

The literature presents a peculiar contradiction when discussing the way foresters cope with the uncertain future. One the one hand, the forester is portrayed as a "visionary futurist": someone who can overcome the barriers of the uncertain future, who looks ahead and plans for long-range goals. This is the so-called "doctrine of the long run". On the other hand, foresters are seen as "stuck in the present", with the far-off future considered too far away to guide meaningful action. Surprisingly however, this debate has only scarcely been touched upon in the forestry community. That is not to say that time is not talked about: however, mostly the discussion has been limited to a description of the subject either as a problem or as a peculiarity. Empirical evidence of how foresters cope with the far-off future has been missing. The research described in this thesis fills this gap by exploring the legitimacy of the doctrine of the long run, which is a long-standing hypothesis in forestry, and one of the premises on which the strong professional ethos in forestry culture still relies.

The study takes a different approach than previous research: it takes an actor-oriented perspective and focuses on the question of how foresters actually cope with the uncertain future in their actions. This requires not only a shift in the understanding of time from a physical entity to that of a social realm but – even more importantly – a shift from interpreting uncertainty from some form of independent variable to viewing uncertainty as a cognitive and psychological state – a social construct about the availability and "makeability" of the future.

Although an actor-focused perspective is taken, it is not the individual manager but rather the group of foresters as a whole that is at the very heart of this research. Every collective creates its own culture with its own view of time and uncertainty, which is expressed in the culture's signs, communication, rituals and behaviour. This means that looking at foresters'

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attitudes to time and uncertainty yields insight not only into the way individual foresters per se cope with time and uncertainty, but also of the forestry profession as a whole.

The exploration started by examining the influence of time on action. In general, actions seem to be understood to form within, and operate under, two general structural spheres: time perspective and time orientation. Time perspective refers to the composite cognitive structures that characterize the way an individual projects, collects, accesses, values, and organizes events that reside in the past, present and future. The relevance of the concept is that it is linked to goal setting and to other aspects of motivation. For this research it is important that the further away in time a perceived goal lies, the less it motivates action. Studies have shown that for most people, 20 or 30 years from now is too far away to evoke meaningful concern leading to concrete behaviour. This is in sharp contrast with the much longer-term perspectives that have generally been stated to underlie traditional forest management. The first case study, carried out on Dutch and German foresters, therefore explored the time perspectives of foresters and the limits (if any) to these perspectives. The findings underscore the "short-range" nature of the actual practice of forestry decision-making: the most distant horizon to evoke meaningful action seems to be 15 years.

The second structural sphere relates to time orientations. Time orientation describes the way how individuals focus attention on and react to the psychological concepts of past, present and future. Each individual has their own stable tendency ("bias") of relating to these three time zones. The relevance and utility of the concept of time orientation for this research lies in the fact that although all time zones are important for action, only a clear future-orientation brings an added value to future thinking. Given the view that the forester is a "visionary futurist", one would expect that foresters in general would have a strong bias towards the future. The opposite view, the forester as a "normal human being" who is engaged more in the present, would on the other hand point to a time orientation where the future is not that dominant. In the second case study, which was on Dutch foresters' time orientations – specifically their orientation towards the future – are therefore explored. The findings show that foresters have a strong future orientation, which means that in principle, actions in forestry are not merely a continuation of the past and present, but are also based on the foresters' future expectations (which are, however, as the first case study shows not that far in the future as always expected).

Also researched in addition to the two structural spheres of time that determine action was the importance of the future time as source of uncertainty (which can block action). Although the future is objectively seen as uncertain, this does not mean that foresters also experience the future as very uncertain. As perceptions determine actions, the third case study therefore explored how foresters from the USA and Germanic Central Europe (Germany, Austria and Switzerland) experience uncertainty. The findings show that the most certain time period in forestry is the future. In order to create a feeling of greater control, foresters try to seek certainty and enact a stable world, even when they know that it is not.

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These findings show that the vision of the (Western) forester as a "visionary futurist" is an illusion. The futurity of actions taken is only limited, and foresters do not seem to differ substantially from other social groups. These findings also imply that the traditional rational approaches to action that forestry research in general has followed are unable to explain how foresters cope with uncertainty. Instead, the findings show that the essential processes used when foresters cope with uncertainty can be meaningfully described in terms of sensemaking. Sensemaking comprises all activities and processes with which actors construct meaning and reality of situations. The basic occasion for sensemaking consists of uncertain events; when people are unable to assign definite values to objects or events and/or are unable to extrapolate current actions and foresee their consequences, they resort to sensemaking in which this ignorance is reduced. In the case of the uncertain future in forestry, foresters create a picture of the future that is relatively short-term and certain, and which – though not an accurate picture of reality – is sufficiently plausible and stable for them to base their actions on it.

This does not say anything about the quality of long-range planning in forestry, however. Previous research has been inconclusive on how long-range planning influences the quality of management. If one wished to encourage more future-oriented thinking, one could focus on developing individual sensemaking traits. Often, four principles are distinguished that allow for effective response in rapidly changing, uncertain conditions: (1) improvisation, (2) virtual role systems, (3) wisdom and (4) respectful interaction. Another option is to develop and/or enhance scenario thinking. The latter concept recognizes that the future cannot be known, but it might be understood. Using scenarios, foresters can imagine alternative futures and examine the consequences of possible future changes. They can then consider how to cope with such alternatives.

Though scenario analysis is already being used in forestry, the applications mostly use a quantitative method of constructing and analysing scenarios. What makes scenario analysis such an interesting tool for training foresters to orientate on the future is, however, the more qualitative, "soft" approach of scenario thinking, in which intuition and creative thinking are core elements. To date, this variant has not been deployed much in forestry. Applying it in forestry may require substantial shifts in the cognitive-cultural institutions in forestry, as it requires foresters to understand and internalize scenarios; this can only be achieved when true learning occurs, and that requires the existence of a culture in which learning is institutionalized.

But even if foresters are successful in embracing all skills and techniques to improve their capacity to understand and act on the future, the practice of forestry must still be regarded as one full of surprise. Traditionally, foresters have viewed surprises as unwelcome and dysfunctional. Little consideration has been given to the possibility of surprise being something that provides an opportunity. From a sociological perspective, the challenge of the future is to reduce uncertainty, but from an economic-entrepreneurial perspective the

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challenge of the future is to increase the degrees of freedom by creating an open future. The ability and willingness of foresters to recognize changes, and make use of arising opportunities might even prove to be a necessity for the future survival of forestry.

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# Preface

Every journey eventually comes to an end. And it is with a feeling of bewilderment that I realize that this time has now come for my dissertation. What a great journey it has been. A unique period of my life in which I could gratify my curiosity and urge to dive into what drives human beings (especially foresters) when making a decision. Though it has been extensive and sometimes exhausting, at the same time it has always been fascinating and challenging.

I am grateful this journey was not a lonely one. And I am glad to have this opportunity to thank the many people who, in many different ways, have contributed to the writing and completion of this thesis.

First of all, I would like to thank my supervisor Heiner Schanz for showing me the way into the wonderful world of science, for his never-ending support and encouragement, the insightful comments he gave me at different stages of the research, as well as for challenging and criticizing my ideas and for making me think harder than I thought I could.

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For having accepted to act as members of my doctoral examination board, I warmly thank professor Mohren (Wageningen), professor Oesten (Freiburg), dr. Pregernig (Vienna), and professor Thorsen (Copenhagen). I owe a special debt of gratitude to Professor Oesten. My work has significantly benefited from my stays at the Institute of Forestry Economics (Albert-Ludwigs-University Freiburg), which would not have been possible without Professor Oesten's hospitality. Also his support and help with the different project and scholarship applications was invaluable for carrying out this research.

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I was fortunate to have the opportunity to work on my dissertation in three inspiring groups at two universities – Wageningen and Freiburg. I thank all my colleagues in the Forest and

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Nature Conservation Policy group (Wageningen), the Market and Marketing section of the Institute of Forest and Environmental Policy (Freiburg) and the Institute of Forestry Economics (Freiburg) for their regular expressions of best wishes and inquiries into the progress I was (or was not) making, and for their motivating (real or virtual) chats about all forestry and not-forestry related themes. For all of the above, and for their friendship, I especially want to thank Yurdi and Yvonne.

To all my friends I say thanks for, obviously, their friendship, and for having regularly over the past years taken me out of my scientific ivory tower through visits, having dinner and going to films together, giving me calls or sending me e-mails and cards, and so on. Big thanks especially to Andre, Dicky, Ekko, Evelien, Harmke, Marleen, Peter and Veroniek.

I especially want to thank my *paranymphs* Andre Blum and Evelien Verbij, ex-colleagues but moreover great friends. I am really thankful to Evelien for all her friendship and support (and the regular boosts she gave (and still gives) me "to cross boundaries"), be it work related or private matters. It feels good to finish our PhD's (almost) together after all these years. I am also greatly indebted to Andre, my roommate and "companion in forestry economics" in the FNP group for all these years, for the many motivating discussions we had (about science and education, forestry and economics, but moreover life besides the university), for his continuous support and shared ideas, his confidence in me, and above all, for his friendship.

Last, but not least, I thank my family: my mam and dad, my grandparents, my brother Gerke, my sister-in-law Marloes, and my favourite niece and nephew, Saskia and Tobias, for their love and unconditional support and encouragement.

Wageningen, December 2008

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# 1 Introduction

*"And so it begins"*

King Theoden of Rohan, fictional character from Tolkien's "Lord of the Rings"
Lord of the Rings II – The Two Towers (film edition 2002)

This first chapter sets out the rationale for the research on one of the most significant and distinctive characteristics of forestry, namely that of the extremely long time horizons underlying forestry processes. After introducing the topic of future time and the many uncertainties it brings about, the chapter describes the current debate around the theme, namely how foresters cope with the uncertain future, and the role this study is intended to play in the ongoing scholarly adventures involving time and uncertainty in forestry.

## 1.1 Background

The important role that uncertainty plays in forestry has been widely recognized. DUERR ET AL. (1979: 76), for example, discuss uncertainty as being pervasive throughout forest resource management. A forest manager *"may be expected to experience moderate to extreme uncertainty in reference to some facets of virtually every* [ ] *decision"*[1]. And PRICE (1989: 113) states that in practice most decision-making in forestry occurs under conditions of uncertainty; the situations vary only in the degree of uncertainty. CONVERY (1973: 27-28) even talks about uncertainty as being "endemic" in forestry.

The fact that forestry decision-making involves uncertainty is not special. Uncertainty is intrinsically a fundamental and unavoidable fact of every decision and forms a problem for all decision-makers, irrespective of the type of business they are in[2]. What makes the notion of uncertainty in forestry so special and distinctive are the extremely long time horizons

[1] DUERR ET AL. 1979: 76
[2] ARGOTE 1982; GALBRAITH 1973; LIPSHITZ AND STRAUSS 1997: 149; THOMPSON 1967

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involved[3]. Rotation periods for oak and beech, for example, are up to 150-200 years. And even spruce, which is considered to be a fast-growing tree species, has rotation periods of 40-80 years before being mature for harvesting. As Samuel Johnson observed as far back as 1773 regarding the scarcity of trees in the Scottish highlands[4]:

> *"There is a frightful interval between the seed and timber. He that calculates the growth of trees has the unwelcome remembrance of the shortness of life driven hard upon him. He knows that he is doing what will never benefit himself; and when he rejoices to see the stem rise, is disposed to repine that another shall cut it down".*

No other industrial or land-based process encounters these long time horizons, which can span decades and even generations[5]. As a consequence, foresters have to make choices that involve outcomes that are delayed not only by weeks, months or years, but also by decades and generations[6]. This accounts for the general assertion that a forester should be accustomed to taking the "long view", planning should be orientated on the long range. But the further one projects into the future, the more variables may interact and the more uncertainties arise[7], especially when dealing with complex, nonlinear and stochastic ecosystems functioning within rapidly changing, ambiguous environments. Therefore, the uncertainty attached to any estimates about future values as a guide to current decisions is extremely high[8]. As illustrated by DUERR AND DUERR (1975: 31):

> *"Think what far-off horizons may be in view when one decides to buy a forest or to plant a certain kind of tree or to engage in flood-control measures or to set the annual harvest at a certain level. Such horizons are at best dimly seen, veiled in the manager's uncertainty. His uncertainty stems from the rapidity and unpredictability of the change he foresees, compounded over the length of time in view".*

Considering the challenge foresters face, it is not surprising that the way foresters handle an undertaking that spans several generations[9] has traditionally occupied an important place in forestry. The scientific origins of (long range) forest management planning can be traced back as far as 17th century Central Europe when, as demand for wood increased, concerns

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3 FERNOW 1899; SPEIDEL 1972; ZIVNUSKA 1949

4 cited in CONVERY AND RALSTON 1977: 55

5 KANGAS AND KANGAS 2005: 133; PRICE 1989: 112; ZIVNUSKA 1949: 166

6 FAO 1999: 9

7 ASCHER 1978

8 DUERR AND DUERR 1975: 31; ZIVNUSKA 1961: 557

9 CONVERY 1973: 27

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about the wood supply for future generations came to the fore[10]. At the end of the devastating Thirty Years' War there was rapid population growth, industries using wood as an input (such as mining, glass manufacture and charcoal making) were burgeoning, and huge quantities of wood were floated down to the seaports for shipbuilding[11]. It was from these concerns that the notion of sustained yield forest management evolved, which – simply stated – says that per unit of time (mostly a year) one can only harvest the volume of timber that grows during that period of time. With this biological dictum, as CONVERY (1973: 27) calls it, one of the tenets of faith of the forestry culture emerged[12], solving the uncertainty problem for the foresters, as all they had to do to keep faith with posterity was to obey this principle [13].

As long as change was imperceptible, the sustained yield rule was an adequate instrument for forest planning. However, as the changes seemed to accelerate, especially as a result of the widespread industrialization, forest decision-makers turned to other instruments, methods and techniques. One the one hand, they developed their technical knowledge, especially in disciplines such as silviculture and tree genetics, in an effort to increase forest outputs over shorter planning cycles. On the other hand, over time they adapted to their decision-making needs by developing and modifying instruments, methods and techniques to cope with the uncertain future[14]. Some of these were specifically developed within and for the forestry sector: for example the Normal Forest model (*Normalwaldmodell*)[15] and the Faustmann formula[16]. Other instruments and techniques were taken over from social sciences; they include mathematical optimization models, game theory, and technological forecasting[17].

It is therefore not surprising that future time and the tenets to deal with the uncertain future form an important part of forestry's cultural system[18]. DUERR (1969: 380) even considers uncertainty to be *the* factor that produced the forestry profession and formed its character.

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10 CONVERY 1973: 27; DUERR 1974: 927; MARTELL ET AL. 1998: 3; SPEIDEL 1972: 15
11 DUERR 1974: 927
12 DUERR 1974: 927
13 CONVERY 1973: 27
14 CONVERY 1973: 28
15 HUNDESHAGEN 1826
16 FAUSTMANN 1849
17 CONVERY 1973; JOHNSTON ET AL. 1967
18 DUERR AND DUERR 1975: 33-35

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## 1.2 Defining the research problem

Among forestry professionals the prevailing assumption about the long and uncertain future is therefore that it is indeed of special importance in forestry decision-making, but that it can be handled in a fairly unproblematic way: *"As foresters we are accustomed to taking the 'long view'; we plant trees and designate wilderness areas with a view to servicing generations beyond our own"*[19]. DUERR ET AL. (1979: 181) and GLÜCK (1987: 159) have identified this myth of long-term thinking as a part of the "ideology of conservationism" pointing to the existence of a "doctrine of the long run" in forestry. At the heart of this doctrine, which forms one of the premises on which the strong professional ethos in forestry culture still relies[20], is a faith in the capacity of foresters to overcome the barriers of the uncertain future, and look ahead and plan for long-range goals.

But history is full of examples in which these long time horizons have proven to be a major problem: for example, the massive planting of pine (*Pinus nigra* and *Pinus sylvestris*) in the Netherlands at the beginning of the 20th century. These pines were originally planted for the production of mine props in the Netherlands. Unfortunately, the coal mines were closed before the timber was ready to be harvested. In the closing decades of the 20th century, these pine stands were criticised as non-native monocultures that had to be converted[21]. Another example are the now 100-year-old spruce forests in Germany, which were managed to produce long, thin stems for uses such as telegraph poles. But nowadays there is little demand for telegraph poles and the spruce stands are now composed of too many and too weak trees[22].

Scientists have also questioned the ability of humans to make meaningful predictions about the far future. BONIECKI (1980: 174) and SIMONS ET AL. (2004: 123), for example, state that time frames exceeding a person's life span, let alone that of his children or grandchildren, have to be questioned. They say that for most people, 20 or 30 years from now is too far away to evoke a meaningful concern leading to a concrete behavioural commitment[23]. Other scientists have even argued that the notion of "future" itself is increasingly becoming tenuous *"as it collapses into an extended present, the basis for planning, expectation and the forward movement of the self becomes difficult to sustain"*[24]. In contemporary Western societies change happens so fast that the future is taken into the here and now. It loses its meaning, in the sense that people are unable to think about the long term, much less plan for

[19] CONVERY AND RALSTON 1977: 55
[20] PENTTINEN 2007: 8
[21] RIETBERGEN 2001
[22] HAMPICKE 1996: 56
[23] BONIECKI 1980; SIMONS ET AL. 2004
[24] REITH 2004: 392

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it[25]. Thinking is aimed *"at the extended present, or the immediate future"* and *"plans* [ ] *can be seen as no more than a short-term projection of the present into the immediate future, or, indeed as an orientation to the extended present"*[26].

Similar doubts are reflected in the forestry literature. CONVERY (1973: 28), when describing the volatile future in forestry, sees the forester to be in a country like that described to Alice by the Red Queen in Lewis Carroll's *Through the Looking Glass*: *"Now here, you see, it takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"*. Other authors have observed that due to the range of uncontrollable and unpredictable factors operating in the future, decision-making in forestry largely excludes uncertainty and surprise, even when it is known that a situation is uncertain[27]. For example, both STINSON (1986) and TROMMSDORFF (1994) have highlighted that due to the extremely long time horizons in forestry, decision-makers almost never experience the outcomes of their decisions and consequently tend to think about the future as something that cannot be influenced. Others, like DUERR AND DUERR (1975: 38), have noted that the future is often considered to be a very static one, based on the aim to keep the forest more or less similar over time (as for example in the sustained yield approach), even when growth and environmental changes might call for other approaches. KRAMER (2000) found that that when making decisions in forest management, the far-off future is ignored or considered to only a limited extent. He stated that the factor time does not play the decisive role in the management process of forests that is often portrayed in theory and in praxis[28]. It is therefore not surprising that OLSON (1977: 42) even talks about the long range in forestry as a mirage, the nature of the illusion: *"Arising from a fear of depletion – an expected future without 'planning' – the 'planned' future is a forest beyond the horizon, beyond the dazzling expanse of desert"*.

This presents a peculiar contradiction. One the one hand the forester is portrayed as a "visionary futurist", on the other hand there is the view on the forester as "stuck in the present" (or at least in the near future). Surprisingly, however, this debate has only scarcely been touched upon in the forestry community. That is not to say that time is not talked about; however, the discussion has mostly been limited to a description of time either as a problem or as a peculiarity. There is, however, little empirical evidence of how foresters actually cope with the far-off future and the uncertainty arising from it.

In order to investigate this topic, the research approach taken must be different to that used to date. In common with many other disciplines, particularly economics, the forestry

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25 NILSEN 1999; NOWOTNY 1994 ; REITH 2004

26 NILSEN 1999: 175, 180-181

27 BORCHERS 2005; CLEAVES 1994; LUNDGREN AND THOMPSON 1972

28 KRAMER 2000

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community has considered time to be a logical entity, and the main focus has been restricted to the question of how to include the uncertainty inherent to time in choice-making[29]. But this view has changed. Decision-makers are increasingly being interpreted as individuals who construct reality. In this vision, what counts is not the objective view on the world, but rather the subjective perception[30]: *"If men define situations as real, they are real in their consequences"*[31]. CHILD (1972), for example, found that the perceptions of individuals strongly influence responses to the environment. SNOW AND MILES (1974), in a study of responses to environmental conditions, report that actions taken in responding to the environment are consistent with managerial perception rather than with the objective characteristics of the environment. DUNCAN (1972) emphasizes that organizational response is strongly influenced by the perceptual process, which, in turn, is affected by managerial characteristics such as tolerance of ambiguity. PREGERNIG (2002) found that foresters' readiness to implement actions does not hinge on the facts, but on the subjective problem perception of the decision makers.

Understanding time and uncertainty, and the way to cope with it in forestry therefore means that one has to focus on the way uncertainty actually influences actions and decisions in forestry in an "actor-focused perspective". Instead of focusing on how uncertainty is incorporated in decisions, emphasis has to be put on the question of how foresters actually cope with the uncertainty underlying the long time horizons. This requires not only a shift from understanding time as a physical entity to seeing time as a social realm but also – more importantly – a shift in interpretation of uncertainty from some form of independent variable[32] to that of a cognitive and psychological state[33], a social construct about the availability and "makeability" of the future.

But coping with uncertainty is much more than an individual variable: there is a distinction between the individual as himself and the individual as a representative of his collective. Every collective creates its own culture with its own view on time and uncertainty, which is expressed in the culture's signs, communication, rituals and behaviour. Each culture also has its own "handles" for coping with this time and uncertainty[34]. Forestry can be viewed as a social collective with its own subculture providing ready-made goals, values and predictions, all of which can be used for decision-making[35]. Think of all the norms (e.g. pursuing the

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29 BOLAND 1982; VICKERS 1994; ZAMAGNI AND AGLIARDI 2004

30 PREGERNIG 2002

31 THOMAS AND THOMAS 1928: 572

32 see for example BURNS AND STALKER 1961; LAWRENCE AND LORSCH 1967

33 DUNCAN 1972

34 HOUSE ET AL. 2004; HOFSTEDE 2001; KLUCKHOHN AND STRODTBECK 1961; SCHWARTZ 1994; TROMPENAARS 1993

35 HUMPHREYS AND BERKELEY 1985; PREGERNIG 2004; SCHANZ AND SUDA 2001

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"common welfare" or "public interest"[36]), institutions (e.g. the concept of sustainable forestry) and instruments (e.g. the Normal Forest model (*Normalwaldmodell*) and the Faustmann formula) that have been developed and institutionalized within the forest sector to cope with uncertainty arising from the long time horizons.

This means that looking at foresters' attitudes and coping strategies relating to time and uncertainty allows one to gain insight not only into the way individual foresters cope with the uncertain future, but also into that of the forestry profession as a whole. It will reveal whether the forestry profession does indeed differ from other professions and social groups in its way of looking at and coping with time and uncertainty – that is if professional foresters are indeed the visionary futurists as always portrayed in the literature – or whether this view is an illusion and foresters do not differ from other groups.

## 1.3 Research objective and research question

Given the above, the scientific objective of this research is therefore

> *to empirically explore one of the most important and long-standing hypotheses in forestry, namely the doctrine of the long run, which expresses the forestry profession's faith in the capacity to overcome the barriers of the uncertain future and look ahead and plan for long-term goals.*

To do so, the research will examine

> *how foresters actually cope with the intrinsically uncertain future in their actions regarding forest management.*

## 1.4 Research approach

The design of an appropriate research approach is of utmost importance as it *"determines what we can study as well as the range of possible results and conclusions"*[37]. The central focus of the research project is the question of how forest professionals cope with the intrinsically unknowable, and therefore uncertain, future in their actions regarding forest management. This project thereby aims at deepening our understanding of the role of time in forestry and how professionals cope with the uncertainty resulting from this role. So far, no

[36] GLÜCK 1987
[37] ADLER ET AL. 1989: 61

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theories about time and uncertainty in forest management have been proposed in the literature and as a consequence, it is inevitable that this research necessitates an exploratory approach.

Considering the exploratory nature of the research and the complexity of the context of the issue(s) under investigation, this research began by developing a sound theoretical footing that would generate the research questions to be studied. This theoretical footing is mainly intended to create a rigorous and distinctive overview over the main elements of the research, namely time, uncertainty and action, and the interrelationships between them. It attempts to disclose two features: the boundaries of the environment in which the problems, opportunities or situations of interest are likely to reside, and the salient variables that may be found there and which are relevant to the research[38].

The empirical investigation of the different themes is best achieved by focusing on specific cases that provide context within which a comprehensive overview can be elaborated[39]. Case study research is considered to be particularly useful where *"research and theory are at their early, formative stages"*[40], as is the case here. Case studies, are, according to YIN (2003: 1) also *"the preferred strategy when 'how' and 'why' questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context"*. Clearly, all three of these conditions also apply to this research exploring how forest professionals cope with the intrinsically uncertain future in their actions regarding forest management.

Moreover, the empirical research was not be limited to one case, but combined different cases in order to research complementary aspects of the subject under study, and combine different theoretical conceptions and methodological approaches of the phenomenon researched, in order to give a fuller and completer picture of the phenomenon studied. This collection of evidence from different sources and in different ways is known as "triangulation"[41]. It is important to note that in this research, triangulation does not imply that more valid interpretations can be made, but that it is a strategy to include different theories and methods with their unique angles in addressing the research question. As FIELDING AND FIELDING (1986: 33) stated: *"We should combine theories and methods carefully and purposefully with the intention of adding breadth or depth to our analysis but not for the purpose of pursuing 'objective' truth"*.

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38 BENBASAT ET AL. 1987; WEBB 1992

39 YIN 2003

40 BENBASAT ET AL. 1987: 369

41 JICK 1979; SHIH 1998

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Naturally, the question then is which (complementary) cases form the *"pieces of a complex puzzle"*[42] and shed light on the topic of time and uncertainty in forestry, and were therefore studied in this research. These cases can only be selected, however, when the salient variables of the research topic are clear. As this was not the case in the first stage of the research, but the intention was to find these variables in the theoretical footing, in this thesis the justification for choosing the cases to be researched will be given in the theoretical exploration.

Opting to follow case study approaches still leaves open the question of what kind of case studies to conduct. Case studies can use qualitative evidence, quantitative evidence or a mix of these two[43]. Qualitative research, broadly defined, means *"any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification"*[44]. Where quantitative researchers seek causal determination, prediction, and generalization of findings, qualitative researchers seek instead illumination, understanding, and extrapolation to similar situations. Typically, the gulf between qualitative and quantitative research has been considered in a dualistic tradition occupying opposite ends of the spectrum[45]. But increasingly, as for example THASHAKKORI AND TEDDLIE (1998: 5) and READ AND MARSH (2002: 235) have observed, the trend of combining both methodological approaches is gaining grounds in current research practice: *"the traditional philosophical division between them is increasingly becoming viewed as a false dichotomy"*[46]. The concept of "mixed methods" (or mixed methodology or methodological mixes) embraces elements of both the quantitative and qualitative approaches[47]. By combining the two approaches, one can capitalize on the strengths, and minimize the weaknesses, of each[48]. This means that mixed methods can be highly synergistic.

For the research problem considered here, the case studies used these mixed method approaches. As the formulation of the qualitative data (used for understanding the situation) may benefit from using quantitative representations and formats to improve the analysis of the data, specifically, where the analysis could benefit from quantitative analysis using statistical tests for example, this was used to strengthen the work.

The outcomes of the case studies can be used to answer the question of how foresters cope with the uncertain future in their actions. By so doing, this research provides insight into one

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42 SHIH 1998
43 EISENHARDT 1989: 534-535; YIN 2003
44 STRAUSS AND CORBIN 1990: 17
45 HAMMERSLEY 1992; MOSTYN 1985
46 READ AND MARSH 2002: 235
47 THASHAKKORI AND TEDDLIE 1998: 5
48 DENZIN 1970; HINES 1993; JICK 1979

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of the most important and long-standing supposition in forestry: namely that foresters have the capacity to look ahead and plan for long-term goals, thereby overcoming the barriers of the uncertain future. It explicitly does not attempt to provide a judgment about the way foresters plan, nor does it offer any particular blueprint of how one should plan.

## 1.5 Structure of the thesis

This thesis consists of seven chapters. The first chapter outlines the motivation and reasons for choosing time and uncertainty in forestry as the central theme of this study. It also outlines the main objective and the main research question of the study, as well as the research approach taken.

The theoretical framework necessary for this study is described in chapter 2, which gives an overview of the three main elements of this research: the concepts of time, uncertainty and action, and the interrelationships between them. On the basis of this exploration, the research questions to be studied in this research are formulated and the three cases to be researched described.

Chapters 3 to 5 describe these three case studies, the "empirical part" of the research. In the first case study on time perspectives (chapter 3), the question investigated is what limits (if any) there are to future time. Do foresters indeed consider the far-off future in their actions, or is the future not as far as has always been thought? The second case study on time orientations (chapter 4) discusses the question of to what extent foresters base their actions on the (unknown) future or focus more on (known) experiences from the past and/or the situation in the present. And in chapter 5 in the last case study it is explored what the future of foresters looks like; objectively one would expect a future full of uncertainty, but is this also how foresters perceive the future to be?

These three empirical case studies are followed by chapter 6, which provides a general discussion and presents the lessons learned, highlighting what has been achieved in this study and the contribution of this research to knowledge about time and uncertainty in forestry. Moreover, it discusses new questions which would benefit from being investigated in further research.

Finally, in the last chapter (chapter 7), the central question of this research, i.e. how foresters cope with the uncertain future in their actions, is answered on the basis of what was learned in the preceding chapters.

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# 2 Theoretical framework

*"He who loves practice without theory is like the sailor who boards ship without a rudder and compass and never knows where he may cast"*

Leonardo da Vinci (1452-1519)
Italian draftsman, painter, sculptor, architect and engineer

This chapter describes the theoretical framework of the research, so as to provide the context without which this research could not be meaningful. Against the background of the research objective and research question it maps those concepts of the empirical complexity of the real world that have to date been found to be relevant according to the theoretical and empirical literature, based on the notions and beliefs of the researcher[49], thereby making the focus of the research explicit.

## 2.1 The future time

### 2.1.1 Defining time

Time is a fundamental dimension of human experience and human action. The concept of time is however a notorious source of confusion[50] and has engaged mankind for centuries. *"What is time? It is a secret – lacking in substance and yet almighty"*, said the 1929 German Nobel Prize Winner in Literature, THOMAS MANN (1924), in his novel "The Magic Mountain"[51]. His ideas about time do not differ much from those expressed by AUGUSTINE[52]

[49] CAMP 2001
[50] FRANCK 2000: 111
[51] Der Zauberberg
[52] Aurelius Augustinus, Augustine of Hippo, or Saint Augustine (November 13, 354 – August 28, 430), philosopher and theologian, bishop of the North African city of Hippo, and considered to be one of the church fathers

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(397-398/2005) in his famous autobiography "Confessions", more than fifteen hundred years earlier: *"What then is time? Provided that no one asks me, I know. If I want to explain it to someone who asks, I do not know"*[53].

Nonetheless, numerous scientists have come up with clear-cut definitions[54], mostly from a disciplinary perspective. Time as a physical phenomenon, where time is understood as a unit, comparable to the other fundamental quantities of space (length) and matter (mass). Time in nature's dimension, with concepts like the natural rhythms of our earth and the ageing process of living beings. Human time, with time as a resource that individuals have at their disposal and can allocate to various purposes, even intertemporally[55].

The problem with these one-dimensional terminological definitions of time is that they do not fully express what is meant when the word is used in everyday speech. The somewhat rigorous definitions seem logical from an operational point of view, but ignore the fact that time is a fundamentally trans-disciplinary phenomenon that consists of multiple dimensions and that the focus on any one dimension always implies the other dimensions[56]. On the other hand, the literature shows that the richer a theory's account of what we experience as time, the looser becomes its definitions[57]. It seems that the complexity of the concept simply cannot be expressed in its entirety.

This research therefore does not define time itself, but focuses on a specific field of time, that is the relation between action and time. It does so by realizing that this is only a small part of the whole time dimension and is related to many other aspects of time which fall outside this research, and that the small part explored is in itself also complex and multi-dimensional.

### 2.1.2 Time and action

The way in which human action is constituted and shaped by time has long been of interest to social scientists[58]. As far back as the 18th century, KANT (1781/1965) argued that the time conception of an individual is an innate ability of that individual and colours the way that he or she experiences the world and acts upon this experience. Later existential philosophers and psychologists like HEIDEGGER (1962) and HUSSERL (1964) expounded on his notion of time. They view time as intimately being bound up with the content of human experience in

53 AUGUSTINE 379-378/1949
54 FRANCK 2000: 112
55 ADAM 1990
56 ADAM 1990; FRANCK 2000
57 FRANCK 2000
58 JONES 1994; NUTTIN 1985; WEIK 2004: 301

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that the past and future are reflected in the present[59]. The past preconditions the present and is responsible for its taken-for-granted nature; the future is embedded in the present in terms of expectations, possibilities, and strivings[60].

With the later behaviourist revolution, a more restricted focus on the behavioural consequences of time-based experiences emerged. Behaviourists, like WATSON (1913), for example, questioned the importance of time for action, even tried to stop time (at least the psychological study of it)[61]. But this narrow view was rejected by LEWIN (1951). The latter's integrative view on time and the temporal frames influencing the present more or less followed those of the existential philosophers and psychologists. He contended that, although a behavioural act happens in the present, all the variables that are active at that moment – which include also future and past events present in the frame of the subject – affect and help to explain that action[62]. As FRAISSE (1963: 151) later explained: *"In this ever-changing world our actions at any given moment do not only depend on the situation in which we find ourselves at that instant, but also on everything we have already experienced and on all our future expectations. Every one of our actions takes these into account, sometimes explicitly, always implicitly"*.

LEWIN (1951) incorporated people's conceptions of past, present and future into his concept of "life space", the subjective representation of one's current goals and social setting. After FRANK'S (1939) article about time perspectives, LEWIN (1951: 75) adopted the term "time perspective" and defined it as *"the totality of the individual's views of his psychological future and his psychological past existing at a given time"*. Since then, time perspectives have become the topic of much research[63].

The avalanche of studies on time perspectives created great terminological confusion[64]. In their research, PLATT ET AL. (1971: 108) concluded that researchers *"who attempted to study time perspective have apparently not all investigated the same thing, since no two measures are necessarily comparable"*. The literature review by MCGRAWTH AND KELLY (1986) even identified up to 211 different ways of approaching the concept of time perspectives.

In general, in the literature the cognitive, affective and behavioural temporal schemata seem to be understood to form within, and operate under, two general structural spheres: time (or temporal) perspective and time (or temporal) orientation. Time perspective is seen in most circles as the broader concept of the two, referring to the composite cognitive structures that

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59 HEIDEGGER 1962; SCHUTZ 1967
60 HEIDEGGER 1962; MEAD 1934; SCHUTZ 1967
61 BOYD AND ZIMBARDO 2005: 87
62 LEWIN 1951
63 NUTTIN 1985: 12
64 DEVOLDER 1979; NUTTIN 1985: 12

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characterize the way an individual projects, collects, accesses, values, and organizes events that reside in distinct temporal loci. These temporal loci (past, present and future) are the *"regions of life space"* that underlie this temporal perspective[65]. Time orientation seems to represent a more circumscribed construct and describes an *"individual difference variable that predicts various aspects of an individual's social behaviour and the overall self-schema that may reliably drive and influence behaviour"*[66]. Some scientists however see time orientation as a specific aspect of time perspective[67]. Still others define what is described here as time orientation as time perspective[68], or mix aspects of time perspectives with time orientation[69].

Resolving this definitional quandary is neither critical nor essential for this research. This research will therefore avoid considering it further in great depth, and use the distinction made by LASANE AND O'DONNELL (2005: 24), which views time perspectives as *"the processes utilized in dealing with temporally relevant information"*. Time orientation refers to the *"behavioural by-product of the cognitive processes that results in a distinct pattern of responding to objects, events, and situations that implicate a particular temporal space"*.

### 2.1.3 Time perspectives

Time perspectives refer to the individual's coping with his psychological past, present, and future. Often, within the concept of time perspectives a distinction is made between several aspects of this general concept. LEWIN (1951) made a distinction between the range (or length) of a temporal perspective and the realism of temporal perspective. WALLACE (1956) contributed to the question of time perspectives by introducing two new concepts. Extension was defined by him as length of the life span toward the past and future that becomes a concept. Coherence was defined by him as being the degree of organization of events concerning the past and future life span. Later, JONES (1994) discerned six dimensions: extension, density (the relative concentration of cognitions that reside in a particular time frame), valence (the subjective evaluation (positive or negative) of the various time regions), accessibility (the ease with which an individual can recall and use information from a particular time frame), content (the specific events, feelings, images, experiences, etc. in a specific time region), and structure (the arrangement of the different time frames).

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65 LASANE AND O'DONNELL 2005: 12
66 LASANE AND O'DONNELL 2005: 14
67 for example WALLACE AND RABIN 1960
68 for example LENNINGS 1996
69 for example ZIMBARDO AND BOYD 1999

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The relevance of the concept of future time perspective is that it is linked to goal setting and to other important aspects of motivation, such as perceived instrumentality. Perceived instrumentality is when a person recognizes that the current endeavour supports or is instrumental to achieving a valued future goal[70]. In the context of this research it is important that there exists a negative correlation between the distance in time to a certain goal and the psychological distance to that future goal. In other words, the further away in time a goal is perceived to be, the less it motivates action[71]. And when a person perceives a certain goal to be "very far away", this goal does not even influence his present actions anymore[72]. How far "very far away" is, is not only situationally determined, but depends also on the individual[73]. People with a long time horizon experience the distance to a given goal as psychologically much shorter than people with a short time horizon. For the latter, the same future goal may not even be part of their life space. What is important is that when a goal is set in the very near or in the very far future, this does not affect the psychological distance to this goal. Tomorrow or next weekend is very near for every person, independent of the length of the time horizons of that individual, while time frames exceeding a person's life span, let alone that of his (grand)children, are unthinkable, whatever the extent of one's time horizon[74].

Most research on future time perspectives focuses on the relative differences in individuals and in their perspectives, and the influence these differences have on action[75]. Not many studies have explored the limits to future time perspectives. However, the few studies on the topic imply that time frames exceeding a person's life span, let alone that of his children or grandchildren, have to be questioned: for most people, 20 or 30 years from now is too far away to evoke a meaningful concern leading to a concrete behavioural commitment[76].

If this also holds true for foresters, this would be in sharp contrast with the much longer term perspectives that have always been assumed to underlie traditional forest management[77]. However, no empirical research on these perspectives has been carried out on foresters. This research therefore explored foresters' future time perspectives and investigated the limits (if any) to these. The first research question is therefore:

***Q1: What are the time perspectives of foresters and are there any limits to them?***

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70 GREENE AND DEBACKER 2004: 95; HUSMAN AND LENS 1999: 115

71 BANDURA 1986; GJESME 1975; GJESME 1981; GJESME 1983; MOREAS AND LENS 1991; SIMONS ET AL. 2004

72 BONIECKI 1980: 174; GJESME 1975: 156; GJESME 1981: 129

73 GJESME 1983: 449

74 BONIECKI 1980; SIMONS ET AL. 2004

75 see for example GJESME 1975: 156; GJESME 1981: 129; SIMONS ET AL. 2004; TROMMSDORFF ET AL. 1979; ZALESKI 1987

76 BONIECKI 1980; SIMONS ET AL. 2004

77 DUERR ET AL. 1979: 181; GLÜCK 1987: 159

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### 2.1.4 Time orientation

In contrast to future time perspectives, the future time orientation is viewed as a one-dimensional construct that describes how individuals focus attention on and react to the psychological concepts of past, present and future[78]. Each individual has their own stable tendency (or "bias"[79]) relating to these three time zones. Some individuals focus more on the past or on the present, others more on the future or on any combination of the three time frames. Based on learned preferences that become stabilized in a functional cognitive style, and depending on the situational, structural, and task demands[80], the time orientation is used in encoding, storing, and recalling experienced events, as well as in forming expectations, goals, contingencies, and imaginative scenarios[81], influencing individual choices and actions[82].

The relevance and utility of the concept of time orientation for this research lies in the fact that although all time zones are important for action, only a clear future-orientation brings an added value to future thinking[83]. People with a future orientation are mostly curious about the unknown, open to new and possibly inconsistent information, and have high tolerance of ambiguity. They seek out new ideas and explore previously unknown possibilities[84]. On the other hand, past- and/or present-oriented managers who ignore the future are threatened by the uncertainty of the unknown[85]; they tend to be defensive, including (1) passively awaiting what can occur; (2) withdrawing from risky, open and constructive activities; (3) keeping to routine ways and tested methods of dealing with situations encountered in life and (4) undertaking activities in order to preserve the status quo rather than taking risks to increase present opportunities[86]. These people *"would rather escape from the future and concentrate on past or present matters"*[87] and their future thinking is not an activity "*based on an adequate appreciation of time passage in the long-term future*"[88], but merely an extrapolation of the past and/or the present, possibly including some short-term visualizations they are endowed with[89].

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78 JONES 1994 ; ZIMBARDO AND BOYD 1999
79 BONIWELL AND ZIMBARDO 2004
80 ZIMBARDO AND BOYD 1999; ZIMBARDO ET AL. 1997
81 ZIMBARDO AND BOYD 1999: 1271-1272
82 BONIWELL AND ZIMBARDO 2004
83 DAS 1991: 53
84 SORRENTINO ET AL. 1992: 420; ZALESKI 1996: 167
85 SORRENTINO ET AL. 1992: 420; ZALESKI 1996: 169
86 ZALESKI 1996: 169
87 ZALESKI 1996: 169
88 DAS 1987: 207
89 DAS 1987: 207; HOGG AND TERRY 2000

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In light of the view that the forester is a visionary futurist, one would expect that foresters in general would have a strong bias to the future. The opposite view – the forester as a normal human being who is more engaged in the present – would, on the other hand, point to a time orientation where the future is not that dominant. This research therefore explored foresters' time orientations, and specifically their orientation towards the future. The second research question is therefore:

***Q2: What are the time orientations of foresters and how important is the future in these time orientations relative to the past and the present?***

### 2.1.5 Individual and cultural time

In the first instance, time perspectives and time orientations are individual constructs and differences in experiences, judgments, values, motives, functional responsibilities, and in many other personal factors cause different individuals to have different perspectives and orientations. Factors that are frequently discussed as influencing individuals' time perspectives and orientations include the age of the person, their socio-economic status, gender, education, family model and religion[90].

But time perspectives and time orientations are more than an individual variable; just as each social collective creates its own collective space, it also creates its own social time[91]. Several anthropologists and sociologists have shown that cultures at various phases in their existence, as well as various social classes and organizations within one culture, tend to entertain temporal perspectives and orientations unique to themselves, which serve to shape, organize, and control actions[92]. In other words, depending on the specific demands of their daily life worlds, collectives socially construct characteristic time perspectives and time orientations[93]. Or, as BLUEDORN AND DENHARDT (1988) call it, they construe their own temporal understanding and set their own temporal boundaries which distinguish them from other collectives. This means that each collective, social entity, including the forestry sector, has its own typical symbols, values, rules and orientations referring to time, which are *"codified and entrenched in social consciousness or culture"*[94] and which represent an

90 COTTLE 1967; D'ALESSIO ET AL. 2003; ZIMBARDO AND BOYD 1999

91 BLUEDORN AND DENHARDT 1988; LEWIN 1951; MONGARDINI 1986; SZTOMPKA 1994

92 BLUEDORN 2002; BRISLIN AND KIM 2003; GOLDRICH 1967; HALL 1983; PETTIGREW 1990; TUTTLE 1997

93 KASAKOS 1971: 85

94 SZTOMPKA 1994

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intersubjective and normative force affecting both the behaviours and cognitions of the members[95].

Although this research explores the time perspectives (research question 1) and time orientations (research question 2) of individual foresters, in the end with both questions the focus is not on the individual, but on the perspective on and orientation towards time and future time that are embedded in the forestry profession.

## 2.2 The future time as source of uncertainty

### 2.2.1 The unknowable future

The future is not only a space that sets the frame for actions (in the form of expectations, goals, ambitions and so on); for this research it is also important that the future is a major source of uncertainty. One thing is certain: it is that the future is uncertain. Some scientists even call the future the "great unknown"; it will never be known because it does not yet exist. As VICKERS (1994) observed, *"the time still to come [ ] refuses to betray, even to the most sensitive prescience, a foreknowledge of what it contains. The future cannot be known before its time"*[96]. And O'DRISCOLL AND RIZZO (1985: 2) argue, "*a world in which there is autonomous or creative decision-making is one in which the future is not merely unknown, but unknowable*". It may be guessed, but as so many variables may interact, *"the ability to guess the future is extremely limited"*[97].

In his discussion on temporal uncertainty, WEBER (2000: 210) also focuses on the fact that the future is in principle unknowable and therefore inherently uncertain (see figure 1). He compares the three time zones past, present and future and relate them to knowledge. The past is all that has occurred prior to the present. The present is a precise point of time when events are actually happening. The future is everything beyond the present.

Along this time line knowledge can be divided into three different categories: the known, the unknown and the unknowable. The known is all data and information that we, that is to say humankind, have recorded and that is retrievable. In a diagram, that which is known is represented by a curve. The further in the past, the more data and information has been lost or has become unknown. At present, events are occurring and only part of the information pertaining to them is known. The other part of the information has gone because not enough

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95 SZTOMPKA 1994
96 VICKERS 1994: 2
97 WILDAVSKY 1978: 333

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time has passed for it to be analysed and integrated. The unknowable comprises the information that does not yet exist, that is the future. This in contrast to the unknown, which has the attribute of existing, but is not known or not understood by the decision-maker[98].

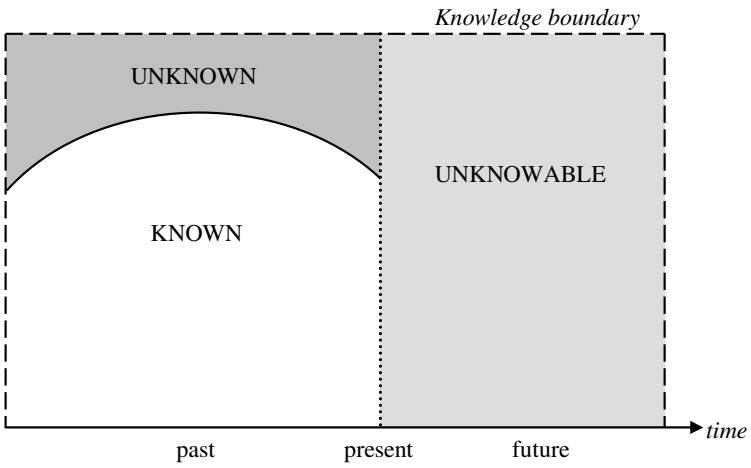


**Figure 1: Temporal uncertainty**[99]

The future is therefore in principle unknowable and uncertain for all decision-makers, irrespective of the type of business they are in[100]. What makes the future in forestry so special is that the further one projects into the future, the higher the levels of uncertainty to be dealt with (see figure 2)[101]. Guessing the future is, according to WEBER (2000: 211), a function of statistical probability, logic, and imagination. The further away an event, the more variables interact, and the more difficult it is to forecast this event[102]. Considering the long time frames underlying forest processes, in forestry, therefore, the uncertainty attached to any estimates about far-off future values as a guide to current decisions is extremely high[103].

98 WEBER 2000: 210
99 adapted from WEBER 2000: 210
100 LIPSHITZ AND STRAUSS 1997; THOMPSON 1967
101 VAN DER HEIJDEN 2004: 97; WEBER 2000: 211; WILDAVSKY 1978: 333
102 WEBER 2000: 211; WILDAVSKY 1978: 333
103 DUERR AND DUERR 1975; ZIVNUSKA 1961

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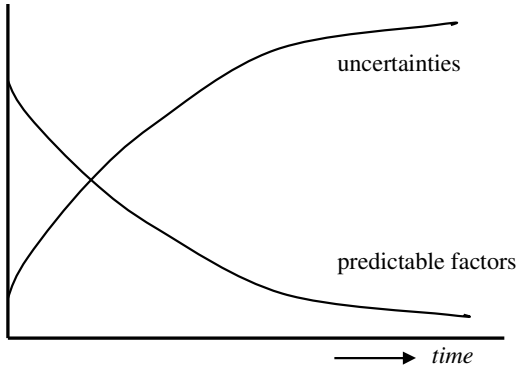


**Figure 2: Uncertainty over time**[104]

### 2.2.2 Uncertainty and action

But even if objective uncertainty is high, uncertainty is only relevant if decision-makers become aware of it[105]. That is, when they realize that there are things they do not know but they feel they need to know for some reason[106]. DEWEY (1929: 38) stated that what makes uncertainties real or relevant for people are the consequences of different possible outcomes that flow from the uncertainties and their implications for action. In this tradition, LIPSHITZ AND STRAUSS (1997: 150) conceptualize uncertainty as *"a sense of doubt that blocks or delays action"*.

Although this is only one of the many definitions of uncertainty available[107], the present study used this conceptualization as it has three essential features that make it extremely suitable for the research. The first feature is that it is conceptualized in terms of action[108]. Although the conceptualization of uncertainty in the sense of its effect on action is not very conventional[109], it is consistent with the work of several scientists, as for example GOLDMAN (1986), YATES AND STONE (1992), and MARCH (1981). It also fits excellently with this research, which focuses on the question how foresters actually cope with the intrinsically uncertain future in their actions.

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[104] adapted from VAN DER HEIJDEN 2004: 98
[105] MILLIKEN 1987: 139; PREGERNIG 2002
[106] ABBOTT 2005: 238
[107] ARGOTE 1982
[108] LIPSHITZ AND STRAUSS 1997: 150
[109] LIPSHITZ AND STRAUSS 1997: 152

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Secondly, such a conceptualization is inclusive[110]. This means that it does not relate to a specific form of doubt (e.g. about possible actions, or the possible consequences of actions). It also means that no distinction is made between uncertainty and risk, but that risk is part of uncertainty. It thereby avoids the longstanding discussion about the difference between the terms risk and uncertainty[111].

The third feature is that this conceptualization highlights the subjective nature of uncertainty. This means that this study departs from the classical notion – which has predominated in uncertainty research in forestry, as in other disciplines – that the perception of uncertainty is factual and conscious. Instead, this research focused on the more unconscious experience of uncertainty of situations, as uncertainty is not something objective, but a cognitive and psychological state, a social construct about the availability and "makeability" of the future[112]. Foresters in similar settings may experience different degrees of uncertainty. If an individual perceives a specific situation as fully known, that person is not uncertain, even if another person might claim that the situation is not fully known. And vice versa: an individual may perceive uncertainty even if others experience the situation as certain. This individual perception of uncertainty in turn determines the way one acts in response. If the objective state of the world is uncertain, but an individual perceives it as not uncertain, this individual will not act upon the (objectively present) uncertainty[113].

The forestry community has comprehensively discussed the problem of the (objective) uncertainty in forestry. In so doing it was automatically assumed that this objective uncertainty also guides the actions in forestry. However, uncertainty as a subjective experience has never been empirically researched. As these perceptions determine foresters' actions, however, this research explored foresters' perceptions of the uncertainty of the future. The third research question is therefore:

***Q3: How (un)certain is the future for foresters?***

### 2.2.3 The social construction of uncertainty

The perception of uncertainty is a personal characteristic[114], depending on factors such as dread, the ability of an individual to control uncertainty, economic status, and associations with fear[115]. Some individuals may have a very high tolerance of uncertainty, so they may

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110 LIPSHITZ AND STRAUSS 1997: 150
111 ARGOTE 1982
112 DUERR ET AL. 1979; DUNCAN 1972; STARBUCK 1976
113 FORSS AND SAMSET 1999: 409; MILLIKEN 1987: 139; PREGERNIG 2002
114 DUERR ET AL. 1979
115 RENN AND ROHRMANN 2000: 219

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perceive situations as less uncertain than others who are less tolerant. However, it is much more than an individual variable. The notion that uncertainty perception is also culturally constructed and shaped by the attitudes and behaviours of individuals within a particular social and cultural environment (such as professions, organizations, or nations), has been shared by several studies in different disciplines (e.g. anthropology, psychology, sociology, philosophy, political studies)[116]. Some social groups distinguish more uncertainty than others, and some groups appear to be better prepared to face uncertainty than others[117]. This means that looking at foresters' experiences of uncertainty allows one to gain insight into the extent to which forestry is perceived as a particularly uncertain enterprise, especially when compared to other enterprises.

## 2.3 Coping with uncertainty

### 2.3.1 Rationality and bounded rationality

The last topic to discuss in this theoretical framework is the question of how people cope with uncertainty about the future in their actions. The starting point is the question of how an individual action comes about. Every action starts with a goal or intention, as action is intended or purposeful behaviour, aiming at ends and goals[118]. An actor must first search for data and information about the possible courses of actions and the consequences of these actions to reach these goals and ends. The data and information form the input for the decision-making process, which generates a decision. The actor must then translate this decision into action. This process is represented in figure 3.

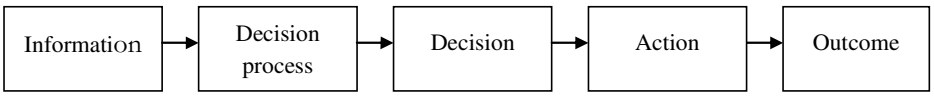


**Figure 3: Action formation**

[116] BONTEMPO ET AL. 1997; SCHNEIDER AND DE MEYER 1991; SCHWARZ & THOMPSON 1990; SLOVIC ET AL. 1991; WEBER AND HSEE 1998
[117] FORSS AND SAMSET 1999: 409
[118] DRETSKE 1991: 5; VON MISES 1966

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The decision-making process in this short description is rather black-boxed. It describes the mechanism which processes and integrates the information to make a decision. Although other perspectives exist, two main views of the decision-making process are dominant: rational decision-making and bounded rational decision-making.

*Rational decision-making*

Sown in classical Greece, rooted in Renaissance Italy, cultivated by philosophers of the Enlightenment, and pruned by the utilitarians, the idea of rational decision-making is a central legacy of Western thought, pervading Western culture at all levels[119]. This model has achieved a paradigmatic status in certain disciplines, especially in economics.

In its basic form, the rational actor model assumes that as it is not possible for individual actors to achieve all of the various things that they want, they should (and do) choose among alternatives in accordance with well-defined preferences. Actors will choose the alternative that optimizes the utility[120]. The intuitive appeal of the approach lies in the fact that it appears to capture what introspection and everyday experience shows are the essential features of human behaviour: its intentional, purposeful, goal-seeking or forward-looking nature and its instrumental adaptedness to the problem-environment in which the actor operates[121]. The model of rational action has, however, not been undisputed[122]. Empirical observations of actual behaviour of actors have shown that actors do not always act in accordance with the prescriptions of the theory[123]. The main focus of critique is not the action-model of "*Homo economicus*" per se, but the underlying assumption of complete knowledge – that actors can, even in complex situations, derive their actions from a clear preference ranking, thereby maximizing their utility[124]. However, the reality is that ignorance and incomplete knowledge colour actors' decision situations[125]. Accurate understanding of the means–ends relationships[126], which is inherent to the nature of decision-making, is simply beyond their capability. The notion of a decision implies the future is not predetermined, different outcomes are possible, and some uncertainty will always be present[127]. In other words, uncertainty impinges on the perfect knowledge as presupposed by

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119 JAEGER 2001: 22

120 CARLING 1992: 27; COLEMAN 1973; HEATH 1976: 3; SAMUELSON AND ZECKHAUSER 1988: 7-8; SCOTT 2000: 128

121 VANBERG 2001: 3

122 BECKERT 2003: 771; JOAS AND BECKERT 2001: 272

123 ELSTER 1986; GREEN AND SHAPIRO 1994; HOLMSTROM AND TIROLE 1987: 126; KANT 2003: 40

124 BECKERT 1996: 818

125 LIPSHITZ AND STRAUSS 1997; THOMPSON 1967

126 TARTER AND HOY 1998: 213; VICKERS 1994: 5

127 ABBOTT 2005; SHACKLE 1969

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the rational actor model; uncertainty makes maximizing an impossible choice[128]. It calls into question the core of rational choice because it negates the possibility to define what the rational choice would be[129]. As ELSTER (1986: 6) has stated: *"Assuming that we are facing a choice under uncertainty, does rational-choice theory tell us anything about what we ought to do? The answer is: very little"*.

This does not mean that the notion of uncertainty of actors has not been discussed. Uncertainty entered economic discourse some time ago, together with the marginalist revolution (1871-1874)[130]. MENGER (1923), and after him the Austrian school of economics, for example, emphasized that uncertainty pervades all actions and is the ubiquitous context in which all choice must be made. Time is seen as the root of this uncertainty: action is directed at an unknown future and this future is inherently unknowable. As VON MISES (1966: 105) put it: "*The uncertainty of the future is already implied in the very notion of action. That man acts and that the future is uncertain are by no means two independent matters. They are only two different modes of establishing one thing"*.

The most important economic publications on the problem of uncertainty are probably those by KNIGHT (1921) and KEYNES (1921). In his book "Risk, Uncertainty, and Profit", KNIGHT (1921) stressed the importance of uncertainty in taking economic actions; uncertainty brings the question of *"deciding what to do and how to do it"* into the foreground of economic analysis and relegates the actual execution of activities to a secondary phenomenon. KNIGHT'S book appeared in the same year that KEYNES published his "Treatise on Probability". Like KNIGHT, KEYNES was concerned with the notion of perfect and imperfect knowledge in orthodox economics.

Although in all three approaches uncertainty is considered to be a limitation to the rational actor model, the reinterpretations of the problem of uncertainty in economics have tended to focus on maintaining the model of the *Homo economicus*[131]. The problem of uncertainty per se is seen as a theoretical complication. The concept of expected utility is well known. The lack of knowledge about the future is turned into (subjective) probability distributions of options, which are used to calibrate the utility of these options to value different alternatives[132]. These assumptions of probability have been invoked as a means of abolishing the future[133].

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[128] BECKERT 1996: 819; TARTER AND HOY 1998: 213

[129] BECKERT 1996: 819

[130] BECKERT 1996: 807

[131] BECKERT 1996: 813; BECKERT 2003: 772; HIRSHLEIFER AND RILEY 1992; VICKERS 1994

[132] see for example ARROW AND DEBREU 1954; VON NEUMANN AND MORGENSTERN 1944; SAVAGE 1954

[133] see for example DAVIDSON 1991; GEORGESCU-ROEGEN 1971; KATZNER 1986; LAWSON 1988

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*Bounded rational decision-making*

An alternative to the hyper-rational decision-making model has been developed by the Carnegie School. Back in the 1950s, SIMON (1956; 1957) introduced the notion of "bounded rationality". This bounded rationality approach recognizes the constraints on the decision processes that arise from the limitations of human beings as problem solvers with limited information-processing capabilities[134]. That is not to imply that in the bounded rational approach the decision makers are simply irrational. However, the approach considers actors to be intentionally rational, but only to a limited extent due to their cognitive limitations.

In practice, each decision-maker attempts to seek rational answers to his problems in the context of the complexity of the situation, his limited knowledge and experience, the costs of gathering more information, etc. SIMON (1990) suggests that agents solve problems by processes such as recognition, by heuristic search, and by pattern recognition and extrapolation. Since humans have only limited brainpower, and only limited time and money, one cannot expect them to solve difficult problems optimally. Clearly, people adopt these "short-cut" approaches as a way of economizing on cognitive faculties. Instead of optimising, as in the classical rational choice model, decision-makers *"satisfice"*[135]. As MARCH AND SIMON (1993: 162) have noted, *"most human decision-making, whether individual or organizational, is concerned with the discovery and selection of satisfactory alternatives"*.

### 2.3.2 The limits to the rational models

Models that proceed from a type of rational action rest on at least four assumptions that are questionable. First, they assume that goals and ends are predefined[136] (the problem of predetermination). Second, they assume the actor is able to act in a purposeful manner (the problem of intentionality). Third, they assume the actor is able to control, dominate, or to instrumentalize his body (the problem of corporeality). And fourth, they assume the autonomy of the individual actor towards his fellow actors and his environment (the problem of sociality)[137]. These four assumptions will be discussed below.

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[134] BEN-AKIVA AND LERMAN 1985: 38
[135] DAVIES AND LAM 2001: 241
[136] SCHWARZ AND THOMPSON 1990: 90
[137] JOAS AND BECKERT 2001: 272-276

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*Predetermination*

The rational models are based on an analytical frame that essentially explains decision-making in terms of goals- or ends-seeking. Intelligent actors have certain goals and make calculations of the consequences of actions for these goals and act sensibly (within their constraints) to achieve those goals[138]. Such approaches reduce action to a single level – the politics of interests – with the pre-existence of goals and ends as its essential premise[139]. BECKERT (2003: 770) therefore describes such approaches to action as "teleological".

SCHWARZ AND THOMPSON (1990: 49) point out that such approaches completely disregard the problem that one cannot handle the conundrum of how actors who act according to their own goals and ends know what these goals and ends are. In the rational approaches, trying to determine what one's goals are depends on prior knowledge of the set of goals which are being pursued. *"In short, to know one's own interest one must know one's own interest."*[140] They therefore argue that any model premised on predetermined interests breaks down as an analytical basis for explaining actions and should therefore be rejected. They suggest that instead on focusing on goal-seeking, one should focus on goal-setting[141].

*Intentionality*

Other scientists also see the goals as a fundamental deficiency in these approaches[142]. LUHMANN (1968), for example, rejects the idea that predetermined goals can provide sufficient explanation for the selection of actions. In his opinion, the complexity of social situations does not allow for the identification of the multiple causes and their interrelations which lead to an outcome. Actors simply cannot fully understand means–ends relationships accurately. DEWEY (1929) also rejects the idea that goals and ends are predetermined and rigid.

However, LUHMAN (1968) and DEWEY (1929) draw completely different consequences from their critiques. According to JOAS AND BECKERT (2001: 273), LUHMANN'S (1968) critique forms an early step toward his radically functionalist systems theory and a reason for abandoning action theory altogether. DEWEY (1929), in contrast, considers goals and ends not as anticipations of future conditions we want to bring into being, but only as something

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138 BECKERT 1996: 806; HASAN AND GOULD 2001: 79; HUDSON 1979: 389; JOAS AND BECKERT 2001: 272; MARCH 1988: 38-39; SCHWARTZ 1986; SCHWARZ AND THOMPSON 1990: 90; THOMPSON ET AL. 1990: 39-41

139 JOY 1967: 32; SCHWARZ AND THOMPSON 1990: 49

140 SCHWARZ AND THOMPSON 1990: 49

141 SCHWARZ AND THOMPSON 1990: 49

142 BECKERT 2003; SCHWARZ AND THOMPSON 1990: 49

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which becomes more specific as a consequence of the decision to use particular means. His focus is therefore on goal setting as a reciprocal activity that is based on pre-reflective aspirations that are operative in the action situation. In his view, the capabilities, habits, and ways of relating to the environment form the background to conscious goal-setting, i.e. to intentionality. Action formation is therefore dependent on the perception of a given situation and to meaning-making in that situation.

*Corporeality*

Increasingly[143], the rational action models have been faulted for their neglect of human corporeality, that is the complex relation of action to the human body and to the actor's ability to control his body for instrumental purposes[144]. The models automatically assume that the actor exercises effective control over his body. An example is the process of falling asleep. Wanting to fall asleep, does not always mean that you do fall asleep. Another example is a situation which is so ambiguous or so emotional and overwhelming that the actor loses control over his actions[145].

In order to incorporate the instrumentalisation of the body, JOAS (1997: 158-163) proposed replacing the means–ends scheme with the concept of situation as the basic category of a theory of action. This means that our perception of the situations already incorporates a judgment on the appropriateness of certain kinds of action; situations are not merely neutral fields of activity for intentions (or ends) which were conceived outside of that situation, but appear to call forth, to provoke certain actions already in our perception. When this is taken as the point of departure, action ceases to resemble a process guided by general norms and values. Instead, the concrete course the action takes has to be determined constructively from situation to situation and is open to continuous revision in a manner that involves (inter alia) the concretization of values[146].

*Sociality*

For many decades, sociologists have criticised the absence of the social conditions for action in the rational models[147]. Actions are, however, embedded in social, cultural, political, and cognitive structurations of the contexts. Sociology focuses especially on how these external variables influence the action process. Action itself is considered to be situated on a

[143] for a review see for example CAMIC 1989
[144] CAMIC 1998: 286
[145] JOAS AND BECKERT 2001: 275
[146] CAMIC 1998: 286-287
[147] BECKERT 2003: 769

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completely different conceptual level; this level refers to the question how to conceive of the structure of action. Actions therefore have to be considered in relation to other actors and to the social group which constitutes the social context of the situation[148].

### 2.3.3 Towards an alternative to rational action

Notwithstanding these critics, many economists appear to be unshaken in their belief that the rational choice model offers the best analytical tool available for explanatory purposes[149]. They argue that even if in real life people do not follow the rational approach, what is of interest is the decision of the decision maker, not the process leading to the decision. So, even if the decision maker does not behave in the manner described by the "rational man" paradigm, it may still be that his decision can be described as if he is following such a procedure. In their view, this is sufficient for the purpose of economics[150]. However, others[151] argue that one should develop an alternative to the rational approaches.

In light of these critiques, below it will be explored what could serve as an alternative explanation for action. This exploration starts with an individual in a situation. Such a starting point joins with JOAS' (1997: 158-163) idea to use the concept of a situation as the basic category of a theory of action. NORTH'S (2005) "knowledge ladder" gives a detailed overview of the process of individual action: in a certain situation; the signs of a certain situation are transformed first into data and then into information that forms the basis for the knowledge of an individual actor again, which in turn is converted into action through the ability of that actor (see figure 4).

Signs (e.g. letters, numbers) are transformed to data through syntax. Data can be considered as objective symbols, that is it provides no judgement or interpretation, and it says nothing about the importance or the relevance of the situation[152]. Information can then be described as interpreted data, which means that information is data which is set in a certain context[153].

DAVENPORT AND PRUSAK (1998) explained the concept of information as follows: *"Unlike data, information has meaning* [ ]. *Data becomes information when its creator adds meaning"*[154]. The information in turn forms the raw input for knowledge. Through the conscious processing of information by the actor, knowledge emerges.

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148 BECKERT 2003; MEAD 1934
149 RUBINSTEIN 1998: 10; VANBERG 2001: 1
150 RUBINSTEIN 1998: 10
151 see for example BECKERT 2003; JOAS AND BECKERT 2001
152 DAVENPORT AND PRUSAK 1998: 2-3; NORTH 2005: 32
153 LUEG 2001; NORTH 2005: 33; SVERLINGER 2000
154 DAVENPORT AND PRUSAK 1998: 3-4

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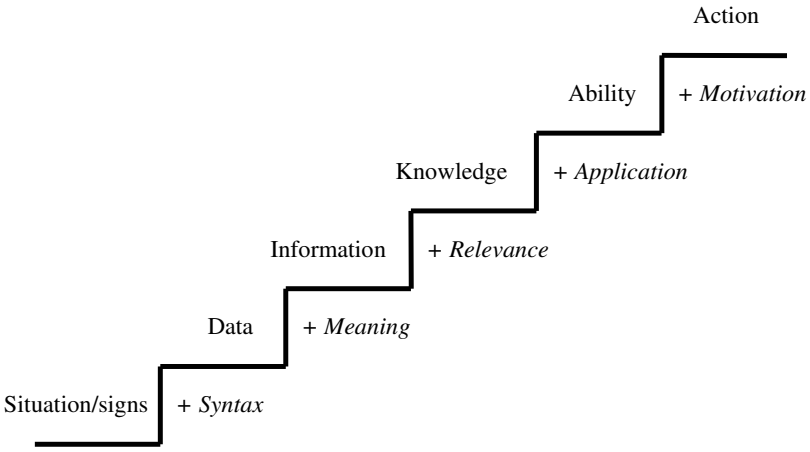


**Figure 4: From situation to action**[155]

Knowledge is in fact information endowed with relevance and purpose[156]. And unlike data and information, knowledge contains judgment: *"values and beliefs are integral to knowledge, determining in large part what the knower sees, absorbs, and concludes from his observations"*[157]. This means that humans do not have to be rational processors of information – they create their own subjective reality rather than try to discover some existing reality[158]. Knowledge in turn is only relevant for action when it is converted into an ability to act. NORTH (2005: 33) describes this as a transformation from a "knowing what" into a "knowing how". But this ability to act will only lead to real action when there is a motivation to act[159].

Although this description of action might suggest that action is solely an individual (intrasubjective) affair, action formation is not limited to an individual facing a non-human environment, but also encompasses others and social arrangements[160]. First of all, the actions of an individual are contingent on what other individuals think and do (whether these others are imagined or physically present). This is called the intersubjective level. Secondly, individual action is guided by the social context the actor is embedded in. This generic level

[155] based on NORTH 2005: 32
[156] NORTH 2005: 33
[157] DAVENPORT AND PRUSAK 1998:12
[158] CHOO 1996: 332-333
[159] NORTH 2005: 34
[160] MEAD 1934; SCHUTZ 1967

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transcends individual interacting humans. It represents abstract social wholes of a superindividual sort (like societies, cultures, civilizations, social systems)[161]. On this level, patterns of social life (structures) are created (willingly or unwillingly, consciously or unconsciously) that have dynamics and an underlying logic of their own. Examples of structures include norms, values, roles, relations, rules, positions, institutions, etc. (either formally codified or "unwritten") that form common interpretive schemes in a particular social system[162].

In his Model of Social Becoming SZTOMPKA (1994: 213) therefore distinguished two levels of social reality: that of the individuals (agents) and that of the structures. He also added a second distinction of social reality, namely the two modes of existence: the mode of potentialities (inherent tendencies, capacities, abilities, powers, etc.) and the mode of actualities (processes, transformations, development, conduct, activities, etc.). In his view, actors (agents) are potentialities (in the form of capacities, abilities, talents, knowledge, etc.) actualizing themselves (mobilizing) in action. Structures can be considered as actualities, which actualize themselves (unfold) in operations[163] (see figure 5).

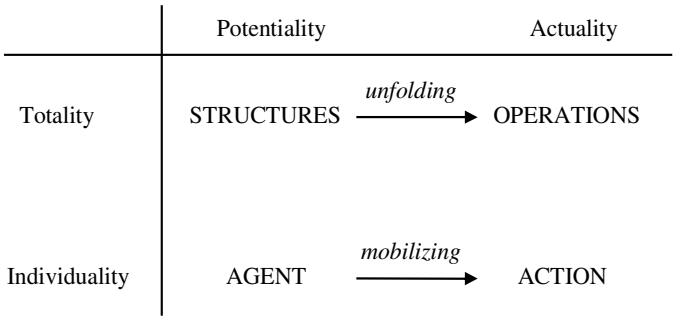


**Figure 5: Levels and modes of reality**[164]

Structure and action are a duality that cannot be conceived of separately. GIDDENS (1982; 1984) calls this the "duality of structure". Structures are created, maintained and changed through actions, while actions are given meaningful form only through the background of the structure. As RILEY (1983: 415) stated: *"They are the medium, because structures provide the rules and resources individuals must draw on to interact meaningfully. They are*

[161] SZTOMPKA 1994; WEICK 1995; WILEY 1988
[162] DURKHEIM 1964; DURKHEIM 1965a, DURKHEIM 1965b; DURKHEIM 1966; GIDDENS 1984; HAYS 1994; SEWELL 2005; SZTOMPKA 1994
[163] SZTOMPKA 1994: 213
[164] after SZTOMPKA 1994: 214

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*its outcome, because rules and resources exist only through being applied and acknowledged in interaction – they have no reality independent of the social practices they constitute"*. Similarly, one could propose a *"duality of agents"*, as a complementary principle to the *"duality of structure"*, describing that the properties of agents are both products of structures and resources for structure building[165].

GIDDENS'S (1982; 1984) duality of structure has been criticised by numerous scholars from both structural and agent perspectives as reducing one perspective to the other or conflating rather than bridging the two[166]. ARCHER (1996) therefore opts for an *"analytical dualism"* in which both structures and agents are described in a mutual interplay, rather than conflating the two as *"tightly constitutive of one another"*[167]. SZTOMPKA (1994: 216), using the insights of both views (that are the duality principles and the analytical dualism), proposes a different conceptualization. In his view, the levels of structure in operation and agent in action should be treated neither as analytically separable nor as mutually reducible. Instead, a third intermediate level has to be postulated, which represents the only true substance of social reality, a specific social fabric. There are no structureless agents, and there are no agentless structures; however, at the same time structures do not merge into agents, and agents are not merged into structures. Structures and agents are fused together in society.

The actual manifestations of the social fabric SZTOMPKA (1994: 217) calls *"praxis"*. Praxis is the combined product of moment of operation (at the level of totalities) and action (at the level of individualities); it is a synthesis of what is going on in a society and what people are doing. The potentiality of the actuality of praxis is called "agency". It is where structure and agent meet and describes the combination of capacities, dispositions, tendencies, etc. inherent in the social fabric (see figure 6). It is conditioned by the resources and facilities provided on the one hand by the structure and on the other hand by the agent's capacities, abilities, talents, knowledge, etc.[168]. This vertically integrates agency and praxis. But praxis is also anchored horizontally. As a potentiality, agency is actualized in praxis, manifested in social events. This link between the two referred to as *"eventuation"*.

The model as shown in figure 6 might give the impression that structures and operations, agency and praxis, and agent and action are linear, monodirectional. There are feedbacks between potentialities and actualities, however (see figure 7). Consider for example the level of individuality; action is not only the actuality of the agent, the agent is also the product of its own activities[169].

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[165] SZTOMPKA 1994: 216

[166] see for example ARCHER 1996; BYRNE 1991; CALLINICOS 1985; HELD AND THOMPSON 1989; JOHNSON 1990; LAYDER 1987; MESTROVIC 1998; THOMPSON 2004; WILLMOTT 1986

[167] ARCHER 1996: XIII

[168] SZTOMPKA 1994: 217

[169] PLAMENATZ 1975: 76

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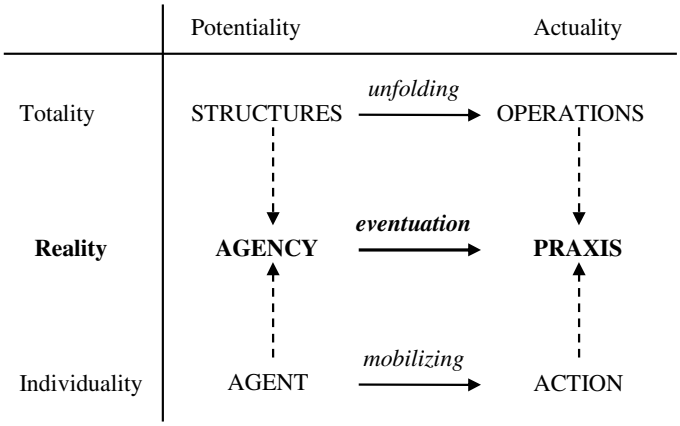


**Figure 6: Agency and praxis**[170]

The same holds for the levels of totality: structures are reshaped by their own operations. SZTOMPKA (1994: 218) refers to these process as *"double morphogenesis"*. He applies the same idea to the mediating, third level of reality.

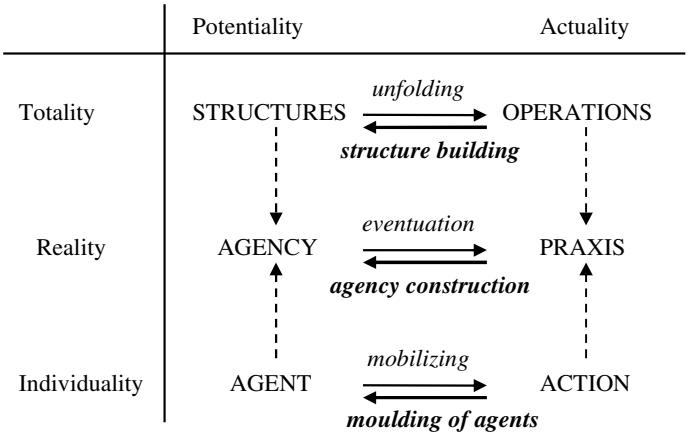


**Figure 7: Double morphogenesis**[171]

[170] after SZTOMPKA 1994: 219
[171] after SZTOMPKA 1994: 219

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Time is an important variable in this model (see figure 8). The praxis at a certain moment of time influences both the structures (modifying or shaping new relations, rules, norms and values, etc.) and the agents (modifying or shaping their capacities, knowledge, talents, etc.) at the later time. As a result of these changes new agencies emerge, which means that the potentialities for praxis change, and that new praxis is manifested due to the actualization of the new agencies. This process goes on perpetually[172].

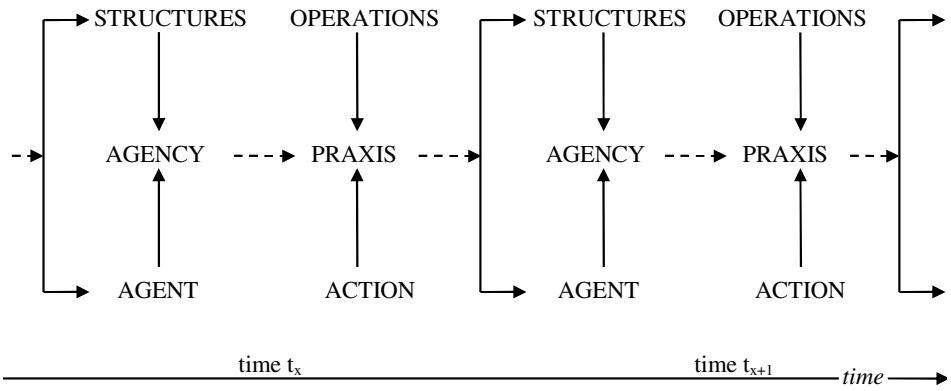


**Figure 8: Time in the Model of Social Becoming**[173]

Despite the recent contributions from the fields of economics, sociology, political science, and management on agents, structures and agency, most studies seem to emphasize either structure or agent, and fail to ignore that action and structure are mutually constituted. An approach that bridges this gap is the sensemaking approach. The following section will show how this concept serves as a useful approach to bridge the gap between structure and action.

### 2.3.4 The concept of sensemaking

In the last 25 years the sensemaking approach has attracted more and more interest as a way of explaining how people think and act in the world, especially when they are confronted with ambiguous and uncertain situations[174]. The sensemaking approach is not a rigid model, form or theory, but is accepted as a term and has been addressed by an array of researchers

[172] SZTOMPKA 1994: 226
[173] SZTOMPKA 1994: 226
[174] WEICK 1995

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concerned with organisational behaviour, organisational development, strategy and strategic processes, management and related areas[175].

Literally, the concept of sensemaking means "the making of sense". Sensemaking refers to those processes of interpretation and assigning meaning, whereby people interpret phenomena and produce intersubjective accounts[176]. It describes those sets of sociocognitive processes by which people *"structure the unknown"*[177] into *"sensible, sensable"* events[178] in their efforts *"to comprehend, understand, explain, attribute, extrapolate, and predict"*[179]. THOMAS ET AL. (1993: 240) describe sensemaking as *"the reciprocal interaction of information seeking, meaning ascription and action"*. And PEREIRA (2002: 40) defines sensemaking as *"the cyclical process of taking action, extracting information from stimuli resulting from that action, and incorporating information and stimuli from that action into the mental frameworks that guide further action"*.

The basic occasion for sensemaking consists of *"incongruous events, events that violate perceptual frameworks"*[180]. It occurs whenever people perceive the current state of the world to be different from the expected state of the world[181], as in situations of uncertainty and ambiguity. This interruption is a signal that announces change and is the herald of new experiences which have to be made sense of and whose complexity must be reduced to an understandable level[182]. Sensemaking is therefore activated by the question *"the same or different?"*[183]. In the case of the situation being perceived as being different, one experiences a situation of discrepancy, breakdown, disconfirmation, opportunity, or interruption[184]. All these events, these "breakdowns, disruptions and disturbances" have in common that they breach continuity, and that it is not clear for the actor what actions should be taken.

The sensemaking recipe for this is to interpret the environment through connected sequences of enactment, selection, and retention[185] (see figure 9). In this recipe the discontinuities are considered to be the raw data that have to be made sense of. An actor tries to construct a plausible sense of what is happening.

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175 NIELSEN 2006: 26
176 WEICK 1995
177 WATERMAN 1990: 41
178 HUBER AND DAFT 1987: 154
179 STARBUCK AND MILLIKEN 1988: 51
180 STARBUCK AND MILLIKEN 1988: 52
181 MISHEL 1988; MISHEL AND BRADEN 1988; WEICK 1995; WEICK ET AL. 2005
182 DU TOIT 2007: 282
183 WEICK ET AL. 2005: 414
184 DUTTON 1993; MANDLER 1984; ORLIKOWSKI AND GASH 1994; PATRIOTTA 2003; WEICK AND SUTCLIFFE 2001
185 WEICK 1979

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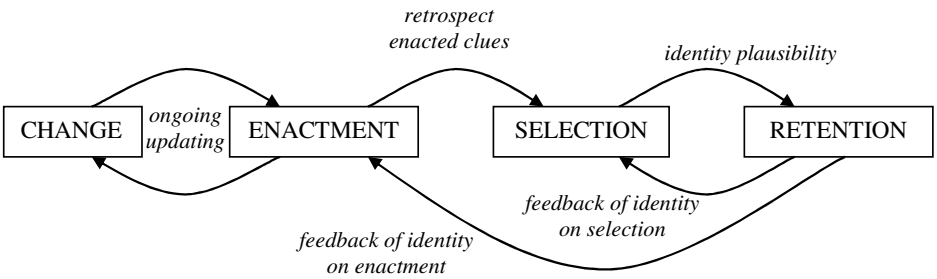


**Figure 9: The sensemaking recipe; enactment, selection, and retention**[186]

In this process of enactment, actors actively construct the environments which they are dealing with by bracketing, rearranging, and labelling portions of the experience, thereby converting raw data from the environment into equivocal data to be interpreted[187]. It is important to note that these activities are only the beginning of the change of the flux of circumstances into the orderliness of situations, as this enactment is only a relatively crude act of categorization and the resulting data can still mean several different things[188].

In the process of selection the number of possible meanings is reduced. Here, a combination of retrospective attention, mental models, and articulation perform a reduction of the material gathered in the enactment stage of the process, and the actor chooses a plausible story from several possible interpretations of current enactments, according to their fit. This means that sensemaking is driven by plausibility – sensemaking is about shaping plausible meaning – rather than any notion of accuracy. It is about pragmatics, coherence, reasonableness, creation, invention, and instrumentality[189]. The story that is selected is a tentative and provisional one, which gains further solidity in the process of retention. It tends to become more substantial in this "retention" stage because it is related to past experience, connected to significant identities, and used as a source of guidance for further action and interpretation.

What is essential in sensemaking is that it is grounded in identity construction[190]. The sensemaking process always starts with an individual who tries to maintain a consistent

[186] adapted from JENNINGS AND GREENWOOD 2003 and WEICK 1979
[187] BONIFACIO AND PONTE 2004
[188] WEICK ET AL. 2005: 414
[189] WEICK 1995: 57
[190] SACKMANN 1991: 31; WEICK 1995: 17

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conception of self[191]. Without a reference point bound in the self-construct, it would be hard to make sense of anything[192]. Identity construction is, as noted by MILLS (2003: 55), even *"at the root of sensemaking and influences how other aspects, or properties of the sensemaking process are understood"*. And BONIFACIO AND PONTE (2004) describe sensemaking as the need *"to re-establish appropriateness between their* [the actors] *identities (preferences) and situations (consequences)"*. Who we think we are (identity) shapes what we enact and how we interpret, which affects what outsiders think we are (image) and how they treat us, which stabilizes or destabilizes our identity[193]. This means that the sensemaking process is a continuous quest of individuals to find out who they are and who the others are by acting and reflecting on their own and others' behaviour[194]. They do that in conversation and interaction, constructing what can be called *"shared understandings"*[195].

This sensemaking is done in a retrospective manner. Regardless of whether a person is fully aware of this time dimension in his search for answers, he makes sense by looking back in order to learn and "unlearn" things for the present and the future[196]. Sensemaking and decision-making occur in an almost simultaneous relationship where sensemaking is followed by decision-making, which is followed by sensemaking, and so on[197] (see figure 10). The direct effects of a decision and the indirect ripples that are caused by the decision are made sense of and precipitate further rounds of sensemaking and decision-making. It is this idea of sensemaking that lead to it being described as a retrospective activity[198].

Interpreting an event after it has occurred means that the meaning attached to the experience of an event is not related to the event itself nor to the objective interpretation of that event, but rather to the kind of attention given to the experience of having lived the action. Furthermore, from the outset, persons tend to assume that something (a cue) sets off an event, an action, a reaction, a response, but the outcome of the action also influences which cue, among many, it attributed to have triggered that event. The meaning attributed to both the event and the triggering cue depends on the situational context. This means that one can say that the ongoing interaction will influence the constructed meaning of what has just happened[199]. As RANSON ET AL. (1980: 4) say succinctly: *"Actors reflexively monitor their experience and thus remake and recreate that experience"*.

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191 WEICK 1995: 18
192 ALBERT ET AL. 2000; HUMPHREYS AND BROWN 2002
193 WEICK ET AL. 2005: 416
194 RASMUSSAN ET AL. 2001: 84; WEICK 1995: 18-24
195 PORAC ET AL. 1989; VAUGHAN 1996; WEICK 1995: 71
196 GIOIA ET AL. 2002: 622; NATHAN 2004; SCHUTZ 1967; WEICK 1995: 17; WRIGHT 2005: 89
197 WEICK 1995
198 GIOIA ET AL. 2002; LOUIS 1980; ORTON 2000; WEICK 1995
199 WEICK 1995

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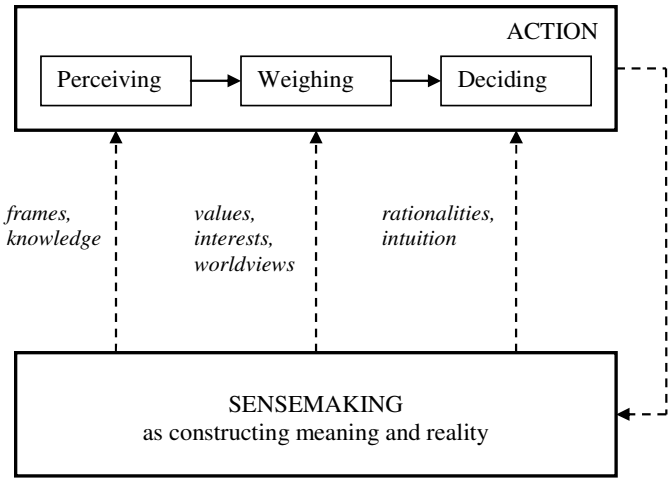


**Figure 10: Sensemaking and decision-making**

Sensemaking is also an ongoing interchange between on the one hand the action of a person and on the other hand the social structures. The process of sensemaking simultaneously draws upon, reproduces and alters the generative structures of action[200] (see also figure 11). In other words, structures are both the input for (or the antecedents to) and the outcome of (or product of) sensemaking[201]. They are the input, as they delimit, prime, edit or trigger possible actions, giving individuals "handles" to cope with new and uncertain situations. And they are the output, as they only exist with the action and the repetitive interactive pattern that people recognize and engage in, based on their interpretation framework[202]. This echoes the thoughts expressed by GIDDENS (1984) and SZTOMPKA (1994).

Sensemaking is therefore enactive of sensible environments; although people adjust to the environment, at the same time they also produce part of that environment through their actions and the interpretations attributed to actions and reactions[203]. This is an ongoing process – there is no start or ending in sensemaking. It is a continuous flow of activities[204]. WEICK (1995: 43) even calls the flows the "constants" of sensemaking, as people are always in the middle of events.

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200 MARSHALL AND ROLLINSON 2004: 76-77; WEICK 1995
201 SMIRCICH AND STUBBART 1985; WEBER AND GLYNN 2006; WEICK ET AL. 2005
202 GIDDENS 1984; RILEY 1983
203 SMIRCICH AND STUBBART 1985; WEICK 1995: 30
204 WEICK 1995: 43

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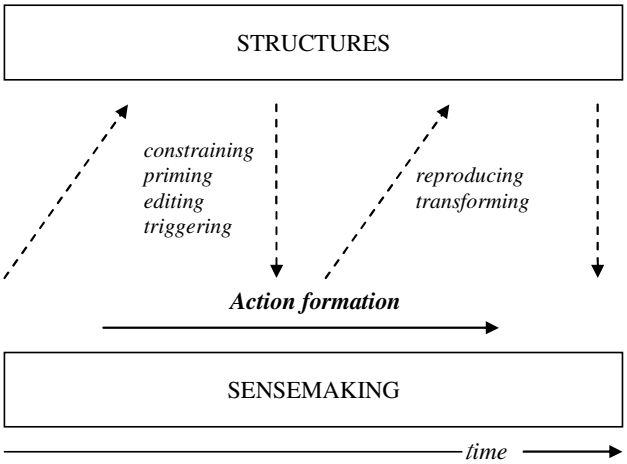


**Figure 11: Structures, action and sensemaking**[205]

This also means that structures should not be seen as static structures that endure unless dislodged by effort, but instead as dynamic equilibria that need to be continuously reaffirmed[206].

In conclusion, one could say that sensemaking involves *"the ongoing retrospective development of plausible images that rationalize what people are doing. Sensemaking unfolds as a sequence in which people concerned with identity in the social context of other actors engage ongoing circumstances from which they extract cues and make plausible sense retrospectively, while enacting more or less order into those ongoing circumstances"*[207]. This immediately reflects the seven characteristics, or properties, of sensemaking, as set out by WEICK (1995); sensemaking is something (1) grounded in identity construction, which is (2) retrospective in nature, (3) enactive of sensible environments, undoubtedly indisputably (4) social and (5) ongoing, (6) focused on and by extracted cues and – most definitely – (7) driven by plausibility – shaping plausible meaning – rather than any notion of accuracy. These characteristics describe what sensemaking is, how it works, what sets it apart from other explanatory processes such as understanding, interpretation, and attribution, and where it can fail[208]. These seven were chosen because

[205] adapted from WEBER AND GLYNN 2006: 1641
[206] WEBER AND GLYNN 2006: 1647
[207] WEICK ET AL. 2005: 409
[208] WEICK 1995: 17

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they are mentioned often in the literature on sensemaking. Each is a self-contained set of questions but is closely linked with the other six; each incorporates action and context which are the key aspects of sensemaking. All seven can be represented as a sequence (although very crudely as the sequence omits feedback loops, simultaneous processing, and the fact that over time, some may drop out). They should be seen as a sort of observer's manual and not as a tacit set of propositions to be refined and tested[209].

### 2.3.5 Sensemaking versus (bounded) rational action

The concept of sensemaking is a model of action that complies with all categories of critiques on the rational approaches as described in section 2.3.2: it explains how goals are set (namely as retrospective constructions instead of predefined inspirations)[210]. It is about constructing meaning and reality, which depends on the conditions of the situation, and which is socially embedded[211]. At the end of this chapter, therefore, two different approaches explaining how actors cope with uncertainty in their actions are left: the (bounded) rational models and the sensemaking approach. Until now, forestry research has, in general, followed the rational economic approach[212]. Forestry has been viewed largely as a technical problem to be solved by gathering data and using rational analyses to choose and implement management strategies[213]. Complete information is assumed to be a reasonable goal, objectives are considered to be clearly and unambiguously (pre)defined, and means can be defined and analysed on the basis of unambiguous cost–benefit calculations[214].

However, doubts about such an approach have increasingly been voiced and critics have started to question the rational approaches used, as they seem not to be justified if one wants to explain how decisions are made in forestry[215]. KANT (2003: 40), for example, writes that *"it is now the turn of forest economists to respond to the new challenges of forest management by extending the boundaries of forest economics beyond neo-classical economics"*. And SCHLÜTER (2007: 1094) states that for taking decisions in such complex settings as in forestry we need mental models, programmes, *"'if, then' connections"*, which allow us to interpret the data in order to make a choice. Only if we understand the particular

[209] WEICK 1995: 18
[210] BOUGON ET AL. 1977: 620
[211] WEICK 1995
[212] KANT 2003: 40; SCHLÜTER 2007
[213] SMITH 1997: 419
[214] SHANNON 1999: 140
[215] KANT 2003; SCHLÜTER 2007

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models lying behind a certain action will we be able to understand why a particular action was taken. The bounded rational approaches cannot fulfil these demands[216].

In view of the above, with its fourth and last research question, this research explored whether the sensemaking approach would offer an alternative to the bounded rational models as used in forestry so far, by researching the way how foresters cope with uncertainty arising from the long time horizons underlying forestry processes:

***Q4: Does the sensemaking approach offer an alternative model toaction the (bounded) rational approaches explaining how foresters cope withtemporal uncertainty in their actions?***

## 2.4 Recapitulation

The focus of the research project is the question of how forest professionals cope with the intrinsically unknowable, and therefore uncertain, future in their actions regarding forest management. This chapter first of all developed a theoretical footing, which gives a rigorous and distinctive overview of the main elements of the research, namely time, uncertainty and action, and their interrelationships. The overview revealed the boundaries of the environment in which the problems, opportunities or situations of interest reside, as well as the salient variables that are found there and which are relevant to the research.

Due to the exploratory nature of the research and the complexity of the context of the issue(s) under investigation, the objective of the theoretical footing was also to give direction to the research by generating the research questions for this study:

*Q1: What are the time perspectives of foresters and are there any limits to them?*

*Q2: What are the time orientations of foresters and how important is the future in these time orientations relative to the past and the present?*

*Q3: How (un)certain is the future for foresters?*

*Q4: Does the sensemaking approach offer an alternative model of action to the (bounded) rational approaches explaining how foresters cope with temporal uncertainty in their actions?*

It was also intended that the theoretical footing would provide an answer to the question of which (complementary) cases should be selected (and studied) in this research in order to

[216] SCHLÜTER 2007

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shed light on the topic of time and uncertainty in forestry. Emanating from the research questions, the following cases were chosen:

1. a case study on time perspectives
2. a case study on time orientations
3. a case study on perceptions of uncertainty

The relationships between the three cases and the first three research questions are clear, as each case study will provide an answer to the corresponding research question. The totality of the three cases will answer the fourth research question, as the three cases study complementary aspects of the way foresters cope with time and uncertainty in their actions and, when combined, give a fuller and completer picture of the research topic.

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# 3 Time perspectives[217]

*"Ihr seid groß, ihr wirket unbekannt, unbelohnt, frei von des Egoismus Tyrannei, und euren stillen Fleißes Früchte reifen der späten Nachwelt noch"*

Friedrich von Schiller (1759-1805)
German poet, dramatist, philosopher and historian

An important tenet in forestry is that foresters look ahead and plan for long-range goals. As shown in the previous chapter, however, research has demonstrated that time frames exceeding a person's lifespan (or even longer) are too far away for most individuals to evoke meaningful concern that leads to a concrete behavioural commitment. To see if this also applies to foresters, this first empirical chapter explores the individual time perspectives of forest managers and the limits (if any) to these perspectives.

## 3.1 Methodology

### 3.1.1 Research approach

Using a case-study approach, forest managers – those persons responsible for the day-to-day management of forests – from two different countries, namely Germany and the Netherlands, were questioned about their future time perspectives. The reason for choosing different countries was that several researchers have reported differences in time perspectives among countries, although the pattern and domains remained unclear[218]. SHANNON (1975), for example, found that Anglo-Americans had more extended futures than

[217] This chapter is based on HOOGSTRA AND SCHANZ 2008a
[218] POOLE AND COONEY 1987: 131

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native Americans and Mexican-Americans. And HOFSTEDE'S (2001) research revealed that countries such as China, Taiwan, Japan and India are more oriented on the long term, while countries such as Great Britain, Canada, the Philippines, Germany and Australia are characterized by a short-term perspective.

Germany and the Netherlands were selected because in both countries foresters still form a discernible social collective within society based on their specific traditions and common objectives. However, they are contrasting cultures in regard to their forestry culture and forestry planning tradition. Germany is a classical forestry country, with a great long-standing forestry tradition and culture. It is even the cradle of traditional forest management planning, with origins that can be traced back to the 18th and 19th centuries[219]. The Netherlands on the other hand, is a small forest country, lacking a strong forestry culture. Some even characterize it as a country without forest management planning; this is inaccurate, however, as the state forests have a long history of planning. Still, one cannot speak of a strong tradition in forest management planning in the Netherlands. Germany and the Netherlands are therefore excellent examples of two "polar types" in forest planning and form excellent case studies for research into planning practices.

In any cross-cultural study, comparability of samples is both crucial and problematic[220]. To minimize the influence of other factors (for example topography, types of forests, forest functions), this research focused on a single federal state in Germany: North Rhine – Westphalia (NRW), which is in western Germany, bordering the Netherlands. North Rhine – Westphalia and the Netherlands are similar in size and both have a high population density in an industrialized area, with relatively little forest cover. These similarities make it easier to identify differences in cultural background. The sampling frame used in this study further aimed at comparability along the dimensions of "organizations", i.e. forest managers working in comparable organizations, and the "function" of the managers within these organizations.

### 3.1.2 Data collection

*Sample*

An overview of the sample characteristics is given in table 1. The German sample comprised forest managers of the State Forest Service North Rhine – Westphalia (*Landesbetrieb Forst und Holz NRW*). The State Forest Service NRW consists of local forest districts (*Forstamt*), which are subdivided into forest management areas (*Försterei* or *Forstbetriebsbezirk*). The

[219] CONVERY 1973: 27; MARTELL ET AL. 1998: 3; SPEIDEL 1972: 15
[220] POOLE AND COONEY 1987: 133

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forests in such an area are either state owned, privately and/or community owned, or a mix of these. Unfortunately, the after-effects of storm "Kyrill" of 18 January 2007 in combination with a reorganization of the State forest Service meant it was not possible to contact all 358 forest managers. Instead, the Forest Service of North Rhine – Westphalia provided a list of 105 forest managers to be interviewed. In total, 92 were interviewed, 2 declined to participate and 11 could not be reached within the time frame of the study.

**Table 1: Characteristics of the sample of forest managers**

| | Total (N = 143) | Germany (n = 92) | Netherlands (n = 51) |
|---|---|---|---|
| *Age (years)* | | | |
| Mean | 48.54 | 48.63 | 48.86 |
| Minimum | 26 | 27 | 26 |
| Maximum | 64 | 64 | 63 |
| SD | 8.054 | 7.779 | 8.598 |
| *Gender* | 134 male (94 %)<br>9 female (6 %) | 85 male (92 %)<br>7 female (8 %) | 49 male (96 %)<br>2 female (4 %) |
| *Size of area (ha)* | | | |
| Mean | 2410.76 | 2023.14 | 3110.00 |
| Minimum | 450 | 574 | 450 |
| Maximum | 9000 | 4000 | 9000 |
| SD | 1208.77 | 693.99 | 1580.45 |
| *Experience as manager (years)* | | | |
| Mean | 25.39 | 25.45 | 25.29 |
| Minimum | 3 | 6 | 3 |
| Maximum | 49 | 47 | 49 |
| SD | 10.01 | 9.66 | 10.71 |
| *Educational - background* | 141 forest/nature (99 %)<br>2 other (1 %) | 92 forestry (100 %) | 49 forest/nature (96 %)<br>2 other (4 %) |
| *- level* | 99 college (70 %)<br>42 (adv) second. (29 %)<br>2 unknown (1 %) | 92 college (100%) | 7 college (14 %)<br>42 (adv) second.(82 %)<br>2 unknown (4 %) |

The Dutch sample comprised forest and nature managers of the National Forest Service (*Staatsbosbeheer*). The National Forest Service consists of 4 regions, subdivided into districts which in turn make up a total of 86 management units (*beheereenheid*). The

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management units of the Dutch National Forest Service consist of forest and/or nature areas, and are mostly state-owned. A list of 79 forest and nature managers to be interviewed was provided by the National Forest Service. In total, 51 managers were interviewed; 5 managers declined to participate, 6 managers did not deal with forest and nature management and were therefore not relevant for the study, 4 managers changed jobs during the project and 13 could not be reached within the time frame of the study.

The two forestry organizations have comparable planning systems: almost all (94%) the management areas have at least one plan[221], sometimes for five years, but mostly for ten years. In some special cases (for example, in areas in National Parks) longer management plans are available. The number of plans developed for a certain management area depends on the ownership situation of the area (Germany) or on the types of nature in the area (Netherlands). The management plans set the objectives for the area and give related guidelines; in some cases, even management actions for the specific time period are described. The longer-term plans are combined with short-term activity plans and describe the activities planned for one year.

The fact that these organizations have fixed predilections about future time dimensions does not imply that all their staff are also predisposed toward these set time dimensions. On the contrary, the studies by DAS (1987; 1991) and BROWN AND HERRING (1998) clearly show that there can be significant differences ("freedom of interpretation") between the time perspectives of an organization and the individual time perspectives of the actors in that organization. When studying the time perspectives of foresters within these two organizations, one should therefore keep an open mind about the individual time perspectives.

*Method of measurement*

Any empirical determination of (future) time perspectives faces the difficulty that it can only interpreted in light of cognitive processes and reconstructed out of communication. The direct, objective measurement of such perspectives, however, is impossible, and future time perspectives can only be assessed and compared indirectly through auxiliary constructs. One such construct is the Life Space Sample (LSS) technique of GRAVES (1962; 1967; 1974) and JESSOR ET AL. (1968), who were for their part inspired by the Future Time Perspective Inventory of WALLACE (1956). The LSS technique entails asking participants to look ahead and generate a list of a number of events (usually ten) they plan to engage in or expect to

[221] In Germany, some privately owned areas do not have management plans for several reasons: ownership is too fragmented, or the owners do not want to have such a plan and/or a plan is too costly. The objectives for these areas are set by the forest managers themselves, or by the district office, or in the form of agreements with the forest owners.

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occur in the future. The participants are then asked to estimate how long from now each future event will probably take place. These data can be scored in a variety of ways, but what has proved simplest and empirically most satisfactory is to calculate the median time from the present until the time at which these events are expected to occur. This score then becomes a summary of the "extension" of the entire sample of events[222]. The underlying assumption is that the sample of events mentioned reflects the degree to which an individual thinks about and is concerned with future consequences. It gives an indication of the critical period of time in which a person is willing to take action to achieve a certain goal[223]. This method has proven to be a valid measure of time perspectives[224], and has - since its development in the 1960s and 1970s - been used in different areas of research such as substance (mis)use[225], career perspectives[226], and crime and delinquency[227]. The criticism of this approach – that the LSS technique assumes that an individual has only one future time perspective that functions for every area in their life[228] – can be avoided by focusing on only one of the six areas in which a certain time perspective may be maintained, namely family, personal development, work field, economics, environment, and politics[229]. In the context of the present research, this means focusing on the work field of forest managers.

It nevertheless remained important from the viewpoint of triangulation to complement the Life Space Sample technique with other constructs. For this, a more open approach as used by BONIECKI (1980) was chosen, which entailed asking (1) whether, and (if so) in what terms forest managers have thought of what their forests will be like in 20 or 30 years' time and (2) whether forest managers have a specific wish, goal, ambition for the future of their forests that is very important to them, and when in the future they think this will be achieved.

*Method of data collection*

Data were collected through two identical, specially devised telephone questionnaires (one in German, one in Dutch), administered by two native speakers. The key part of the questionnaires concerned the individual time horizons. Following the LSS approach, the managers were asked to look ahead and generate a list of 10 events they plan to do with the

[222] GRAVES 1974: 70
[223] JESSOR ET AL. 1968: 308
[224] GRAVES 1962; GRAVES 1967; GRAVES 1974 ; JESSOR ET AL. 1968
[225] MURPHY AND DEWOLFE 1985
[226] MARKO AND SAVICKAS 1998
[227] SCHEURER AND RICHTER 2005
[228] KASAKOS 1971: 28
[229] LAMM ET AL. 1976

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area they are managing. The managers were then asked to estimate how long from now each future event would probably happen. The specific wording of the questions ran as follows:

> *Please think about the future of your forest (and/or nature) area. Please list ten important management actions that you plan to carry out or would like to carry out in the future. Can you give an estimation how far into the future each action could or should occur?*

Additional to the LSS task, following BONIECKI'S (1980) approach, the forest managers were asked the following questions:

1. *have you thought of what your forest will be like in 20 or 30 years time and if so, in what terms? and*
2. *do you have a specific wish, goal, ambition for the future of your forest (and/or nature) are that means a lot to you and if so, what time from now do you think this could be achieved?*.

The questionnaires furthermore contained questions to elicit background information on the forest managers (such as gender, age, years of experience, and educational background) and the (in)formal planning practices in the respective management areas (such as the use of management plans, and deviations from management plans).

The questionnaires were pre-tested before being administered. This led to several minor modifications being made with regard to the formulation and order of the questions. To ensure response uniformity (i.e. minimize variance due to differences in data collection), standardized data collection procedures were carried out in the two countries[230].

### 3.1.3 Data analysis

The data were analysed with the SPSS statistical software package. The tests used to measure the association or dependency between two variables were either the Cramer's V test (for categorical data) or the Pearson's correlation test (for continuous data). Both tests indicate whether or not two variables are correlated and how strongly they are correlated. If the significance level of the tests is small enough (the conventional approach was followed in this study, i.e. the *p*-value must be less than 0.05), the assumption that the two variables are in some way related is accepted. The strength of association is then determined by the value of Cramer's V (which ranges from 0 to 1: the higher the number the stronger the correlation between two variables) or the r (which can take on values from -1.0 to 1.0, where

[230] SEKARAN 1983: 62

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-1.0 is a perfect negative (inverse) correlation, 0.0 is no correlation, and 1.0 is a perfect positive correlation).

To measure possible different relationships between different continuous variables, the independent t-test was used to ascertain whether the means of the samples were different or not. The null hypothesis is that the means of the groups are the same. If the significance level of the test is small enough (again less than 0.05), then the null hypothesis is rejected and the sets of numbers can be considered to be different.

## 3.2 Results

### 3.2.1 Forest management planning

Forest management plans set out the goals and the approaches used to accomplish those goals in a given period of time; for the two organizations in this case study, the period is usually ten years. However, often priority appears to be given to shorter-term considerations.

An example of this is the use of the management plans by the forest managers. Although the majority (55%) of the forest managers indicated that they use the plan regularly or even as the basis for everything they do, a large group (45%), particularly the German foresters (51%, compared with 34% Dutch foresters) reported that they made only limited use of the plan. Two different types of reasons were given for using the plans only marginally or not at all. The first is a cognitive one, i.e. the forester knows what to do: *"it is all in my head, I know what we have to do"* (male, Dutch, age group 40-54 years, forest and nature area). The second – and for this research more interesting – reason is a dynamic one. Foresters indicated that the plans are only of limited use as the day-to-day management is not always determined by the management plans, but by short-term considerations: *"there are so many unexpected events, that one cannot take the course that was planned"* (male, German, age group 40-54 years, private/community forest) or *"in practice, the management is based on the market situation and the allocation of means"* (male, German, age group 55-65 years, state and private/community forest).

The influence of the short term on planning is also reflected in the forest managers' perceptions of how often they have to depart from their planning (see table 2). Only 4% of the managers stated that they never or very rarely have to depart from what was planned, while more than 40% reported deviating regularly to frequently. Interestingly, significant differences exist between the Dutch and the German managers: the German foresters appear to depart from the plans much more often than the Dutch foresters (Cramer's $V = 0.216$, $p < 0.05$).

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**Table 2: Forest managers' experiences of departures from forest management plans**

| | Total (N = 143) | Germany (n = 92) | Netherlands (n = 51) |
|---|---|---|---|
| often, regularly | 62 (43.4%) | 46 (50.0%) | 16 (31.4%) |
| occasionally | 75 (52.4%) | 41 (44.6%) | 34 (66.6%) |
| seldom, never | 6 (4.2%) | 5 (5.4%) | 1 (2.0%) |

It is therefore not surprising that when asked whether the perceived uncertainty in forest management is high, especially when compared to other sectors, most German managers (62%) agreed. The Dutch managers had a different opinion (Cramer's $V = 0.276$, $p < 0.01$); more than 65% saw forest management as being no more uncertain than other business sectors, or not uncertain at all. This difference in subjective experience between German and Dutch foresters might be explained by the fact that the Germans objectively encounter more change. It is also possible, however, that there is a cultural difference in perception; research has shown that compared with the Dutch, Germans feel more uncomfortable in unstructured situations, rely more on rules, laws and regulations and more actively seek to avoid uncertainty[231].

There are differences between the foresters in the two countries not only in terms of their experience of change, but also in the root causes of these departures (see figure 12). In both countries the natural environment is the main source triggering departures; most of the departures mentioned were responses to the weather (drought, storms, frost). However, there were differences (sometimes large) between the two countries for all the other sources. For Germany, the economic environment – in particular, the timber market – was important. Only a few Dutch managers mentioned this as a trigger for departure; this might be because timber production plays a subordinate role in the Dutch National Forest Service. Dutch forest managers frequently mentioned the financial situation within the organization, i.e. the budget available for management. They usually mentioned the lack of money, but some also mentioned an unexpected surplus of money for certain projects and issues. These two factors clearly show the difference in the financial motivation of the two organizations: the State Forest Service of NRW as a business that has to generate its income primarily through the sale of timber, and the Dutch National Forest Service as a producer of goods and services mainly on the basis of a certain budget (provided by the Ministry of Agriculture, Nature Management and Food Quality).

[231] HOFSTEDE 2001

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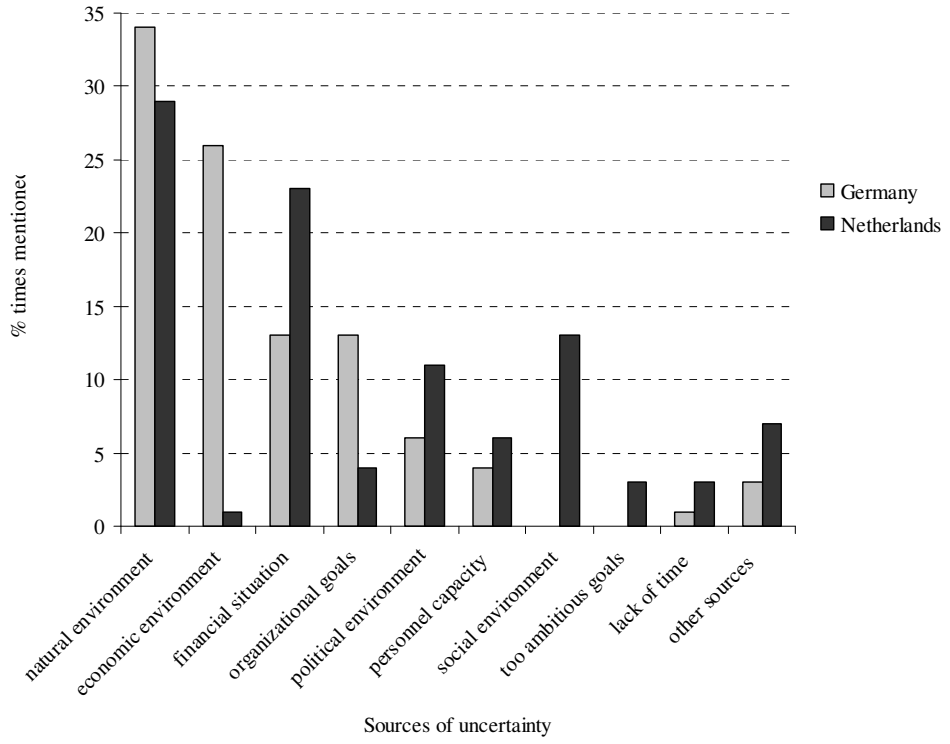


**Figure 12: Sources of triggers for departures in planning**

The specific relationship between the Dutch Ministry and the Dutch Forest Service might also account for the higher score of the political environment for the Dutch. Also of particular note is the high Dutch score for the social environment; by contrast, none of the German foresters mentioned this aspect. Especially the (lack of) public support for certain forest management actions is regularly mentioned as a reason to deviate from what is planned. This confirms one of the characteristics of the Netherlands, namely the high level of societal organization, which is also found in forestry. This societal organization is reflected in the (formal and informal) involvement of a large number of various groups of stakeholders in forest management, which allows society to exert influence on forest management decision-making[232].

[232] SCHANZ AND OTTITSCH 2004

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Considering all the departures a forester faces, it is not surprising that about 50% of the foresters prefer a one-year period of management planning. One of the German foresters (male, age group 40-54 years, private/community forest area) noted *"one year is sensible, as changes happen so often"* and a Dutch forester (male, age group 25-39 years, forest and nature area) said "*there are so many uncertainties, and the financing is also per year*". Nevertheless, 35% of the forest managers prefer to make plans covering a period more than one year. Several managers indicated that forest management "*is about the long-term; timber does not grow faster*" (female, Dutch, age group 40-54 years, forest and nature area) and these longer-term demands require action to be planned for a period longer than one year.

The remaining forest managers favoured a combination of the two, as the combination of the short- and the long-term are considered to be both sensible and useful. The two exceptions indicated that forest management actions should be reactive, i.e. based on what is happening at that moment: *"only goals should be formulated, not forest management measures"* (German male, age group 55-65 years, state/private/community forest).

The results so far show that long-range planning in forest management is not so easy: the daily reality of unplanned events forces forest managers to regularly depart from their plans. However, the findings do not say anything about the futurity of the actions taken. To investigate to what extent forest management is still oriented on the (far) future and to explore the limits (if any) of this future, the managers' future time perspectives were examined.

### 3.2.2 Future time perspectives

The future for an individual exists only to the extent that that individual is capable of forming an image of it. Conversely, a lack of interest in or involvement with the future is often interpreted as the lack of such an image[233]. The forest managers were asked about their images of their forest or nature area in the future, and the time frame of these images. In contrast to the time perspectives of 10 to 15 years, which BONIECKI (1980: 174) observed to be the most distant perspective for people in Western societies, it was found that more than 90% of the managers have a "vision" or "image of reference" that goes beyond this "maximum". Time frames of 20 to 30 years seem not to be too far off; some time frames even went beyond the 50 years. On average, the Dutch foresters have a time frame of 38 years, which is significantly less than the average time horizon of 59 years for the German foresters ($t(141) = 3.026$, $p < 0.01$). This might be a cultural difference due to the difference in tradition in forest planning and not due to a general country difference, as Germans in

[233] BONIECKI 1980: 166-167

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general are considered to be more short-term oriented than the Dutch[234]. To rule out the influence of educational background (the German foresters had on average a higher level of forestry education than the Dutch foresters) and the difference in organization (as the Germans also manage private and community forest), possible correlations between these variables and these perspectives were tested. As all German foresters had the same educational background, this variable was tested for the Dutch only: no correlation could be found (Cramer's V = 0.652, $p > 0.05$). Testing the German forest managers revealed no correlation for type of ownership (Cramer's V = 0.640, $p > 0.05$). No differences could be ascribed to the foresters' age ($r = 0.110$, $p > 0.05$) or years of experience ($r = 0.146$, $p > 0.05$) foresters, or to their perception of uncertainty (Cramer's V = 0.230, $p > 0.05$).

The few managers (7%) not having this long vision of the future seem to be constrained by what BONIECKI (1980: 167) calls the "rate of change": *"10, 20 or 30 years is too far to look ahead, given all the changes and uncertainties"* (male, Dutch, age group 25-39 years, nature area) and *"the societal and political trends dictate what happens; elections are every four years"* (male, Dutch, age group 40-55 years, forest and nature area).

These results imply that most of the forest managers have a long-term view or vision of their forests that spans several decades. However, they do not indicate whether these time perspectives also evoke *"a meaningful concern leading to a concrete behavioral commitment"*[235]. It might also be that these perspectives are the "nature of the illusion": *"Arising from a fear of depletion – an expected future without 'planning' – the 'planned' future is a forest beyond the horizon, beyond the dazzling expanse of desert"*[236].

Consequently, as a next step the research focused on the "content" of foresters' future. Using the Life Space Sample technique, the forest managers were asked to look ahead and then to highlight ten forest management actions that they thought they would carry out or would like to carry out in or with their forest (and/or nature) area, and when. The answers indicate how far into the future a subject tends to think, or how much of the future is maintained as part of his or her current psychological "life space".

Though at first sight, the task appeared to be straightforward, it proved difficult for the foresters: over 90 % were unable to complete it. The German managers found it more difficult than the Dutch managers (on average, 4 actions per person, versus approx. 5.5 actions per person: $t(141) = -4.339$, $p < 0.01$). To what extent these differences are the result of, for example, cultural differences or situational differences (such as the storm Kyrill which might have lead to a stronger focus on the present in the case of the German forest managers) is not clear. Still, it seems that foresters in both countries find it difficult to

[234] HOFSTEDE 2001
[235] BONIECKI 1980: 174
[236] OLSON 1977: 42

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complete the Life Space Sample. This of course has implications for the general issue of foresters' time perspectives, as the low number of answers indicates a difficulty in thinking about the future. This is in sharp contrast with the long-term thinking that is invariably mentioned in the forestry literature.

In addition to the surprisingly low number of answers, the answers themselves also show that when opting to carry out a certain action the distant future is considered to only a limited extent. The answers could be classified into three types:

- cyclical actions (24%);
- goals and objectives (36%);
- autonomous actions (40%).

The first group (cyclical actions) demonstrates the cyclical character of forest and nature management. The foresters from both countries mentioned about the same number of actions that are, as they themselves noted, either "cyclical", "yearly" or "continuous". The Dutch foresters however mentioned a more varied collection of actions: almost twice as many different actions compared with the German foresters. The most popular actions mentioned by the Dutch were mowing (14%) and infrastructural measurements (10%), for the Germans, the most popular was tree-thinning (27%). These types of actions, however, do not really contain a "futurity aspect" as they are based on a continuation of the past and on a present that is close to the *"eternal present"*[237].

With regard to the second and third groups, the small number of answers created some measurement problems. Median time perspective scores for these two groups had to be calculated on the basis of a very limited sample of future events. Fortunately, however, there is no correlation between the number of goals and the median time perspective ($r = -0.12$, $p > 0.05$) and the number of actions and the median time perspective ($r = 0.005$, $p > 0.05$), so that scores based on different sample sizes are reasonably comparable. Nevertheless, this small sample size probably resulted in greater instability in these scores than desirable and may have contributed to poorer predictive power than might otherwise have been obtained.

Although the interviewers asked for actions, some of the answers did not refer to actions but instead to goals and objectives (for example: improving the forest values, increasing social support and developing a more stable forest). Most of the answers in this second group were given by the Dutch foresters (60%). Interestingly, for both countries the average median time perspective of these goals and objectives was around the 15-year limit ($t(101.5) = 1.693$, $p > 0.05$), which BONIECKI (1980: 174) considers to be the most distant practical horizon for Western man. No correlations could be found between the median time perspective of the goals and age ($r = -0.226$, $p > 0.05$), years of experience ($r = -0.048$, p . 0.05), perception of

[237] HALL 1983

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uncertainty (Cramer's V = 0.161, p > 0.05), level of education (Cramer's V = 0.286, p > 0.05) or type of forest ownership (Cramer's V = 0.440, p > 0.05).

The third and final group of answers were the autonomous actions. In contrast to the actions from the second group, autonomous actions have a specific time perspective assigned to them. An overview of the 5 autonomous actions mentioned most often (grouped according to category) by the two groups is given in table 3. Most of the answers in this group were given by German foresters (60%), which explains the differences in numbers of actions mentioned in the two countries. On average, the average median time perspectives for both groups were about equal: around 7 and 8 years ($t(108) = 1.652$, p > 0.05). Over 90% of all the actions mentioned were between 0 and 15 years. For this group too, no correlation could be found between the median time perspective and respondent's age (r = -0.004, p > 0.05), years of experience (r = -0.043, p > 0.05), perception of uncertainty (Cramer's V = 0.101, p > 0.05), type of ownership (Cramer's V = 0.322, p > 0.05) or level of education (Cramer's V = 0.286, p > 0.05).

**Table 3: Top five forest management actions**

| Germany | | | Netherlands | | |
|---|---|---|---|---|---|
| Action | Number | % | Action | Number | % |
| Infrastructure | 37 | 21.5% | Regrowth removal | 8 | 11.4% |
| Forest Maintenance | 28 | 16.3% | Animal grazing | 8 | 11.4% |
| Forestation | 22 | 12.8% | Mowing | 7 | 10.0% |
| Thinning | 15 | 8.7% | Timber yield | 7 | 10.0% |
| Enrichment plantings | 13 | 7.5% | Infrastructure | 6 | 8.6% |

In conclusion, the outcomes of the Life Space Sample show that the future time perspective of foresters is not as long as the visions or images of references seemed to indicate. The results confirm BONIECKI'S (1980) outcomes, namely that time horizons extend to around the 15-year mark at most; some foresters visualize a longer orientation but most do not have a future orientation surpassing 7.5 years.

## 3.3 Reflection on the results

Although the use of the concept of time perspectives as a way of exploring long range forest management planning to forestry research is new, it provides a unique insight into foresters' relationship with time. Measurement of the individual time perspectives of forest managers, however, reveals that although they have a long-term vision (or image of reference)

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spanning several decades, the futurity of the actions taken is much shorter. In practice, 15 years seems to be the most distant horizon that makes sense to foresters. For most foresters, even this time perspective is still too distant.

This limit of 10 to 15 years is exactly what BONIECKI (1980) found in his research on the planning horizons of people in Western societies. Even though the tendency to restrict the scope of their future time perspective runs counter to the dominant ethic of forestry, this psychological tendency may actually be quite adaptive for foresters. It is considered to be a very normal behavioural tendency for people facing many un-analysable and intangible uncertainties[238], as is the case in forestry. As BONIECKI (1980: 168-169) observed:

> *"Our attempt at understanding the world around us must be focused more on shorter intervals, as the periods of continuity shrink and the change, instead of being far away, appears to be waiting just 'around the comer'. Thus intellectually, we are being put off from looking too far ahead, simply because the world of 'tomorrow' will be so different from that of 'today'".*

This way of acting points to a sensemaking process in which foresters "construct" the future by shortening it to reduce the range of uncertainties and improve the predictability compared with longer time perspectives[239].

These outcomes also show the importance of considering the individual future time perspectives when talking about planning horizons in forestry, that is the distance into the future for which to plan[240]. Many authors acknowledge the importance of the right planning horizon as a critical factor in the planning process of an organization, as it forms the basis for the allocation of resources and energies, as well as for the coordination of short- and long-range planning[241]. On the one hand, it is claimed that a planning horizon should be long enough to allow organizations to achieve the objectives set for this time span. On the other hand, it is argued that planning horizons that are too long receive only "lip service" as nothing is permanent but change[242]. No doubt because of conventions and formal procedures, in forest management planning these horizons have been addressed purely in quantitative and mechanistic (technical) terms, following traditional conventions and planning models. The timeframes chosen depend on criteria such as the production period

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238 YAFFEE 1997
239 CYERT AND MARCH 1963; OLSON 1977: 42; TAYLOR AND HAWKINS 1972
240 DAS 1991: 52
241 see for example DAS 1987; TAYLOR AND HAWKINS 1972
242 BONIECKI 1980: 174; GOODMAN 1973: 215

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(rotation) of trees[243], the transaction costs of formulating a plan[244] and the rate of interest[245], and can vary between 10 to 20 and 200 years[246]. Such a technical determination of futurity assumes, however, that in practice all actors have the capacity to optimally appreciate whatever horizon is set and it ignores the individual judgments of the actors in the organization of the future[247], which could lead to organizational goals that are beyond the motivational setting of the individuals working in that organization. These individuals then adjust the planning objectives to conform to their temporal preferences, often without any clear awareness of the latter[248].

This case study also shows the importance of routine patterns: much of forestry and forest management consists of situations that are neither novel nor surprising, i.e. that are routine[249] (as shown in the first case study of this research). Such routines are a central feature of decision-making and action[250]: humans look for stability and reduced ambiguity in their everyday lives through routinization and recognizable patterns of behaviour and interpretation[251]. Routines not only provide a major determinant for short-term responses to familiar and unfamiliar environmental stimuli, but they do so efficiently by decreasing the effort spent on decision-making[252].

These findings also show that in uncertain conditions, planning loses more and more of its functional aspect[253]: that is, the conscious anticipation of that future[254]. Still, despite the fact that the individual time perspectives are relatively short range, it is a matter of fact that foresters are confronted now and always with the far-off future in their actions. This study has not, however, answered the question to what extent this future is indeed the basis on which actions are taken. For this, the time orientations of foresters have to be researched, as was done in the empirical case study presented in the next chapter.

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243 ANDERSSON 2005: 8; SPEIDEL 1972: 95-96
244 FRIEDMANN AND SEGEV 1976: 87; SPEIDEL 1972: 95-96
245 DUERR 1960: 225; FRIEDMANN AND SEGEV 1976: 87
246 ANDERSSON 2005; KANGAS AND KANGAS 2005; SPEIDEL 1972
247 DAS 1987: 204
248 DAS 1991: 55
249 GIOIA AND MEHRA 1996: 1228
250 FELDMAN AND PENTLAND 2003
251 GIDDENS 1984; WEICK 1995
252 COHEN AND BACDAYAN 1994: 555; MARCH AND SIMON 1958; STINCHCOMBE 1990
253 CLARKE 2001: 4
254 OESTEN AND ROEDER 2002: 53

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# 4 Time orientations[255]

*"…it is abundantly clear that neither the future nor the past exist, and therefore it is not strictly correct to say that there are three times, past, present, and future. It might be correct to say that there are three times, a present of past things, a present of present things, and a present of future things"*

Aurelius Augustinus, Augustine of Hippo, or Saint Augustine (354 - 430),
Philosopher and theologian, bishop of the North African city of Hippo

The previous chapter revealed that to foresters the future is much shorter than the forestry community might have expected. To see if the future is still the most important time period on which to base decisions and actions (or if the past and/or present determine foresters' decisions and actions), this second empirical chapter explores foresters' time orientations, in particular, their future time orientation.

## 4.1 Methodology

### 4.1.1 Research approach

Using a case study approach, Dutch foresters were questioned on what role the future plays in their decision-making and to what extent their planning is based solely on past experiences and/or the perception of present conditions. Even though the Netherlands is not known as a traditional forestry country, Dutch foresters form a very suitable population for the purpose of this research, for two reasons. Firstly, the Dutch foresters, organized in the Royal Dutch Forestry Association (*Koninklijke Nederlandse Bosbouw Vereniging - KNBV*), still form a clearly discernible social collective within society based on their specific traditions and common objectives while, at the same time, also allowing for representation

[255] This chapter is based on HOOGSTRA AND SCHANZ 2008b

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within the group of foresters regarding age, educational backgrounds, field of work, etc. Secondly, in recent years Dutch foresters have encountered a magnitude of far-reaching changes in their natural, social and political environments[256], which is why they can be expected to have a particularly volatile perception of the future. Though these changes are typical of forestry in many European countries, they are more discernible in the Netherlands because of the country's small forest area per capita (only 0.02 hectare) and the enormous pressures of a highly urbanized society on the forested lands.

Given the foregoing, Dutch foresters represent a excellent case for testing the time perspectives of European foresters. When an extreme or critical case is chosen that is the most unlikely to confirm a hypothesis, and yet the hypothesis is confirmed, this provides strong support for inferring that the hypothesis is even more likely to be valid in most other cases, *"where contrary winds do not blow as strongly"*[257]. ODELL (2001: 165) calls this kind of single-case design a "least-likely" case study.

### 4.1.2 Data collection

*Method of measurement*

The key variable examined in this study was the individual time orientation. The problem of the concept of time orientation is that any empirical determination of time orientations is faced with a major difficulty: as KASAKOS (1971: 24) has pointed out, the quality and meaning of time orientations can be interpreted in light of cognitive processes and reconstructed from communication; however, their direct, objective measurement remains impossible. Instead, time orientations can only be assessed and compared indirectly through auxiliary constructs.

During recent decades, many such constructs have been devised and applied in the different fields of research in which the concept of time orientation is studied (e.g. psychology, sociology, anthropology). Examples of these constructs include:

- the Thematic Apperception Test (TAT) – an approach in which subjects are asked to tell stories about pictures on cards. These stories are examined for their temporal references [258];
- the Experiential Inventory – an approach in which subjects are asked to list the ten most important experiences of their lives, and to place these experiences in the

[256] DEN OUDEN AND MOHREN 2004; SCHANZ AND MAAS 2004
[257] ODELL 2001: 165
[258] WOHLFORD 1966; WOHLFORD 1969

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distant past, near past, present, near future, or distant future. The number of experiences in each time zone serves as an indication of the orientation towards that time zone [259];

- the Circles Test – an approach in which subjects are asked to think of the past, present and future in the shape of circles, and to draw them. The size of the circles is supposed to be a reflection of the orientation towards the time zone represented by each circle[260];
- the Motivation Induction Method (MIM) – an approach developed by NUTTIN (1964) in which subjects must finish incomplete sentences such as "I plan …" or "I wish …". Subsequently the answers are scored according to their temporal location;
- the Zimbardo Time Perspective Inventory (ZTPI) – an approach in which subjects assess a number of items related to past, present and future on a 5-point Likert scale according to "how characteristic" each statement is for the respondent [261].

It is beyond the scope of this study to evaluate each method with regard to its validity and reliability as a measurement of time perspectives. The approach chosen in this study was the Circles Test of COTTLE (1967; 1976). This is a projective approach which involves participants by asking them to draw circles of different sizes to symbolize past, present and future time, and to arrange these circles in a pattern to represent the relationships between these time periods[262]. The main reasons for using this approach in this research were (1) it is an easily applicable and quick method allowing people to express how they view past, present and future time and how they perceive the relation between these time zones, on both the conscious and unconscious levels and (2) it has been shown to be a valid[263] and reliable method, yielding relatively stable time perceptions[264]. The specific wording of the Circles Test question in the survey was[265]:

> *How do you personally feel to what extent past, present and future time influence your decision-making in forestry? Think of the past, present, and*

[259] COTTLE 1968; COTTLE 1971; COTTLE 1976

[260] COTTLE 1967; COTTLE 1976

[261] ZIMBARDO AND BOYD 1999

[262] used for example BEISER ET AL. 1989; BIRTH 2004; BRUNO AND MAGUIRE 1993; COTTLE 1967; COTTLE 1976; HARRE AND SCHMIDT 1995; KOENIG ET AL. 1981; MARKO AND SAVICKAS 1998; THOMS 2003; TROMPENAARS AND HAMPDEN-TURNER 1998

[263] BEISER 1987: 447; BRUNO 1995: 113; BRUNO AND MAGUIRE 1993: 424-425; COTTLE 1967; COTTLE 1975; COTTLE 1976

[264] BROWN AND HERRING 1998: 594

[265] adapted from COTTLE 1967

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> *future as being in the shape of circles. You may use circles of different size. Now arrange these circles in any way you want that best shows the relationship between the circles. When you have finished, label each circle to show which one is the past, which one the present, and which one the future.*

*Method of data collection*

The empirical data about the time perspectives of the group of Dutch foresters were collected through a questionnaire that was part of a project that sought to ascertain the image of the Royal Dutch Forestry Association among its members.

In addition to the Circles Test, this questionnaire contained questions related to individual aspects such as age (with the categories < 30 years, 30-40 years, 40-50 years, 50-60 years, > 60 years), profession (with the categories forest education, forest research and consultancy, forest policy, forest management, professional representation of forest interests), and educational background (with the categories forestry background (lower, middle and higher education) and non-forestry background). Other factors such as religion and responsibility to family that are said to have an influence on temporal orientations were not considered in this research, as they did not appear to be appropriate within the scope of the original questionnaire. Gender was not taken into account because by far the most foresters in the Netherlands are male and therefore the female foresters form too small a group to study related influences.

As the time perspectives of foresters might be influenced not only by individual characteristics but possibly also by specific characteristics of the foresters' daily field of work, additional "forest" factors were included in the questionnaire. The study focused on the two most prominent explanatory variables of the general existing conceptualizations of forest management: different "models of time" and different "myths of nature". "Models of time" relates to the respondents' perception of time as either being linear (uni-directional time extending in a straight line from the past via the present into the future) or cyclical (repetitive; the conditions in the world are based on repetition and not on progressive change). It has been pointed out that when people are continuously exposed to natural cycles – as is the case for ecosystem managers who are continuously challenged in their daily decisions by the ecological production and reproduction cycles of ecosystems – they will ultimately be imbued with a cyclic understanding of time[266]. People with a cyclical time perspective tend to be more conservative and find it difficult to comprehend a different future state as they are accustomed to the repetitive cycles of nature[267]. Therefore, one of the

[266] STINSON 1986: 31
[267] ABOU-ZEID 1979; HALL 1983

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hypotheses that this study set out to test was that foresters generally prefer a past time orientation to that of the future. To determine individuals' models of time, COTTLE'S Circles Test could be used.

The second variable, "myth of nature", relates to four corresponding "myths of nature" – a concept developed by HOLLING (1979; 1986) and TIMMERMAN (1986). In their analyses of managed ecosystems they found that when different managing institutions are faced with identical types of situation, they adopt strategies based on different interpretations of ecosystem stability. They identified four different "myths of nature", illustrating them graphically by depicting the model of stability in terms of the relationship of a ball to the surface it rests on: nature benign, nature ephemeral, nature perverse/tolerant and nature capricious (see figure 13).

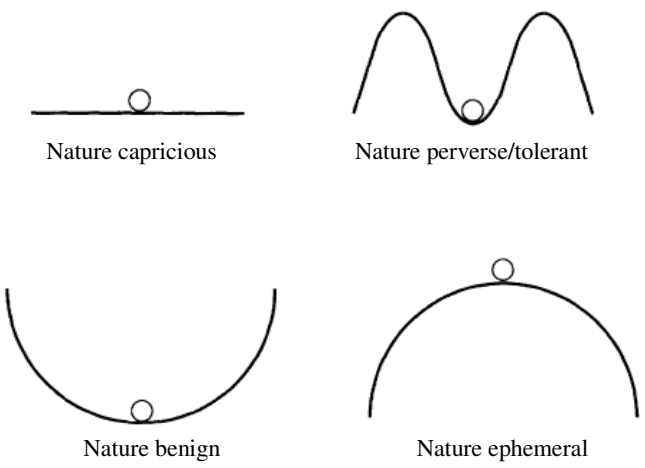


**Figure 13: Four different ways of perceiving and interpreting nature**[268]

SCHWARZ AND THOMPSON (1990) linked these four myths of nature in their Cultural Theory approach with DOUGLAS AND WILDAVSKY'S (1982) theory on the types of social relationships, thus deriving four basic worldviews in which the perceptions of time and the way a person regards nature are explicitly integrated:

- The hierachist, who emphasizes bounded social groups with strong relationships, views nature as tolerant but vulnerable to surpassing ultimate limits, and makes a balanced distinction between short and long term;

[268] SCHWARZ AND THOMPSON 1990: 90

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- The egalitarian, who strives for informal, horizontal social relationships, handling nature with great care from the viewpoint that ecosystems are very vulnerable, and for whom the long term dominates over the short term;
- The individualist, who stresses freedom and autonomy of individuals, considers the abundance of nature as an opportunity, and for whom the short term dominates over the long term;
- The fatalist, who restricts his individual ability to influence events by prescriptions on his behaviour, regards nature as a lottery rather than as being controllable or manageable, and perceives time as involuntary myopia.

All four worldviews also influence foresters' decision-making[269]. It can therefore be hypothesized that the time orientations of foresters differ significantly, according to their preferred worldview. The worldviews of the respondents were ascertained from their assumptions of how nature behaves: they were shown the diagrams depicted in figure 13 and asked which diagram best represented their interpretation of ecosystem stability.

*Sample*

Data were collected through a questionnaire mailed to all 564 members of the KNBV, using the membership list provided by the organisation. In total, 246 respondents returned the questionnaire (48% of the KNBV members). Of these 246 respondents, 206 answered the Circles Test question by drawing configurations of circles. The remaining respondents left the question open (28 respondents), found the question too difficult (10 respondents) or felt that the question was not useful within the framework of the overall project (two respondents). As two respondents drew more than one configuration and 15 drawings were too vague to be interpreted, the final number of drawings analysed was 189.

### 4.1.3 Data analysis

The analysis of the individual drawings focused along two different qualitative dimensions[270]. First, the time orientations of the respondents were determined by comparing the sizes of the circles drawn by each of the 189 respondents in the sample. If one circle was larger than the others, the period it represented (past, present or future) was regarded as dominant. For example, in figure 14, configuration (a) was scored in the following way: past = present = future, indicating a balanced orientation with the different time periods equally important. Configuration (b) was scored present < past < future, indicating a future

[269] SCHANZ 1996; POKORNY AND SCHANZ 2003
[270] COTTLE 1967; COTTLE 1976

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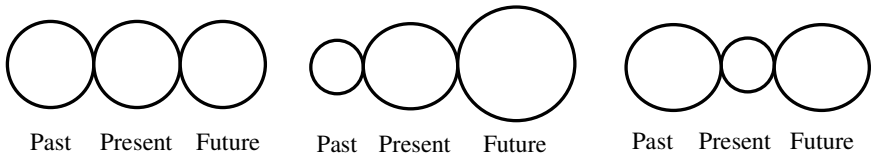
orientation, and configuration (c) present < past = future, signifies an orientation on both past and future, with the present insignificant. The size and ranking of the circles were assessed by eye: a ranking based on precise measurements would have been spurious, given that the respondents were drawing by hand.



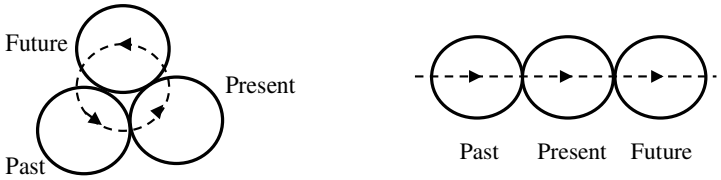

(a) Equally significant

(b) Future dominant, present secondary, past insignificant

(c) Focus on past and future, present insignificant

**Figure 14: Examples demonstrating temporal dominance of arrangements**

Second, the respondents' models of time were ascertained by analysing the positioning of the circles within the Circles Test. The cyclical model is represented by triangular configurations of the circles (see for example figure 15a); the linear model is represented by circles drawn in a line (see for example figure 15b).




(a) Cyclical configuration of time

(b) Linear configuration of time

**Figure 15: Examples of cyclical and linear configurations of time**

In order to measure the strength of the correlation between time perspective and various personal factors, and also to test the hypothesis that foresters are future oriented, Cramer's V tests were applied with the help of the statistical software package SPSS. Cramer's V test measures the association between two categorical variables; it reveals whether or not two variables are correlated and how strong the correlation is. If the significance level of the test is small enough (in this research the conventional approach that $p$ must be less than 0.05 is

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followed), the assumption that the two variables are in some way related is accepted. The strength of association is then determined by the value of Cramer's V, which ranges from 0 to 1: the higher the number, the stronger the correlation between two variables.

## 4.2 Results

### 4.2.1 Individual time orientations

Table 4 provides the outcomes of the Circles Test with respect to the circle sizes, the dominance scores and the number and percentage of respondents per dominance score grouped according to the dominant time zone(s). In total, more than 50 different drawings were made by the respondents. The drawings were grouped per temporal orientation and, for each temporal orientation, two examples of drawings (if available) were included in the table, to give an impression of the configurations.

A summary of the results is given in table 5, showing the distribution of dominance scores. The results show that the future plays a major role: in 72% of the cases the future time is the dominant time zone or a co-dominant time zone in the time perspectives of Dutch foresters – in 41% of the cases it is the only dominant time zone and in 31% of the cases it is co-dominant with past and/or present. In 44% of the cases the past is dominant or co-dominant – in 15% of the cases it is the sole dominant time zone and in 29% it is co-dominant. The least important time zone is the present: in only 35% of the cases is it seen as the dominant or co-dominant time zone – only in 12% is it seen as the dominant time zone and in a further 23% it is seen as co-dominant.

An investigation of how these dimensions of the different time zones relate to each other reveals three interesting patterns. The first pattern can be called the “balanced view” pattern: all three time zones are of equal importance when making a decision. The respondents exhibiting this pattern (20%) see decision-making as an integration of past experiences, present conditions and future expectations. The second pattern is the “present insignificant” pattern, that is the present is subordinate to both the past and the future. Respondents exhibiting this pattern (26.5%) see the present time as an insignificant moment or bridge connecting the past and future.

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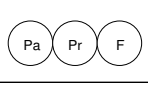
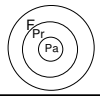
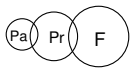
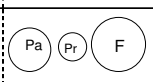
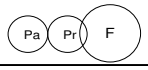
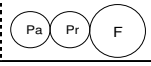
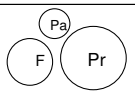
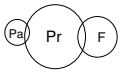
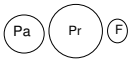
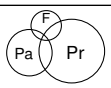
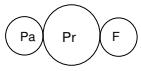
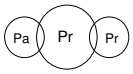
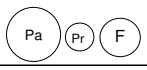
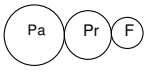
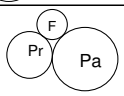
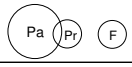
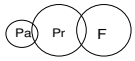
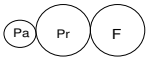
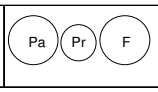
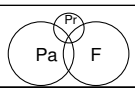
**Table 4: Circles Test results: temporal orientations**

| Dominance | Examples of arrangements[1] | Dominance score | Number of respondents | % |
|---|---|---|---|---|
| All equal | | | | |
| Past = Present = Future |  | All equal | 37 | 19.6 |
| Future dominant | | | | |
| Past < Present < Future |   | Past subordinate<br>Present secondary<br>Future dominant | 43 | 22.8 |
| Present < Past < Future |   | Present subordinate<br>Past secondary<br>Future dominant | 25 | 13.2 |
| Past = Present < Future |   | Past and present subordinate<br>Future dominant | 10 | 5.3 |
| Present dominant | | | | |
| Past < Future < Present |   | Past subordinate<br>Future secondary<br>Present dominant | 8 | 4.2 |
| Future < Past < Present |   | Future subordinate<br>Past secondary<br>Present dominant | 8 | 4.2 |
| Past = Future < Present |   | Past and future subordinate<br>Present dominant | 6 | 3.2 |
| Past dominant | | | | |
| Present < Future < Past |   | Present subordinate<br>Future secondary<br>Past dominant | 9 | 4.8 |
| Future < Present < Past |   | Future subordinate<br>Present secondary<br>Past dominant | 19 | 10.1 |
| Present = Future < Past |  | Present and future subordinate<br>Past dominant | 1 | 0.5 |
| Future and present dominant | | | | |
| Past < Present = Future |   | Past subordinate<br>Present and future dominant | 5 | 2.6 |
| Future and past dominant | | | | |
| Present < Past = Future |   | Present subordinate<br>Past and future dominant | 16 | 8.5 |
| Present and past dominant | | | | |
| Future < Past = Present |   | Future subordinate<br>Past and present dominant | 2 | 1.0 |
| Total | | | 189 | 100 |

[1] Pa = past, Pr = present, F = future

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**Table 5: Summary of the frequency distribution of dominance scores**

| | | Dominance score[1] | | | |
|---|---|---|---|---|---|
| | | Dominant | Co-dominant | Subordinate | Total |
| Time zone | Past | 29 (15%) | 55 (29%) | 105 (56%) | 189 (100%) |
| | Present | 22 (12%) | 44 (23%) | 123 (65%) | 189 (100%) |
| | Future | 78 (41%) | 58 (31%) | 53 (28%) | 189 (100%) |

[1] Number of respondents in a particular category, percentages are given in parentheses

COTTLE (1967: 65) describes this as follows: "*Even though we live only in the present, just about the time we say now, the moment has passed and we are confronted with the next now*". In the third and last pattern, the "future development" pattern, the time zones expand as one moves forward toward the future (past < present < future). The respondents in this category (23%) see a funnelling of time from the past through the present into the future. It describes a movement from a shrinking, meagre beginning to an expanding and explosive end[271].

### 4.2.2 Individual characteristics as determinants of time orientations

Time orientations are individual constructs; interpersonal differences in experiences, judgments, values, motives, and other personal factors cause different individuals to have different views. However, in this study, no significant correlation was found between the time orientations and variables such as age (Cramer's $V = 0.133$, $p > 0.05$), education (Cramer's $V = 0.082$, $p > 0.05$) and field of work (Cramer's $V = 0.113$, $p > 0.05$).

These findings do not necessarily question the validity of our results, as empirical findings on the influence of these factors on the orientations in other social collectives have been contradictory. For example, several studies have shown that the temporal orientations change during a person's life[272]; however, others have not found any clear age-related differences[273]. Although various researchers have shown that socio-economic status is related to time perspectives[274], TISMER (1987) did not find significant differences with respect to socio-economic status.

[271] COTTLE 1967: 68
[272] BROWN AND HERRING 1998; D'ALESSIO ET AL. 2003; LANG AND CARSTENSEN 2002
[273] TROMMSDORFF ET AL. 1979
[274] D'ALESSIO ET AL. 2003; TISMER 1985 ; TROMMSDORFF 1983

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*Models of time as determinants of individual time orientations*

The respondents' models of time were ascertained by analysing the configurations of the circles. The results show that most respondents (75%) have a linear time perception and that only 25% have a cyclical perception of time. No significant correlation could be found between the models of time and temporal orientations (Cramer's V = 0.136; $p > 0.05$). This implies that even though the respondents in this study are continuously confronted with ecological systems and their related ecological production and reproduction cycles, this has not imbued them with a cyclic time orientation. The hypothesis relating to this must therefore be rejected. This finding thus supports the contention that time models are primarily cultural constructs: the linear time model as a Western notion of temporality due to the loss of nature (and especially agriculture); and the cyclical time model as a notion found in non-industrialized countries as the norm for the use of time[275].

*Worldviews as determinants of individual time orientations*

It will be recalled that the worldviews of the respondents were determined on the basis of their assumption of how nature behaves. By far the most (74%) of the respondents were classed as having a hierarchical view, 15% were classed as having a fatalistic view, 8% were classed as having an individualistic view and a mere 3% were classed as having an egalitarian view. Contrary to the hypothesis that there would be an explicit difference in perception of time in relation to the four different "worldviews", no significant correlation between worldviews and temporal orientations could be found (Cramer's V = 0.139, $p > 0.05$). This outcome, however, does not preclude the existence of a relationship between worldview and temporal orientation; in this research the worldview of a respondent was based on only one of the three determinants of a worldview, i.e. the way of perceiving nature. However, two other basic criteria also determine the four worldviews, i.e. the "preferred way of organizing" and "rationality"[276]; neither of these were incorporated in the questionnaire.

## 4.3 Reflection on the results

The results of this second case should be interpreted with care. Even though the vast majority of respondents had no difficulty comprehending the Circles Test assignment, the results may still be biased as a result of a methodological shortcoming: that is, in response

[275] DAHL 1995: 200
[276] SCHWARZ AND THOMPSON 1990: 61

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to direct questioning about their time perspectives, respondents might give socially desirable answers (reasoning that *"forestry is concerned with the future, so I have to emphasize the future circle"*). This shortcoming is not limited to this approach, however: it is the case with any such test[277].

Despite the caveat about interpreting the results, the findings clearly indicate that most Dutch foresters perceive the future as the decisive time zone for forest management and planning (although, as found in the first case study, that future is probably not as long as had previously been assumed). Given the exploratory methodological basis of this study, it is difficult to distinguish to what extent the results are specific to *all foresters*, as distinct from *Dutch foreste*rs . It could be argued that the characteristic Dutch tradition of pragmatism in long-term iterative planning, with great readiness for change and adaptation to changing situations may also account for a stronger future orientation[278]. Unfortunately, there is no other empirical research on foresters with which these findings can be compared. However, all the Circles Tests administered to other social collectives[279] have found that the participants have a strong future orientation.

Even though the future has been found to be the dominant time zone of the respondents, this should not obscure the important role of the past. People examine past experiences and practices in order to learn and "unlearn" things for the present and the future. So, although decision-making is for the future, it cannot be decoupled from the past[280]. EINHORN AND HOGARTH (1987) called this *"going forward in reverse"* or understanding the future by understanding the past, and making choices on the basis of that understanding. This is also what sensemaking is about: a "retrospective" interpretive process in which people assign meaning to ongoing occurrences in order to structure the unknown, regardless of whether they are fully aware of this time dimension in their search for answers[281]. Thus the finding that almost half of the respondents in the present case study see the past as the most important or one of the most important time zones for decision-making suggests that in their way of thinking a process of sensemaking is central.

However, although the past is very dominant for many of the respondents, if they lack a strong future orientation, their actions are merely based on experiences of the past and memories. A similar situation applies to those foresters for whom the present is dominant: the situations and conditions of the present time determine their actions. MYERS (1997: 243) gives the example of foresters planting tree species that reflect past and present conditions of

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277 BROWN AND HERRING 1998: 595
278 SCHANZ AND OTTITSCH 2004
279 see for example BEISER 1987; BROWN AND HERRING 1998; COTTLE 1967; COTTLE 1976
280 NATHAN 2004 ; WEICK 1995
281 WEICK 1995

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warmth and moisture, even though by the time the trees mature they will very probably experience radically different conditions through global warming. Some scientists therefore argue that one should not ask persons with a strong past and/or present orientation to work on future-oriented tasks such as planning[282]. Unfortunately , as this case study has shown, the differences in time orientation among members of one organization occur among all ages, and are independent of field of work and educational background. This in combination with the not publicly apparent influence of the different time orientations on decision-making in the normal course of an organization's daily activities, makes it rather difficult to forecast who is suitable for what task.

Relying on the past and/or present is a common ploy that some of the group of foresters questioned seem to use to cope with the uncertainties of the future . However, it leaves open the question of how the majority of foresters experience the future in terms of uncertainty, given that they are continuously faced with the future as it forms the basis for actions. Is this indeed a future filled with uncertainty, or do foresters maybe perceive the future as being much more certain than it objectively is? This question was addressed in the case study described in the following chapter.

[282] DAS 1987; JAQUES 1964; JAQUES 1976; JAQUES 1982

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# 5 (Un)Certainty[283]

*The quest for certainty blocks the search for meaning.*
*Uncertainty is the very condition to impel man to unfold his powers.*

Erich Fromm (1900-1980)
American psychologist

Chapter four has shown that the time zone on which foresters base their actions is the future. Objectively, however, this future is full of uncertainty. The question is whether the foresters also perceive the future as very uncertain, as what determines the action they take is not the objective state of the world but their perception of the world. This chapter therefore explores the way foresters experience the future in terms of uncertainty.

## 5.1 Methodology

### 5.1.1 Research approach

To study how foresters experience the future in terms of uncertainy, an "embedded" multiple case study[284] was used. Using a 2x2 design, the temporal uncertainty in two sectors (forestry and agriculture) in two different regions (Germanic Central Europe and the USA) was explored (see also table 6). In contrast to the case studies described in the previous two chapters, this study entailed a contrastive analysis of published texts.

In the first instance, the temporal uncertainty in the forest sector was compared with the temporal uncertainty in the agricultural sector. The agricultural sector was chosen as, like forestry, it relies on land-based production; however, the agricultural sector is generally considered to be a short-term oriented activity: the time horizons for many agricultural

[283] This chapter is based on HOOGSTRA AND SCHANZ 2008c
[284] YIN 2003

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decisions are one year, occasionally four to five years. The time horizons for most forestry decisions span decades[285]. As illustrated by PRICE (1989: 112): "*Farmers look ahead only a few months to the harvesting of crops; industrial investors seek a return within a few years; but foresters' efforts reach fruition only after decades, or even centuries"*. These two cases are therefore so-called "polar types". It is a sound rationale to choose cases that are likely to produce contrasting results for predictable reasons in order to gain a broader insight in the subject studied[286].

**Table 6: 2x2 multiple case design**

| | SECTOR | |
|---|---|---|
| COUNTRY/REGION | Forestry, USA | Agriculture, USA |
| | Forestry, Central Europe | Agriculture, Central Europe |

The two cases were each subdivided into two sub-cases, to take account of the different countries considered in the research. These countries were chosen because their national cultures differ in their tolerance of uncertainty and ambiguity and therefore the influence of national culture on the behaviour of their forestry and agriculture sectors is likely to be more apparent [287]. Furthermore, the fact that the countries differ in their national language enabled this study to research whether a specific language can predispose its speakers to distinct interpretations of uncertainty expressions[288].

In this research, Austria, Germany and Switzerland were considered as a single group – Germanic Central Europe – and compared with the United States of American (USA). It was initially intended to compare the USA (an Anglo culture) with Germany (Germanic culture)[289], but insufficient published articles meeting the criteria could be generated for Germany. So two additional members of the German language-culture – Austria and German-speaking Switzerland – were included in the study. Although each of these German-speaking countries has a unique national culture, because they belong to the same cultural area (Germanic)[290] and share a similar language-culture[291] it was considered justifiable to consider them as one group.

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[285] ALIG ET AL. 1998
[286] EISENHARDT 1989: 537
[287] HOFSTEDE 2001; RONEN 1986; RONEN AND SHENKAR 1985
[288] DOUPNIK AND RICHTER 2003: 19
[289] HOFSTEDE 2001; RONEN 1986; RONEN AND SHENKAR 1985
[290] HOFSTEDE 2001; RONEN 1986; RONEN AND SHENKAR 1985
[291] DOUPNIK AND RICHTER 2003: 19

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All the countries selected have a strong forestry orientation and their foresters still form a discernible social collective within society, based on their specific traditions and common objectives. All the countries are also characterized by a long tradition of forest planning. They differ in their attitude towards uncertainty, however[292]. The Germanic Central European countries are characterized by relatively high uncertainty avoidance, which means that they try to minimize the possibility of uncertain situations by having strict laws and rules, safety and security measures. By contrast, the USA has a much lower uncertainty avoidance; US society is more tolerant of opinions that differ from received opinion and it tries to have as few rules as possible[293].

### 5.1.2 Data collection

*Method*

To assess foresters' experiences of uncertainty, a content analysis was carried out. Content analysis enables one to objectively and systematically analyse texts for the presence of words (or concepts) related to a certain topic (in this study, uncertainty and certainty) in order to identify and quantify, patterns that might suggest trends or characteristics of perceptions, attitudes and belief values of individuals and/or groups[294]. Content analysis is an unobtrusive means of analysing communication and it allows one to quickly review large amounts of literature. And, as documents have existed for centuries, it is also possible to carry out historical analyses to ascertain if changes have occurred over time[295].

*Sample of texts*

Content analysis can be performed on numerous text genres ranging from political speeches and open-ended interviews to newspaper articles and historical documents[296]. For this research, articles from forestry journals from different countries with different cultural backgrounds and in different languages (German and English) were analysed. Articles from agricultural journals (from the same countries) were analysed in parallel. The articles were selected on the basis of the following criteria:

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[292] HOFSTEDE 2001
[293] HOFSTEDE 2001; KREDER AND ZELLER 1988
[294] HOLSTI 1969: 14; NEUMAN 2005: 310-312
[295] NEUMAN 2005: 310-312
[296] NEUMAN 2005: 311

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- the topic of the articles:
  - articles on forest management or related topics such as policy, marketing, etc. (or in the case of agriculture, farming or farming-related topics) were selected;
  - only articles with a more general overview were chosen; articles focusing on a certain technical aspect (e.g. harvesting techniques, inventories) were rejected;
  - only articles reflecting on the past or future timeframe were selected (as the focus of this research was on (un)certainty in relation to time);
- the authors of the article:
  - as this study intended to gain more insight into the practices in the field, authors with a university or research institute affiliation were rejected;
  - the author(s) had to be (a) native speakers (as the ability to express (un)certainty is a complex task in a non-native language[297]);
  - only one article per author was taken into consideration.

In total, 25 German forestry articles (46,737 words), 25 American forestry articles (66,063 words) and 25 German agricultural articles (39,878 words) were selected on the basis of these criteria. As it was very difficult to find American agricultural articles complying with the criteria, only 20 American agricultural articles (50,502 words) could be analysed. A list of the selected articles is included in appendix 1.

### 5.1.3 Data analysis

*Text analysis*

The texts were analysed by using deductive content analysis. This means that the texts were analysed with predetermined key words and with predetermined categories. First, two lists of expressions (in English and in German) commonly used by native speakers to express certainty or uncertainty were formulated. These lists were based on existing research on expressions of uncertainty in English. The main sources were HOLMES'S (1983, 1988) analyses of English textbooks. This was supplemented by the research done by CLEAVES (1994), DOUPNIK AND RICHTER (2003), DRUDZEL (1989) and HYLAND AND MILTON (1997). From these sources an inventory of the most frequently used words to express certainty or uncertainty in native-speaker writing was produced (see appendix 2). Five groups of words were distinguished:

[297] HYLAND AND MILTON 1997

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- Modal verbs, e.g. the forester *may* have reached the camp before the bear did;
- Lexical verbs, e.g. it *seems* that the forester made it to the camp before the bear did;
- Adverbs, e.g. the forester *probably* made it to the camp before the bear did;
- Adjectives, e.g. it is *probable* that the forester made it to the camp before the bear did;
- Nouns, e.g. there is a *chance* the forester made it to the camp before the bear did.

The final English word list was translated into German by a native speaker (see appendix 3).

On the basis of the lists of expressions, the articles were analysed using the text retrieval program MAXQDA2, in order to determine the frequency and the context of the words (including misspellings and other morphological variants). All target words were first examined to check if they did indeed represent either certainty or uncertainty, as particular words can only be interpreted as expressing certainty or uncertainty if the context in which they occur is understood[298]. Moreover, as words indicating uncertainty not only express writers' uncertainty concerning the factuality of their statements, but might also indicate deference to their readers (e.g. the "social politeness effect")[299], the target words were also examined for their intention to express possibility. Expressions thus deemed to express possibility were then assigned to one of two categories: certainty or uncertainty. Subsequently, for each expression the timeline was determined, i.e. whether the certainty or uncertainty was related to the categories past, present or future. Only texts by the authors themselves were analysed; citations were not considered.

The certainty and uncertainty expressed in four articles was systematically analysed jointly by two researchers, to test for measurement reliability. Subsequently, the other articles were analysed by one of the researchers. Following the approach of MAYRING (2000), the categories and coding agenda were adjusted on the basis of the coding by the first researcher. The second researcher coded the texts on the basis of this slightly revised coding system. The entire approach led to an intercoder reliability of 0.90 (HOLSTI'S (1969) coefficient of reliability), which is above the generally accepted threshold of 0.80[300].

*Statistical tests*

To measure possible differences between and within the two sectors, the statistical software package SPSS was used to statistically determine whether the means of the samples were different. Depending on the groups to be analysed, either the independent t-test (comparing means of two independent samples), the paired-samples t-test (comparing means of two

[298] HYLAND AND MILTON 1997: 185
[299] HYLAND 1994: 239
[300] NEUENDORF 2002

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dependent samples) or the one-way Anova (comparing means of several independent samples) were applied. In all of these tests, the starting hypothesis is that the means of the groups are the same. If the significance level of the test is small enough (in this research the conventional approach that $p$ must be less than 0.05 is followed), then the hypothesis is rejected and the sets of numbers can be considered to be different. Otherwise, the sets of numbers are considered to be the same.

The Pearson's correlation test was used to find correlations between expressed (un)certainty expressions and other factors, also with the help of the SPSS software. Pearson's correlation coefficient is usually signified by r, and can take values from -1.0 to 1.0, where -1.0 is a perfect negative (inverse) correlation, 0.0 is no correlation, and 1.0 is a perfect positive correlation. A low $p$-value for the test (less than 0.05 in this research) means that there is a statistically significant correlation between the two variables. Otherwise, no significant relationship exists.

## 5.2 Results

### 5.2.1 Expressing (un)certainty in forestry

The first step in the analysis was to look for the use of (un)certainty expressions in the forest corpus and compare this with the agricultural corpus. Table 7 shows that the forest corpus had about one (un)certainty expression every 34 words. The independent sample T-test found that this does not differ from the number used in the agricultural corpus ($t(93) = 1.236$, $p > 0.05$). This figure is much higher than that found in published academic writing (about one expression every 55-60 words)[301], but is similar to that found in conversational uses[302]. This outcome is not surprising, considering that in this research, articles written by professionals, not by scientists or academics were analysed.

A comparison of the average use of words conveying certainty and uncertainty in the forest corpus (using the paired sample t-test) showed that there was no significant difference between the average number of certainty and uncertainty words used ($t(49) = 0.685$, $p > 0.05$). A similar analysis for the agricultural corpus yielded the same result ($t(44) = 0.250$, $p > 0.05$). Therefore, as an additional One-Way Anova test showed no significant difference in the number of certainty and uncertainty words used in the two corpora ($F(3, 186) = 0.745$, $p > 0.05$), we can conclude that both sectors express certainty and uncertainty in the same way.

[301] ADAMS SMITH 1984; HYLAND AND MILTON 1997; SKELTON 1988
[302] HYLAND AND MILTON 1997; HOLMES 1988

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**Table 7: Frequency of words used to express (un)certainty in sectors (per 100 words)**

| | Mean | Min | Max | Std. dev |
|---|---|---|---|---|
| Forestry (N = 50 articles) | 2.94 | 0.86 | 8.31 | 1.54 |
| certainty | 1.40 | 0.06 | 6.53 | 1.20 |
| uncertainty | 1.54 | 0.43 | 4.36 | 0.82 |
| Agriculture (N = 50 articles) | 2.61 | 0.73 | 4.76 | 0.99 |
| certainty | 1.28 | 0.31 | 3.39 | 0.76 |
| uncertainty | 1.32 | 0.19 | 3.50 | 0.75 |

It was also tested whether (un)certainty expressions in the two corpora were influenced by the year of publication of an article. Some scientists[303] have argued that in recent decades the world has become more unmanageable, in contrast to bygone days in which the world was perceived as being more constant. If this hypothesis is true, differences in expressions of (un)certainty are to be expected in our articles and, as in this research the forestry and agriculture articles are not equally distributed over the years, this might have affected our outcomes. However, for both sectors, Pearson's correlation tests show no correlation between publication year and the expressed (un)certainty, which means that the contention that the two sectors are in balance still holds.

In addition to agreement in the number of expressions used, there are also similarities in the usage of words. In the American texts the words "will", "would", "must", "could" and "should" are in the top six most frequently used words of both the forestry and agricultural texts, although with small differences in frequencies. Overall, the American articles contain a diverse range of (un)certainty expressions, as the top ten uncertainty expressions account for just over half (56% for agriculture and 57 % for forestry) of the total number of uncertainty expressions.

The use of words in the Central-European texts show a similar picture. The words "werden" (shall, will), "müssen" (must), "sollen" (shall), "immer" (always) and "dürfen" (may, might) are in both the top six of the two sectors. Both sectors also show a varied collection of (un)certainty expressions, as the top ten for both sectors accounts for over half (51% for forestry and 58% for agriculture) of the total.

All four groups can therefore be characterized by a rich use of words expressing (un)certainty. This corresponds with DRUZDZEL'S (1989: 4) observation that within a group of people, a considerable number of different expressions of (un)certainty are used. However, in all four groups, the category used most frequently is the modal verbs. This result is not surprising as modal verbs *"provide the least marked, and thus the most*

[303] see for example NOWOTNY ET AL. 2001

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*straightforward means of expressing modality"*[304]. Lexical verbs are the least popular in the texts researched, although they are considered *"to offer a more overt and precise means of signaling the writer's commitment to a proposition than other devices"*[305]. HYLAND AND MILTON (1997: 192) believe that the unpopularity of lexical verbs may be due both to uncertainty in how to appropriately employ these verbs when stating claims, as well as to authors thinking that certain genres of writing require an impersonal approach. Mixing informal spoken and formal written forms, i.e. by using more adverbs and modal verbs, might form a solution for these authors and might also apply to the authors analysed in this study.

So far, the results show that the forest sector does not seem to communicate particularly more uncertainty than certainty and does not seem to differ from the agricultural sector. The next step is to see if the same can be said for the (un)certainty expressed, but now in relation to time (past, present and future).

### 5.2.2 (Un)Certainty and time

As no information was available about the total amount of text (words) in the respective articles that focused on the different time zones, it was not possible to work with absolute values when comparing different time zones. To illustrate this problem, here is an example: on average, in the forest sector texts 0.55 future uncertainty expressions and 0.20 past uncertainty expressions are used per 100 words. As it is not known how much of the total text relates to the future and how much to the past, no conclusions can be drawn from these absolute figures. Within a time zone in a certain sector this is not a problem, however, as the text relating to the future is the same for both certainty and uncertainty. Paired-sample t-tests could therefore be applied to test within the different time zones whether certainty or uncertainty dominates (see table 8).

**Table 8: Certainty versus uncertainty dominance per time zone and per sector**

| | Past | Present | Future |
|---|---|---|---|
| Forestry | uncertain | uncertain | balanced |
| | ($t(49)=-3.658$, $p < 0.05$) | ($t(49)=-3.565$, $p < 0.05$) | ($t(49)=0.933$, $p > 0.05$) |
| Agriculture | balanced | balanced | balanced |
| | ($t(44)=-1.994$, $p > 0.05$) | ($t(44)=0.096$, $p > 0.05$) | ($t(44)=0.063$, $p > 0.05$) |

[304] PERKINS 1983: 104
[305] HYLAND AND MILTON 1997: 190

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Contrary to expectations, the time zone assessed as the most certain in the forest texts is future time. For the past and the present, uncertainty dominates certainty; in both cases the frequency of expressed uncertainty is more than 1.5 times that of expressed certainty. The texts in the agricultural corpus shows a different picture: here all three time zones show a balance of certainty and uncertainty.

The differences in outcomes within and between the sectors cannot be explained by the differences in the year of publication of the articles, as statistical analysis revealed no significant correlations. A further and deeper analysis of the results is therefore necessary. In the next section, the influence of two important variables that might influence the (un)certainty in the different time zones, namely the national culture and the organizational culture, will be discussed.

### 5.2.3 Factors influencing expressed (un)certainty

As stated before, different cultures can differ in their attitudes towards (un)certainty. Table 9 shows the results of the (un)certainty for the different time zones, now differentiated for the cultural background (Germanic Central Europe and USA) of the two sectors.

**Table 9: (Un)Certainty dominance per time zone, sector and region for the two sectors**

| | Past | Present | Future |
|---|---|---|---|
| Forestry Central Europe | balanced ($t(24) = -0.547$, $p > 0.05$) | balanced ($t(24) = -1.115$, $p > 0.05$) | balanced ($t(24) = 0.509$, $p > 0.05$) |
| Forestry USA | uncertain ($t(24) = -4.970$, $p < 0.05$) | uncertain ($t(24) = -4.462$, $p < 0.05$) | balanced ($t(24) = 0.972$, $p > 0.05$) |
| Agriculture Central Europe | balanced ($t(24) = 0.659$, $p > 0.05$) | balanced ($t(24) = -0.351$, $p > 0.05$) | balanced ($t(24) = 0.334$, $p > 0.05$) |
| Agriculture USA | uncertain ($t(19) = -4.746$, $p < 0.05$) | balanced ($t(19) = 0.604$, $p > 0.05$) | balanced ($t(19) = -0.395$, $p > 0.05$) |

In contrast to the results for the entire forestry corpus, the Germanic Central European forestry texts are balanced in all three time zones. On the other hand, the American forestry texts show the distribution seen earlier: a balanced future, and a past and present dominated by uncertainty. Cultural differences seem to play a role, as both American corpora demonstrate the dominance of uncertainty in relation to the past. This might be related to the difference in attitude of the Americans and the Central European countries towards the past.

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Americans do linger on the past, but live fully in the present and are also future oriented[306]. Central Europeans have a more balanced view on time in which the past forms an important time zone for their decision-making[307]. The knowledge (and with it the (un)certainty) about the past could therefore be different in the two areas.

The uncertainty dominating the present time in the forestry corpus is brought about by the year of publication. The Pearson's r test shows that the older the forestry articles, the more uncertainty was expressed about the present (Pearson's $r = -0.555$, $p < 0.05$). This relation is not found in the American agricultural sector, indicating that it is the American foresters who have changed their perception of their present world over time.

The influence of the organizational background of an author on (un)certainty was also tested. The organizational structure within which a person operates greatly influences how decisions are implemented. Because organizations evolve and are shaped by experience, each has built-in mechanisms and decision rules for coping with uncertainty[308]. All the forest authors were therefore classed according to their background, into either (1) state forest service, or (2) private organization/company. The only difference found was between private and state forestry in Central Europe (see table 10); for the authors in state forestry, the present is dominated by uncertainty, as is the case for the American authors in the forestry sector.

**Table 10: (Un)Certainty dominance per time zone, region and organization for forestry**

| | Past | Present | Future |
|---|---|---|---|
| Central Europe private | balanced ($t(6) = 1.332$, $p > 0.05$) | balanced ($t(6) = 0.426$, $p > 0.05$) | balanced ($t(6) = 0.480$, $p > 0.05$) |
| Central Europe state | balanced ($t(16) = -1.024$, $p > 0.05$) | uncertain ($t(16) = -2.276$, $p < 0.05$) | balanced ($t(16) = 0.115$, $p = 0.05$) |
| USA private | uncertain ($t(13) = -3.963$, $p < 0.05$) | uncertain ($t(13) = -3.322$, $p < 0.05$) | balanced ($t(13) = 0.911$, $p > 0.05$) |
| USA state | uncertain ($t(9) = -2.641$, $p < 0.05$) | uncertain ($t(9) = -2.478$, $p < 0.05$) | balanced ($t(9) = 1.224$, $p > 0.05$) |

306 BRISLIN AND KIM 2003: 375
307 TROMPENAARS 1993
308 CYERT AND MARCH 1963: 167; HOFSTEDE 2001; SCHWEITZER 1977 :216

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## 5.3 Reflections on the results

The results of this explorative study should be interpreted with great care. The conclusions of this research are based solely on an analysis of texts and this approach can certainly be criticized. The content analysis, for example, did not measure foresters' perceptions of uncertainty nor the actions they took to cope with the uncertainty. Instead, it focused on written communication in which the expressed (un)certainty is in fact already the outcome of the author's perception and matching coping strategy. The choice of approach was nonetheless logical: empirical research on uncertainty in forestry is new and texts are generally considered to provide excellent ways to make sense of cultural patterns of groups, institutions, or societies[309]. The method is therefore well developed and widely used in the social sciences, though in forestry research it has so far received only limited attention.

However, what the case clearly shows is that although the future is by definition unknowable (and thus uncertain), high levels of uncertainty were not found in forestry, not even for the future time. On the contrary, the future was the most certain time period. It seems that foresters reduce all change and chance events to some equivalent of certainty, for example through the use of a broad range of analytical, deductive and explanatory approaches[310]. This strategy has already been reported to widely persist. As DAWES (1988: 256) writes:

> *"We often dread uncertainty. A common way of dealing with uncertainty in life is to ignore it completely, or to invent some 'higher rationale' to explain it, often a rationale that makes it more apparent than real . . . In fact, we even tend to deny the random components in trivial events that we know to be the result of chance."*

Several authors[311] have claimed that foresters also employed this strategy of coping with uncertainty, i.e. by suppressing or ignoring the uncertainty. Until now, however, empirical evidence of this was lacking.

These findings clearly show that when foresters face an uncertain future they enact an environment or model of the world that is consistent with their own ideas and rules, but which, however, does not necessarily correspond to any objective reality[312]: the objectively highly uncertain future proved to be the most certain time period. This is also what other researchers have found: people's perceptions of their environment are often highly

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309 WEBER 1990

310 GOLDBERG 1985: 188

311 see for example CLEAVES 1994; CLIFF 1963; LUNDGREN 1984; LUNDGREN AND THOMPSON 1972

312 WEICK 1995

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inaccurate[313]. But exactly this subjective evaluation of the situation, rather than the objective properties of that situation[314], forms the basis for actions. This is in sharp contrast to the "perceptual accuracy" that is grounded in the traditional rational models in which situations or problems have to be perceived accurately to solve them[315]. But this is precisely what sensemaking is about: people do not need to perceive a situation or problem accurately to solve it; they can act effectively on the basis of their understanding of a situation. Sensemaking is not about accuracy and getting it right, but is rather about plausibility[316].

Several authors warn of the dangers of this strategy of ignoring or distorting uncertainty; it might create the false impression of greater control[317]. BORCHERS (2005: 44) has even labelled this pretence of future certainty *"a fool's errand"*, as it may result in suboptimal[318] or even poor decisions, missed goals and opportunities with high costs in terms of unwelcome surprises[319] and may lead to the misallocation of intellectual, financial and physical resources[320]. However, using sparse and imprecise information foresters have to make decisions that have far and long-reaching, sometimes irreversible impacts[321]. And often, the only way to make sense of such a situation and to come to a decision is to keep within cognitive boundaries and fall back on strategies in which uncertainty is ignored or suppressed.

313 BAZERMAN 2001; GILOVICH ET AL. 2002; HAMMOND ET AL. 1998; KAHNEMAN ET AL. 1982; MEZIAS AND STARBUCK 2003; SUTCLIFFE AND WEBER 2003; WINTER 2003
314 DAFT AND WEICK 1984; WEICK 1995; WEICK 2006
315 WEICK ET AL. 2005: 415
316 WEICK 1995
317 CLAMPITT AND DEKOCH 2001: 28
318 HALPERN ET AL. 2006: 13
319 ROWE 1998: 106
320 CLEAVES 1994: 3
321 PRICE 1989: 113; SCHNEIDER ET AL. 1998

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# 6 Discussion

*"The important thing is not to stop questioning"*

Albert Einstein (1879 - 1955)
German-American physicist, Nobel Prize for Physics in 1921

Following on from the three empirical chapters, this chapter discusses the findings of the three case studies and places the research itself in a broader context. The first part of the discussion is a reflection on the question of how foresters cope with the uncertain future; the results of this reflection are discussed in light of the theoretical arguments and the methodological approaches advanced, and in comparison with the findings of other studies. In the second part, the implications of these findings for long-range planning in forestry are discussed.

## 6.1 Coping with the uncertain future in forestry

### 6.1.1 The (far) future in forestry

Using a mix of theories, methods and empirical cases, the way foresters cope with the uncertain future has been critically investigated. This plural approach was chosen as there is no single best, let alone single all-encompassing perspective for researching the complexity of the topic of time and uncertainty in forestry. Selecting only one element of this broad field would have eliminated, or at least reduced the access to this field. The pluralism offered a chance to transcend three of the major themes of planning in single (narrower) cases. None of these rather explorative cases was adequate for the task alone, but taken together the cases empirically show how foresters cope with the intrinsically unknowable future in their actions and what this means for long-range planning in forestry.

First of all, the time perspectives of foresters, explored in the first case study, underscore the essentially relatively "short-range" nature of the actual practice of long-range forestry planning. This is not only the case in forestry, as TREGOE AND ZIMMERMAN (1980: 24) found

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in their study of 200 major organizations all over the world: *"Long range planning is really more short range than anyone cares to admit"*. Many researchers attribute such short-termism to the uncertainty and instability of the highly dynamic environment in which companies have to function, but the empirical evidence for this is mixed[322]. LINDSAY AND RUE (1980) and JAVIDAN (1984), for example, found no relationship between planning time spans and external stability. KUKALIS (1991), on the other hand, found that planning horizons were shorter in unpredictable markets with high levels of innovation and competition. Furthermore, WELLS ET AL. (2004: 222) noted that small organizations frequently shortened planning horizons or even scrapped long-term planning entirely, due to ever changing conditions.

But although the future in forestry may not stretch as far into the future as widely believed, for most foresters it is still the basis for their actions, as shown in the second case study on time orientations. This means that in principle, actions in forestry are not only merely a continuation of the past and present, but are also based on foresters' future expectations. This seems to be in sharp contrast to what for example GLÜCK (1987) stated and MYERS (1997) feared for forestry. Both describe the forester as conservative, basing his actions on experiences from the past and the present[323], looking for stable social values and institutions, such as tradition, morals, religion and family[324]. However, when one looks more closely at the content of the future, this description may be not too far from reality: in terms of uncertainty, this is not a future that is full of uncertainties, as one would expect. In contrast, the third case study on (un)certainty shows that in forestry it is the future that is the most certain time period. Foresters try to seek certainty and enact a stable world, even when they know that it is not, in order to create a feeling of greater control[325] – a strategy that various scientists, among them forestry scientists – have claimed is already being used in forestry[326]. It seems that the actions are based on one of the possible interpretations of the future: an imagined future which, however, overlooks or ignores the possibility that uncertainty is still around "out there". These findings are again consistent with the observations of GLÜCK (1987) and MYERS (1997), that foresters look for stability and continuity.

This attitude and orientation of the group of foresters is, however, not necessarily different from those of other social groups, as the comparison with the agricultural sector in the third case study shows. The research also showed that there were few national differences affecting the planning practices of foresters. There were not even big differences between classic traditional forestry countries such as Germany, with a great long-standing forestry

322 GRANT 2003; VAN DER HEIJDEN 2004
323 GLÜCK 1987: 159; MYERS 1997: 243
324 GLÜCK 1987: 159
325 CLAMPITT AND DEKOCH 2001: 28; WEICK 1995: 153
326 BORCHERS 2005: 44; DAVIS AND JOHNSON 1987: 197-198; PRICE 1989: 113

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tradition and culture, and small forestry countries such as the Netherlands. This might be partly due to the fact that the forest planning practices in all the countries researched can be traced back to traditional forest planning as developed in Central Europe in the 17th and 18th centuries. Furthermore, despite the many differences between them, all the countries investigated belong to a "Western culture", sharing the same social norms, ethical values, traditional customs, etc. HOFSTEDE (2001), for example, found that when looking at the importance countries attach to the future versus the past and the present, many Asian countries (especially China, Japan and the four Asian tigers) score especially high, whereas Western nations in general score rather low and many of the less developed countries score even lower. Similar differences were also found by HARRISON ET AL. (1994). HOFSTEDE (2001) characterized the cultural values of the Anglo-American society relative to East Asian society as placing a greater emphasis on quantitative and analytical techniques in planning and control. By contrast, the cultural values of East Asian society were associated with a greater emphasis on long-term planning. This means that the planning practices in forestry in non-Western cultures might be different from what was found in the research reported in this thesis.

All in all, it can be concluded that the vision of the (Western) forester as a "visionary futurist" is an illusion. The futurity of actions taken is only limited, and the forestry sector does not seem to substantially differentiate from other social groups. It can therefore be concluded that the doctrine of the long run definitely falls in the realm of ideological myth-making.

### 6.1.2 Coping with uncertainty

What then do these findings say about the way how foresters cope with uncertainty? All three case studies show that the traditional rational (and instrumental) approaches to action are unable to provide an explanation. This is most clearly seen in the lack of a unique and predefined meaning of the environment on the one hand and, on the other hand, in the lack of intentionality[327]. As regards the lack of an "objective" environment, the case studies show that foresters make an interpretation of the world that forms the base for their actions. This interpretation of the world is not necessarily an accurate perception of the world. This is clearly shown in the case study on (un)certainty, in which the future time was the most certain time zone, although objectively this is the most uncertain of all three zones. The rational models, however, assume that there is one reality that correctly describes the "facts of the world". The rational models also assume intentionality: actors perform decisions

[327] BONIFACIO AND PONTE 2004

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before acting, and actions are intended as means to achieve goals[328]. But not all actions of foresters are the results of a decision process; they can also be the consequences of rules or routines (as seen in the case study on time perspectives).

Instead, the essential processes used when foresters cope with uncertainty are better described in terms of sensemaking. To demonstrate the relevance and suitability of the conceptual lens suggested by the sensemaking concept, a recapitulation of the findings of this research in relation to the different characteristics or properties of sensemaking is helpful (although the latter are empirically almost impossible to separate).

Sensemaking is about **identity** and identity construction. From the perspective of sensemaking, *"who we think we are (identity)* [ ] *shapes what we enact and how we interpret, which affects what outsiders think we are (image) and how they treat us, which stabilizes or destabilizes our identity"*[329]. The findings of this research, however, show that, although in forestry the image of foresters as visionary futurists seems to be prevalent, the reality is different. One could even speak of a "false identity". Foresters are not alone in this. When analysing a surgery programme in an English hospital, WEICK ET AL. (2005) found that the identity the surgeons constructed was that of people learning complex surgical procedures in the context of unusually challenging cases. However, they omitted in this identity that the resources they used for learning were minimal (not collecting date about prior performance, not soliciting input from colleagues, no observance of the work of others, etc.). This resulted for almost 14 years in a mortality rate roughly double the rate of any other centre in England[330]. These outcomes, however, are not to the prejudice of the concept of sensemaking: on the contrary, they merely show that identity is an issue of plausibility rather than accuracy, just as is the case for many issues that involve sensemaking[331]. The image of the forester as a visionary futurist gives the forestry community a way to engage in constructing meaning in their profession, even when it is a false image.

The aspect of the (false) identity also shows the importance of the structural context of sensemaking. The image of the visionary futurist is one that has been integrated into and institutionalized in the forestry profession for several decades. It has functioned as a *"mental model"*, which has gained stability and legitimacy, and which has become the cornerstone for reality definition, steering sensemaking and occasions for sensemaking, and determining behaviour – at least expected behaviour – by providing the templates and logics of action. At the same time, this (false) identity could only continue to exist through being continuously reinforced through interaction and communication by the foresters themselves.

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328 BONIFACIO AND PONTE 2004
329 WEICK ET AL. 2005: 416
330 WEICK AND SUTCLIFFE 2003
331 WEICK ET AL. 2005: 416

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In other words, the identity of foresters as visionary futurists functions both as the input for and the outcome of sensemaking.

One of the other salient threads that run through all of WEICK'S (1979) analyses of sensemaking is the **retrospective** nature of sensemaking: *"How can I know what I think until I see what I say?"*[332]. He states that people make sense by looking back at events in order to learn and "unlearn" things for the present and the future[333]; it is the retrospective action of capturing a moment in the continuous flow of reality. The findings of this research confirm the importance of the past for foresters, as seen in the second case study on time orientations, from which it was concluded that foresters use the past to assign meaning to future actions.

The research also clearly shows the **enactment** characteristic of sensemaking: when foresters engage in the sensemaking of an uncertain future, they produce and create an environment or model of the world that is consistent with their own ideas and rules. Enacting involves shaping the world as well as stirring the world so that it yields what the foresters then treat as "answers"[334]. This research shows that the majority of the foresters create two models of the worlds in their coping with the uncertain future: one (conscious) model of the world in which they can handle the far off and uncertain future excellently (the model of the visionary futurists) and one (unconscious) model of the world in which the future is reduced to a shortened and more certain version.

This first model of the world in particular shows the **social** and **ongoing** character of sensemaking. Through the actions within the forestry sector, the interpretations attributed to actions and reactions and the communication about them, the image of the visionary futurist has become an "objective reality"[335] shared by most, if not all, of the forestry community. There is no doubt that this is only possible in a social and ongoing interaction between foresters.

The characteristic of sensemaking being **focused on and extracted by cues** is more difficult to find in this research. These cues, the *"simply, familiar structures that are seeds from which people develop a larger sense of what may be occurring"*[336] can only be found by analysing the process of actions, which was not part of this research. In practice, almost anything can be taken as a cue if/when someone extracts this "anything" and assigns possible relevance to it[337]. The cues that foresters notice are influenced by the beliefs, values

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[332] WEICK 1979: 5
[333] GIOIA ET AL. 2002: 622; NATHAN 2004; SCHUTZ 1967; WEICK 1995: 17
[334] WEICK 2006: 1729
[335] CHOO AND BONTIS 2002
[336] WEICK 1995: 50
[337] NIELSEN 2006: 71

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and ideas embedded in the views they hold, and form the basis on which they create their realities. The doctrine of the long run seems to have an important and dual role in this: on the one hand by helping to extract certain cues (i.e. shaping key sensemaking reference points), on the other hand by providing a crucial cue (i.e. by being a key reference point) for others to extract. This is probably one of the reasons that this doctrine still survives in the forestry of many countries.

The point about sensemaking being driven by **plausibility** rather than by accuracy is amply illustrated in this research. As explained before, foresters create a picture of the future that is (relatively) short and certain, even though this picture does not fit with the objective reality. Other studies have reported similar findings: people's perceptions of their environment are often highly inaccurate[338]. This (subjective) picture, or view on the world, as created by the foresters is, however, sufficient for them to base their actions on it and cope with the uncertain future[339]. A *"good story"* that is pragmatic, coherent, reasonable and instrumental satisfies[340]; it does not have to be a perfect, flawless reflection of reality.

All in all, the findings of this research show that the essential processes used when foresters cope with uncertainty in their actions can be meaningfully described in terms of sensemaking. But in general, too, sensemaking can be considered to be the birthplace for foresters' actions; sensemaking sets the frame for their actions, it becomes the basis for envisioning the future and it creates the communication context for linking with others. So, despite the modest amount of empirical work on sensemaking[341], especially in forestry where – apart from this research on time and uncertainty – it has been limited to the field of forest firefighting[342], the sensemaking approach provides a very promising direction of development for research in forestry.

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338 BAZERMAN 2001; GILOVICH ET AL. 2002; HAMMOND ET AL. 1998; KAHNEMAN ET AL. 1982; MEZIAS AND STARBUCK 2003; SUTCLIFFE AND WEBER 2003; WINTER 2003

339 DAFT AND WEICK 1984; WEICK 1995

340 WEICK 1995: 57

341 WEICK ET AL. 2005: 417

342 for example WEICK'S (1993) famous re-analysis of the Mann Gulch disaster, which occurred in 1949 when a wildfire in the Helena National Forest, Montana, United States, spread out of control and claimed the lives of 13 forest firefighters

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## 6.2 The future of long-range planning in forestry

### 6.2.1 Current planning and its consequences for forest management

Considering the findings of this research – that the futurity of actions in forestry is only limited – there is of course the question of how the way foresters cope with the uncertain future influences forest management and its quality.

Many scientists have argued that it is essential to know how to involve uncertainty in forestry. PRICE (1989: 112) even calls the ignorance of uncertainty in forest management irresponsible, while BORCHERS (2005: 44) talked about a fool's errand. However, no empirical research has been carried out on the impact of the planning practices on forest management. In the area of strategic management on the other hand, many empirical studies have been done on the impact of strategic planning on firm performance, but interestingly these studies have not produced robust findings[343]: as RAMANUJAM ET AL. (1986: 347) have observed: *"The results of this body of research are fragmented and contradictory"*.

One the one hand there is the opinion that the overall effect of long-range planning is very weak[344]. Seeing further is not necessarily always the same as seeing better. Different researchers describe the game of chess as an interesting analogy. Moderately skilled chess players may look only one or two moves ahead[345]. Even grandmasters and Deep Thought (the most sophisticated chess-playing computer program), do not look very far ahead while playing excellent games[346]. CHARNESS (1981) and SAARILUOMA (1990) found that in chess the significant factor is not the depth or extent of the search that is carried out, but in what continuations the search is. If this is indeed the case, one can question the functionality of long-range planning in general. One should not forget, however, that long-range planning has more functions, and that then *"the plan and the planning process itself themselves are the function"*[347]. For example, planning can act as an identity formation tool, establishing a direction for the people working in an organization, and can also be important for communication and consensus building. OESTEN (1984), for example, has pointed out that the interactive, social processes inherent in long- range planning in forestry might be of greater importance to the result than the planned goals themselves. As the German proverb says *der Weg ist das Ziel*, i.e. the journey itself is the destination. The planning process provides a platform to share the purpose behind the objectives by, for example, achieving

[343] GRANT 2003: 492
[344] BOYD 1991
[345] CHARNESS 1981; SAARILUOMA 1990
[346] GIRAUD 2007: 2; GRAY AND GEANAKOPLOS 1991; VAN DER HEIJDEN 2005: 97
[347] CLARKE 2001: 13

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consensus among those involved. In practice, planning carries both values; any planning is at some level functional, and to a certain extent symbolic as well[348].

Research on perceptions and strategy has also concluded that long-range planning positively influences firm performance[349], or that it is likely to be critical for effective problem solving in some – if not all – instances[350]. A renowned example is Royal Dutch/Shell, who – as a result of thinking far ahead – was able to move immediately and well ahead of their competitors when the oil crisis struck in 1973. This determined their position as one of the top 5 multinational oil companies in the following decades[351].

Following this line of the research, the question that arises is what a contemporary paradigm to strengthen foresters' future orientation would look like. However, little research has been done on whether one can develop methods to increase or change future-oriented thinking of persons. It appears that it might be possible to modify certain aspects of an individual's temporal orientation[352]. Suggestions for encouraging more future-oriented thinking in organizations have usually taken very tangible forms, such as a modification of the compensation system to include performance criteria for long-term corporate objectives[353]. More intangible is the idea to develop individual sensemaking traits. All foresters try to make sense of the world and try to understand how it functions by reflecting on their experiences and reconstructing the key events. By focusing on those features that enhance sensemaking in general, one would also enhance foresters' capability to make sense of (and cope with) the uncertain future.

### 6.2.2 Enhancing sensemaking in forestry

In his analysis of events surrounding the Mann Gulch disaster, WEICK (1993: 16) identified four principles, tenets or features that allow for effective response in rapidly changing, uncertain conditions: (1) improvisation and bricolage; (2) virtual role systems, (3) the attitude of wisdom and (4) respectful interaction. When in place, these four facilitate the sensemaking that is required to comprehend and respond to change and uncertainty. The first principle of improvisation is closely linked to that of bricolage[354], i.e. the ability to make do with available resources, and create new forms and order from the tools and materials at

[348] GAUTHERAU AND HOLLNAGEL 2005: 128
[349] MILLER AND CARDINAL 1994
[350] MAULE AND HODGKINSON 2003; MEZIAS AND STARBUCK 2003
[351] VAN DER HEIJDEN 2005: 5-6
[352] BLUEDORN AND DENHARDT 1988: 308; DAS 1987: 207
[353] DAS 1991: 56
[354] following LEVI-STRAUSS 1966

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hand[355]. The concepts are linked because improvisation means that one has to act in an extemporaneous and spontaneous way to respond to changing needs and conditions, and improvisers cannot wait for optimal resources to be deployed; they have to tackle the issues at hand with currently available resources[356]. Therefore, when improvisation happens, then bricolage will too[357]. For forestry, this would imply that centralized, hierarchical decision-making with a high dependency on rules, regulations and restrictions which is often still carried out in forest management agencies could be replaced by a more decentralized, adaptive, bottom-up, and cooperative actions style of decision-making.

The second principle, virtual role systems, describes an advanced form of work team relationships. A virtual role system describes the ability of a forester to visualize how the entire team (organization) in which he works functions, and not just his role in the team (organization). This not only allows foresters to fill in for a member of the group who is physically or cognitively absent, but also to use the virtual system for continued guidance of their own individual action[358].

The third capacity is wisdom, which describes the ability to question what is known, to appreciate the limits of knowledge and to seek new information[359]. Wise people realise that absolute knowledge is unattainable and that full understanding of phenomena is not possible, thereby acknowledging uncertainties, thus saving them from falling into the trap of misplaced overconfidence or – when a sense of helplessness paralyses their ability to act– restrictive over-caution[360]. This is exactly what CLEAVES (1994: 3) means when arguing that in forestry one should have to identify, explain, and even quantify different sources of uncertainty as this helps foresters to find a balanced path between "analysis paralysis" and "impulsive reaction".

Fourth, "respectful interaction" means being open to the beliefs and actions of others (trust), being open about one own beliefs and actions (honesty) and integrating them with the reports of others without devaluing them or yourself (self-respect)[361]. In dynamic settings such as forestry, respectful interaction is an important way to make sense of and coordinate responses to rapidly unfolding events. When faced with an unexpected event which runs counter to existing structures and plans (e.g. a storm or a beetle outbreak), face-to-face

[355] BAKER ET AL. 2003; LANZARA 1999; LOURIDAS 1999; WEICK 1993
[356] CUNHA ET AL. 1999; WEICK 1993; WEICK 1999
[357] KENDRA AND WACHTENDORF 2003: 42
[358] KENDRA AND WACHTENDORF 2003; WEICK 1993
[359] KENDRA AND WACHTENDORF 2003: 42
[360] WEICK 1995; WEICK 1996
[361] WEICK 1995; WEICK 1996

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synthesis of meaning (with fellow foresters within the same organization or in other organizations) is an important way of comprehending what is going on and of reacting to it.

In the forestry community, these four characteristics are to a certain extent already fostered (albeit unconsciously). The many excursions that now take place in the forestry sector in various countries form a good example of an activity in which all four sensemaking principles are encouraged. During these exchanges of information, different situations foresters can or do encounter are analysed collaboratively by (re)constructing the situations in the field, reflecting on the resources at hand and working out the reasons behind the possible actions that could be taken. These kinds of exercises stretch foresters' sensemaking capabilities.

Another very promising tool for developing these sensemaking qualities is scenario thinking[362]. Scenario thinking recognizes that in dynamic environments the future cannot be known and cannot be accurately predicted, but that it should not be ignored[363] as it is still to be created[364]. Traditionally, scenario thinking has been referred to as scenario planning. Scenario planning was brought to most people's attention through WACK's articles (1985a; 1985b) describing Royal Dutch/Shell's use of scenarios during the 1970s and 1980s to provide top management with better information about environmental changes in the form of scenarios[365]. In this approach, scenarios describe futures that could be (rather than will be)[366] and have, as their primary objective, *"to encourage long-term strategic thinking about the business in the light of underlying technological, political and business trends"*[367]. They operate, in other words, as "sensemaking" strategies. There is, therefore, increasing recognition that the process of building scenarios has value that goes beyond that of a mere planning tool for improving foresight[368]; it functions not only as a tool to evaluate and select strategies by exploring the future and identifying future possibilities, but also to make managers aware of environmental uncertainties, to stretch managers' mental models and trigger and accelerate processes of learning[369]. For this reason, the term scenario planning has increasingly been superseded in the literature by scenario thinking[370], to reflect its role in cognitive processes[371] and the importance of individual reasoning techniques in interpreting

362 MACKAY AND MCKIERNAN 2006: 94
363 BERNSTEIN ET AL. 2000
364 GODET AND ROUBELAT 1996
365 DAS 1991: 56; GRANT 2003
366 RASKIN ET AL. 1998; VAN DER HEIJDEN 2005
367 GRANT 2003: 502
368 MACKAY AND MCKIERNAN 2004: 162-163
369 BOOD AND POSTMA 1997: 634
370 MACKAY AND MCKIERNAN 2004; VAN DER HEIJDEN AND SCHUTTE 2000
371 GRINYER 2000; MACKAY AND MCKIERNAN 2004; SCHOEMAKER 1991

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the past, considering present events and processes and perceiving the future[372]. Scenarios can be seen as vehicles for mental experimentation through which foresters could make better sense of their alternative future environments by incorporating uncertainty and the unexpected[373]. They can then examine the consequences of possible future changes and consider how to cope with such alternatives[374].

### 6.2.3 Scenario thinking in forestry

Although the scenario methods literature is replete with examples of applications about forests and forest management[375], these applications mostly use a quantitative and formal method of constructing and analysing scenarios (e.g. by using statistical analyses and other forecasting techniques, often based on rational, scientific information)[376]. It is, however, precisely the more qualitative, "soft" approach of scenario thinking, with intuition and creative thinking as central elements, which makes scenario analysis such an interesting tool for training foresters to develop future orientation, a prerequisite for effective strategic planning[377]. As WACK (1985a: 84) has explained, good scenarios focus not so much on predicting outcomes, but on understanding the elements that may force an outcome; they focus not so much on figures, but on foresight. And this type of scenario thinking has until now not been used much in forestry. This approach, however, would be an excellent supplement to or possibly even a replacement of the "adaptive management" approach, which has emerged during recent decades as an important paradigm for forest management around the globe.

The adaptive management approach is generally understood to be a systematic process for continually improving management practices over time by emphasizing learning through experimentation. Those who use the approach acknowledge the uncertainty inherent to forest management[378]. The actual outcomes of management actions are monitored in order to identify when and why management activities fail to be implemented as planned or do not produce the expected outcomes. The management planning step is then revised to

372 MACKAY AND MCKIERNAN 2004: 163
373 WRIGHT 2005: 95
374 WACK 1985a; WACK 1985b
375 WOLLENBERG ET AL. 2000b
376 see for example MOHREN 2003; NABUURS ET AL. 2000; OHLSON ET AL. 2005
377 BUNN AND SALO 1993; WOLLENBERG ET AL. 2000b
378 WALTERS AND HOLLING 1990

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incorporate new information gained from the monitoring step, and new management plans are developed. It allows managers to remain flexible and adapt to uncertainty[379].

Adaptive management, however, means first and foremost matching the real situation to the desired situation, based on previous experiences[380]. Therefore it is sometimes seen as a too reactive approach: given the many surprise events nature and society throws at us, forest management soon spirals into a never-ending series of ad hoc actions that keep its foresters busy[381]. And when adaptive management does involve the design of a strategy considering explicitly all that has been learned, it relies on understanding the kinds of uncertainty being encountered, and their likely effects. This is the uncertainty one knows about, and so to some extent can plan for. The danger is that one may overlook the fact that nature and people are co-evolving and are affecting each other in novel ways, and on such a large scale, that what is learned is of little use, if any, anymore. In contrast, by helping to see things in new ways, scenarios can be a basic and powerful tool for learning, particularly for anticipatory or forward-looking learning. Scenarios are considered to help to overcome the strong tendencies for people to believe that the future will repeat the patterns of the recent past, which can be a problem with adaptive, monitoring-based learning[382].

Applying scenario analysis in forestry may require substantial shifts in the cognitive-cultural institutions in forestry. According to WACK (1985a), the main challenge is that foresters also internalize scenarios and scenario thinking. Within this context WACK (1985a; 1985b) speaks, among other things, of *"changing the manager's microcosm"* and *"the gentle art of reperceiving"*. SCHOEMAKER (1993) refers to this as *"changing managerial landscapes"* and *"shifting the anchor from which people view the future"*. The problem is that many individuals rely for their decision making on cognitive inertia that has become so embedded in an individual's decision-making process that it makes the individual unable to think beyond these models and guides to thinking and acting, as for example is the case in current future thinking in forestry. Commitment to these recipes tends to escalate in a smooth, undisturbed fashion, with incremental adjustments or improvements to current strategy over time. But it may make individuals fail to notice changes, until these changes have become so widespread or so significant, that it is already too late to adapt[383]. This means that in order to be effective, foresters must clearly understand and also internalize scenario thinking, which can only be reached when true learning occurs[384]. As described by WACK (1985b: 140):

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379 HOLLING 1978; WALTERS 1986
380 WOLLENBERG ET AL. 2000b
381 ROGERS 1998
382 WOLLENBERG ET AL. 2000a
383 HODGKINSON AND WRIGHT 2002: 949
384 WACK 1985b: 140-142

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> *"Scenarios deal with two worlds: the world of facts and the world of perceptions. They explore the facts but they aim at perceptions inside the heads of decision makers. Their purpose is to gather and transform information of strategic significance into fresh perceptions. This transformation process is not trivial—more often than not it does not happen. When it works, it is a creative experience that generates a heartfelt 'Aha!' from you* [decision makers] *. . . and leads to strategic insights beyond the mind's previous reach. I have found that getting to that* [decision makers'] *'Aha!' is the real challenge of scenario analysis. It does not simply leap at you when you've been presented all the possible alternative.* [ ] *It happens when your message reaches the microcosms of decision makers, obliges them to question their assumptions about how their* [ ] *world works, and leads them to change and reorganize their inner models of reality."*

To what extent learning is possible depends not only on the cognitive boundaries of individuals, but also on the cultural and structural features of the organization in which the individual is working[385]. In this respect, one of the greatest hurdles for organizations is considered to be the change to a corporate culture in which learning is institutionalized[386]. The challenge is therefore, as VAN DER HEIJDEN (2005) states, to convince an organization to invest resources in perceptions, reflection and learning in order to develop a complete philosophy mobilizing the cognition, culture, structure and process throughout an organization. This often requires an almost revolutionary transformation in an organization[387], yet only in this way can the organization as a whole acquire the perceptual skills needed to see, understand and act on the future[388].

This is not to say that scenario thinking is the panacea for long-range planning in forestry[389]. However, by confronting the imagined worlds in their planning foresters have a means to overcome cognitive biases, such as undervaluing that which is hard to remember or imagine, remembering recent events better and giving them more weight, underestimating uncertainties, denying evidence that does not support one's views, overestimating the ability to influence events beyond their control, being overconfident about their own judgements and overestimating the probability of desirable events[390]. Scenarios possibly could give foresters greater confidence in facing the uncertainties of the future; scenario thinking gives

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385 AKGÜN ET AL. 2003; BROWN AND STARKEY 2000; COOK AND YANOW 1993; VAN DER HEIJDEN 2005

386 WILSON 1998: 352

387 WACK 1985b

388 VAN DER HEIJDEN 2005

389 MACKAY AND MCKIERNAN 2004

390 BARNES 1984; BECKER 1983; BUNN AND SALO 1993; SCHOEMAKER 1993

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them more control over their future by sensitizing them to the planning environment and it can help accelerate response rates[391].

### 6.2.4 Not uncertainty, but surprise

Despite all the hardware and software available to understand and act on the future, the practice of forestry must still be regarded as one full of uncertainty, and moreover surprise. Surprise is part of change, and change is essential to life and essential to forestry; insights from complexity science show that the natural state of things is not a state of equilibrium. Surprise is the rule, rather than the exception,[392] as new opportunities are always being created by the system. This is clearly shown by the first case study of this research on time perspectives, in which over 40% of the foresters indicated that they regularly or often had to depart from their planning due to unexpected happenings, especially in the natural environment. Only 4% of the managers stated that they never or very rarely have to depart from what was planned. This means that it is essentially meaningless to talk about a complex system being in equilibrium: *"the system can never get there. In fact, if the system ever does reach equilibrium, it isn't just stable. It's dead"*[393].

Yet the forestry literature has hardly touched on the topic of surprise, even by implication. A library computer search carried out by MYERS (1997) revealed that there have been only a few substantive efforts to explore surprise. With some exceptions[394], it is largely a black hole of research and analysis. This might be because many foresters tend to be conservative and not adept at thinking in terms of sudden changes[395]. Surprises are often considered to be unwelcome and generally dysfunctional occurrences; they are unfavourable departures from past experiences, prompting actions to avoid or manage them. Foresters often try to normalize surprise and deny its existence, or attempt to enact surprise away so that they can know what to do and so that they are not confused by new information[396]. Surprise is often predominantly viewed from a negative perspective, implying a failure or mistake and a threat[397].

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391 MYERS AND KITSUSE 2000

392 GUNDERSON AND HOLLING 2002

393 WALDROP 1992: 147

394 for some preliminary work on surprise in the environmental sphere, see FABER ET AL. 1992; HASSOL AND KATZENBERGER 1995; HOLLING 1995; HOLLING 1996; KATES AND CLARK 1996; MYERS 1996; MYERS 1997; SCHNEIDER AND ROOT 1996; SCHNEIDER AND TURNER 1995; SHANNON AND ANTYPAS 1997; SVEDIN AND ANAINSSON 1987

395 MYERS 1997: 243

396 MCDANIEL AND DRIEBE 2005: 8; MYERS 1997: 243

397 MCDANIEL AND DRIEBE 2005: 8

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Little consideration has been given to the possibility that surprise is something positive, that it provides an opportunity rather than a threat. Surprise can actually provide a window for positive change and an impetus for remedial action[398]. In this respect, forestry itself provides numerous examples. In the Netherlands, for example, the severe storms in the 1970s resulted in such extensive areas of wind-blown stands that immediate clearance and reforestation of the stands was not possible. To much surprise, in many of these areas good natural regeneration took place, leading to an introduction of a more "close to nature" forestry which is now practised by more than 30% of the forest owners and managers[399]. Another example is that of one of the largest and most important Dutch wetland reserves, the Oostvaardersplassen, which developed by accident when land was reclaimed for the Flevopolder at the end of the 1960s. Now, the area has international importance as a European wetland.

This view on uncertainty and surprise as something positive and offering opportunities is exactly what RINDERSPACHER (1994) meant when he said that maybe from a sociological perspective the challenge of the future is to reduce uncertainty and surprise, but from an economic–entrepreneurial perspective the challenge of the future is to increase the degrees of freedom by creating an open future. Some scientists[400] believe that the ability and willingness of forest owners and managers to recognize opportunities and make better use of them might even be a necessity for the future survival of forestry.

[398] DUTTON AND JACKSON 1987; KATES AND CLARK 1996; MCDANIEL AND DRIEBE 2005
[399] HOOGSTRA AND WILLEMS 2005: 472
[400] RAMETSTEINER AND WEISS 2006

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# 7 Conclusions and recommendations

*"I may not have gone where I intended to go,*
*but I think I have ended up where I needed to be"*

Douglas Adams
English humorist & science fiction novelist (1952 - 2001)

This final chapter of the research brings all the threads of the research together and ties up all the loose ends. It does so in the first part of the chapter by looking back at what this research has contributed to the question of how foresters cope with the uncertain future and what this means for the practice of long-range planning in forestry. The second part of the chapter looks forward and focuses on aspects that cropped up but were not covered by this research, yet merit further exploration in order to gain more insight into forestry planning.

## 7.1 Conclusions

The forestry community has always argued that it is well capable of handling the long time horizons and the uncertainty arising from them. The forestry literature even talks about a "doctrine of the long run", describing the forester as a "visionary futurist", someone who can overcome the barriers of the uncertain future, and look ahead and plan for long-range goals. However, during recent decades, doubts have arisen about the basis of long-range planning: in particular, the ability to make meaningful predictions about a far-off future in such a dynamic world has been disputed. Long-range planning has even been called a "mirage" and an "illusion".

This research is the first empirical study to show that these doubts are justified. Responding to an absence of hard facts about the future, and confronted with so many un-analysable and intangible uncertainties, foresters can only make sense of the future by creating a world they do understand. They do that, first of all, by shortening their time perspectives. Although foresters have a long-term vision (or image of reference) spanning several decades, the futurity of the actions taken is much shorter. In common with other human beings, to

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foresters, 15 years seems to be the most distant horizon to evoke meaningful action; for most foresters, however, even this is still too distant in time.

The foregoing does not mean that actions in forestry are merely a continuation of the past and present. Many of the foresters investigated in this study have an orientation towards the past, which means that the past is important, but among the group as a whole, the dominant time orientation is the future. This means that they also base their actions on the future. Contrary to expectations, however, the future is not full of uncertainties. Foresters try to seek certainty and enact a stable world – even when they know that it is not – in order to create a feeling of greater control. As described by CYERT AND MARCH (1963: 120), each forester will *"devise and negotiate an environment* [ ] *and make the environment controllable"*. They will construct, filter, frame, and create facticity[401], which will help them to define the adequate context or space for action[402], limiting the uncertainty they face[403]. It seems that foresters' actions are based on one of the possible interpretations of the future: an imagined future that overlooks or ignores the possibility that uncertainty still abounds "out there".

These findings also show that the traditional rational (and instrumental) approaches to action do not explain how foresters cope with the uncertain future. Instead, the essential processes used when foresters cope with uncertainty are better described in terms of sensemaking. This can be excellently seen with the different characteristics or properties of sensemaking (although they are empirically almost impossible to separate):

> the importance of *identity* (e.g. the concept of the visionary futurist offers the forester a way to engage in constructing meaning, even when the concept is false),
>
> the *retrospective* nature (the importance of the past for foresters, to assign meaning for future actions),
>
> the *enactment* of the world (foresters create models of the world that are consistent with their own ideas and rules, which are *plausible* rather than accurate). Which can only be done in a *social* and *ongoing* interaction between foresters, which is focused on and extracted by *cues* (as for example the doctrine of the long run).

The implications of the foregoing are that although it is not clear what these planning practices mean for forest management and the quality of such management, the way to enhance how foresters cope with the uncertain future is to focus on developing the individual sensemaking traits (as for example improvisation, wisdom, respectful interaction and communication). Another very promising tool in this respect seems to be scenario thinking, i.e. recognizing that though the future cannot be known, it might be understood. Using

[401] TURNER 1987; WEICK 1995: 14
[402] SCHÖN 1983
[403] DORADO 2005: 389

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scenarios, foresters could imagine alternative futures and examine the consequences of possible future changes. They can then consider how to cope with such alternatives. Scenarios could also give foresters greater confidence in facing future uncertainties, perhaps giving them more control over their future by sensitizing them to the environment. Scenarios could help accelerate response rates. Applying scenario analysis in forestry may require substantial shifts in the cognitive-cultural institutions in forestry. The main challenge is that foresters must understand and also internalize scenarios; this can only be achieved when true learning occurs. Whether this is achieved, however, depends not only on the cognitive boundaries of individuals, but also on the cultural and structural features of the organization in which that individual is working. One of the greatest hurdles to be overcome in this respect is a change to a corporate culture in which learning is institutionalized.

But even if foresters are successful in embracing all skills and techniques to improve their capacity to understand and act on the future, the practice of forestry must still be regarded as one full of surprise. Traditionally, people have viewed surprises as unwelcome and dysfunctional. Little consideration has been given to the possibility of surprise being something that provides an opportunity. From a sociological perspective, the challenge of the future is to reduce uncertainty, but from an economic-entrepreneurial perspective the challenge of the future is to increase the degrees of freedom by creating an open-ended future. The ability and willingness of foresters to recognize changes and make use of the opportunities that arise might even be a necessity for the future survival of forestry.

## 7.2 Recommendations

### 7.2.1 Implications for practice

This research has challenged a commonly held view surrounding the practices of long-range planning in forestry, namely the view of the forester as a visionary futurist, who can overcome the barriers of the uncertain future, and look ahead and plan for long-range goals. Instead, one of the findings of this research is that foresters appear to be grappling with high levels of uncertainty and continuously try to make sense of the uncertainty. This sensemaking is something foresters do instinctively: they continuously reflect on their experiences and communicate their interpretation of the important cues they draw from it – for example, by reconstructing key actions and events that resulted in a successful outcome (such as good regeneration, high quality timber, high visitor numbers, enhanced biodiversity) in order to understand how the outcome was achieved. Similarly, unsuccessful outcomes are analysed and replayed with alternative responses.

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As explained earlier, however, sensemaking does not preclude accuracy or desirability; it is about plausibility. This plausibility is enough for foresters to establish some sort of stability and predictability on which to base their decisions and actions, even though these decisions and actions may seem undesirable in the eyes of others. Unless they encounter a surprise, foresters have no need to review these "mental maps", and will continue to make sense of their situation based on existing understanding. This implies that in order to change the behaviour of foresters (e.g. in favour of a certain policy), the focus should also be on the sensemaking processes of foresters. In this situation, one must attempt to influence the interpretation schemes to enable people to make sense of their situation in a way that promotes the desired values and actions and makes these explicit.

Individual foresters, however, should also be aware that they may see and handle things differently from others. For this reason it is crucial that they communicate and discuss what they do and why they do it. CZARNIAWSKA (2004) calls this the "openness for negotiating meaning". It is through the telling of their "narratives" that foresters not only come to understand themselves, but also invite others into their world, which could create or improve understanding and support for their actions. This demonstrates the importance of good communication in highly sensitive cases in forestry (for example, the often contentious issue of tree felling in urban areas).

### 7.2.2 Implications for research

The findings from this research first and foremost support and advance the call for a refocusing of forest economics research from the rational approaches, to what foresters actually *do* when taking action, namely sensemaking. The importance of the sensemaking framework is presented in this thesis; its explanatory power is demonstrated, as are the empirically based concepts it offers to account for how intended and unintended consequences arise out of sensemaking.

Future research focussing on further exploring the concept of sensemaking in forestry serves two functions, namely (1) to gain insight into foresters' decision-making and actions and (2) to enhance the understanding of the concept of sensemaking itself. As WEICK, who is considered to be the "father" of the concept of sensemaking, wrote in 2005 when reflecting on the future of sensemaking: *"the question of 'future directions'* [in research on sensemaking] *pretty much takes care of itself"*[404]. In other words, almost any kind of empirical work will contribute to a better understanding of sensemaking. A few of the many ways in which present thinking about sensemaking might be enhanced are:

[404] WEICK ET AL. 2005: 417

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- the role of identity. With its insight into the false "long-range planners" identity, this research gives a reason for further exploration of this topic, first of all on the role of true and false identities in sensemaking, and secondly on the identities in forestry and what these mean for forest management. A good starting point in this respect would be research on the doctrine of the long run and its influence on forest management and the quality of such management. Other doctrines in forestry (e.g. sustained yield, timber primacy) also merit attention.
- the different types and sources of uncertainty, and the related strategies and tactics of coping. This research focused solely on the latter, but other researchers have indicated that it is important to research types of uncertainty, as decision makers respond differently to different uncertainties[405]. MILLIKEN (1987), for example, describes the importance of recognizing the possibility that people may experience different types of uncertainty as they attempt to understand and respond to events or changes in the environment. Since different types of uncertainty elicit different types of coping strategies, conflating all these types of uncertainty (as done in this research) might mask important distinctions. Such a masking of differences is of particular concern when the goal of research is to understand the process of environmental interpretation[406], which is the case when using the sensemaking approach. Thus, distinguishing between different uncertainties will provide more insight into the process of sensemaking in uncertain conditions.
- the retrospective nature of sensemaking. Sensemaking is a retrospective activity: in the concept, the attention given to the future is only limited. This research has shown, however, that the way people look at forestry is crucial to the way they make sense of the future. WEICK ET AL. (2005: 409) acknowledge this and state that sensemaking should be more future-oriented, and less sedentary and backward looking.
- the role of routine behaviour. This research has demonstrated the importance of routines and rules in forest management. In WEICK'S (1995) sensemaking approach, however, these automatic, unconscious processes seem to be relegated to the margins; sensemaking is described as a purely conscious, controlled process. An interesting line of development seems to lie with GIOIA AND MEHRA (1996: 1228), who object to this narrow construction of sensemaking and see routine situations also as something we make sense of: *"such slices of our* [ ] *existence are in fact meaningful because they involve episodes of schema matching and schema adjustment, much of which occurs out of awareness"*[407].

[405] LIPSHITZ AND STRAUSS 1997; MILLIKEN 1987
[406] MILLIKEN 1990
[407] GIOIA AND MEHRA 1996: 1228-1229

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Future research on sensemaking should moreover focus on sensemaking in "real" settings. Researchers interested in studying sensemaking need to adopt *"a set of methodological tactics that enables them to deal with meanings rather than frequency"*[408]. An appropriate approach would for example be the observation of actions, for example, in experiments in which foresters are confronted with uncertainty in real (or reality-based) forest management decision-making situations. This is also consistent with the ideas of LIPSHITZ AND STRAUSS (1997) and MARCH (1981), who argue that research on decision-making should be carried out in naturalistic settings, as decision-making is characteristically driven by situation assessment. By contrast, traditional decision-making research on uncertainty and coping with uncertainty has focused on single decision events conducted under laboratory conditions[409]. Single decision events, however, do not reflect complex decision-making that occurs under real world conditions. The experiments on uncertainty carried out in the military sector[410] or from the aircraft industry[411] could serve as an example of how such research could be done. Other options include interviews to reveal sensemaking at the level of the individual, and group discussions to expose sensemaking at the group level. These should preferably deal with problematic situations (for example, uncertain events), about which the participants are asked retrospectively.

Research on sensemaking should moreover be carried out in different national or cultural contexts, including in non-Western cultures, as such comparisons help to better understand the relationship between country/cultural specific beliefs, attitudes, social norms, ethical values and traditional customs, and sensemaking processes.

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408 WEICK 1995: 173

409 ORASANU AND CONNOLLY 1993

410 see for example ST. JOHN ET AL. 2000

411 see for example COHEN ET AL. 2000

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# Appendices

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# Appendix 1 - List of articles analysed

German forestry:

BITTIG, B. [1978] Zukunft der Waldwirtschaft im Jahre 2100; politische and wirtschaftliche Aspekte (The future of forestry in the year 2100; political and economical aspects). In: Schweizerische Zeitschrift für Forstwesen, 129 (1), p. 37-38.

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# Appendix 2 - List of English expressions

| | | | | |
|---|---|---|---|---|
| Modal verbs: | (be) bound to | can't/cannot | could(n't/not) | have (got) to |
| | may (not) | might (not) | must | ought to |
| | should(n't/not) | will (not) | would(n't/not) | will not/won't |
| Lexical verbs: | appear | argue | assume | assure |
| | believe | bet | claim | consider |
| | convince | (not) doubt | ensure | estimate |
| | expect | feel | guess | hope |
| | imagine | indicate | (not) know | look as if |
| | look (like) | predict | presume | reckon |
| | seem | speculate | suggest | suppose |
| | tend | think | threaten | |
| Adverbs: | about | actually | almost | always |
| | apparently | approximately | around | at first sight |
| | beyond doubt | certainly | clearly | commonly |
| | definitely | doubtless | essentially | evidently |
| | in reality | generally | hopefully | in fact |
| | frequently | in theory | in X's opinion | in X's view |
| | indeed | indubitably | inevitably | largely |
| | likely | maybe | naturally | necessarily |
| | never | normally | obviously | of course |
| | often | perhaps | plainly | quite |
| | presumably | probably | (un)questionably | possibly |
| | rarely | relatively | seldom | sometimes |
| | somewhat | surely | undeniably | undoubtedly |
| | unlikely | usually | virtually | |

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| | | | | |
|---|---|---|---|---|
| Adjectives: | apparent | certain | clear | definite |
| | doubtful | doubtless | evident | impossible |
| | improbable | incredible | indefinite | inevitable |
| | likely | obvious | plain | possible |
| | predictable | probable | uncertain | (un)questionable |
| | risky | sure | in question | unlikely |
| Nouns: | assumption | belief | certainty | chance |
| | claim | danger | doubt | estimate |
| | evidence | explanation | possibility | hope |
| | idea | opinion | fear | probability |
| | risk | speculation | tendency | uncertainty |

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# Appendix 3 - List of German expressions

| | | | | |
|---|---|---|---|---|
| Modal verbs: | dürfen | (nicht) können | müssen | mögen |
| | sollen | werden | | |
| Lexical verbs: | ahnen | andeuten | annehmen | ausgehen von |
| | aussehen | behaupten | denken | einbilden |
| | erwarten | (er)hoffen | garantieren | glauben |
| | halten für | hindeuten | prophezeien | hoffen |
| | indizieren | (ver)meinen | hinweisen | (er)raten |
| | suggerieren | (ab/ein)schätzen | (er)scheinen | vorhersagen |
| | rechnen mit | überzeugt sein | unterstellen | vermuten |
| | versichern | voraussagen | voraussetzen | spekulieren |
| | weissagen | wetten | wissen | zusichern |
| | (an/be)zweifeln | | | |
| Adverbs: | allerdings | im Allgemeinen | außer Zweifel | annähernd |
| | augenscheinlich | auf den ersten Blick | bestimmt | beinah(e) |
| | ca/circa | einigermassen | etwa | etwas |
| | eventuell | fast | ganz | gegen |
| | generell | geradezu | gewiss | gewissermaßen |
| | immer | infrage/in Frage | manchmal | möglicherweise |
| | mutmaßlich | nahezu | nie | niemals |
| | normalerweise | offenbar | offensichtlich | oft |
| | öfters | oftmals | ohne Zweifel | scheinbar |
| | schier | selten | sicherlich | ständig |
| | stets | so gut wie | tatsächlich | theoretisch |
| | üblicherweise | unbedingt | ungefähr | vermutlich |
| | vielleicht | voraussichtlich | ziemlich | zuweilen |
| | zwangsläufig | zweifellos | zweifelsfrei | zweifelsohne |

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| | | | | |
|---|---|---|---|---|
| Adjectives: | ausgeschlossen | bedenklich | deutlich | definitiv |
| | fragwürdig | endgültig | fest | fraglich |
| | eindeutig | glaubhaft | klar | möglich |
| | rar | sicher | üblich | unabwendbar |
| | unbestreitbar | unleugbar | unmöglich | unsicher |
| | (un)vorhersehbar | unschlüssig | unvermeidbar | unvermeidlich |
| | (un)vorhersagbar | (un)wahrscheinlich | | |
| Nouns: | Abschätzung | Annahme | Anschein | Ansicht |
| | Auffassung | Aussicht | Bedenken | Behauptung |
| | Bestimmtheit | Chance | Einschätzung | Erklärung |
| | Glaube | Gewissheit | Hoffnung | Meinung |
| | Möglichkeit | Risiko | Sicherheit | Erwartung |
| | Überzeugung | Ungewissheit | Wagnis | Spekulation |
| | Vermutung | Verunsicherung | Unsicherheit | Unterstellung |
| | Wahrscheinlichkeit | Zweifel | | |

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# Summary (in Dutch)

Bij elke beslissing die een persoon neemt, vormt onzekerheid een probleem. Dit geldt ook voor beslissingen in de bosbouw. In vergelijking met andere sectoren is het probleem van onzekerheid in de bosbouw echter bijzonder groot. Dit heeft met name te maken met de lange tijdshorizonten in het bosbeheer. Eik en beuk, bijvoorbeeld, hebben omlopen van wel 150 tot 200 jaar. Zelfs fijnspar, die toch tot de snelgroeiende boomsoorten wordt gerekend, heeft een omloop van 40 tot 80 jaar. Geen enkele andere sector heeft met zulke lange termijnen te maken. Echter, hoe verder je in te toekomst kijkt, des te meer factoren spelen een rol, en des te meer onzekerheid ontstaat er.

Over de manier waarop bosbouwers omgaan met deze onzekere toekomst, wordt tegenstrijdig gedacht. Enerzijds is daar het wijdverbreide beeld van de bosbouwer als een "visionaire toekomstdenker": iemand die over de barrières van de onzekere toekomst heen kan stappen, en die ver vooruit kijkt en plant. Dit is de zogenaamde *"doctrine of the long run"*. Anderzijds bestaat juist de overtuiging dat de (verre) toekomst te onzeker is en dat bosbouwers zich daarom vooral op het heden richten. Verrassend genoeg is er tot nu toe in de bosbouw sector weinig aandacht besteed aan deze tegenstrijdige uitspraken. Dat wil niet zeggen dat er niet over tijd en onzekerheid gesproken wordt. De discussie heeft zich echter vooral beperkt tot een beschrijving van het onderwerp als een probleem of als een bijzonderheid van de bosbouw. Empirische bewijzen hoe een bosbouwer nu eigenlijk in de praktijk met de verre toekomst omgaat, ontbreken. Deze studie vult deze leemte en onderzoekt de vraag in hoeverre de *"doctrine of the long run"* inderdaad op waarheid berust.

In dit onderzoek is gekozen voor een andere benadering dan in eerder onderzoek over dit thema. De studie volgt namelijk een actorbenadering, waarin de vraag hoe bosbouwers omgaan met de per definitie onzekere toekomst centraal staat. Dit betekent dat in dit onderzoek tijd niet meer als iets fysisch wordt beschouwd, maar als iets dat in de beleving van personen bestaat. Misschien nog wel belangrijker is het uitgangspunt dat onzekerheid geen onafhankelijke, objectieve variabele is, maar iets dat persoonsgebonden is en leeft in de hoofden van personen. Het is een sociale constructie van hoe iemand de toekomst ziet in termen van "beschikbaarheid" en "maakbaarheid".

Hoewel dit onderzoek een actorbenadering volgt, gaat het in het onderzoek niet om de individuele bosbouwer, maar om de groep van bosbouwers als een totaal. Elk collectief (zoals de bosbouw sector) creëert haar eigen cultuur met haar eigen visie op tijd en onzekerheid, wat weer tot uitdrukking komt in bijvoorbeeld communicatie, rituelen of gedrag. Onderzoek naar de houding van bosbouwers ten opzichte van tijd en onzekerheid

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geeft dan ook niet alleen inzicht in de individuele bosbouwer per se, maar ook in de bosbouw professie in zijn totaliteit.

Startpunt voor het onderzoek vormde een verkenning van de invloed van tijd op menselijk handelen. Twee concepten spelen daarbij een centrale rol, namelijk tijdsperspectieven en tijdsoriëntaties. Met het eerste concept, tijdsperspectieven, wordt de omvang en structuur van iemands psychologische veld in de tijd op een bepaald moment bedoeld. De relevantie van dit concept voor menselijk handelen ligt in het feit dat het tijdsperspectief van een individu gerelateerd is aan het proces van doelformulering en aan andere aspecten van motivatie. Voor dit onderzoek is het belangrijk dat hoe verder in de tijd iemand een bepaald doel ervaart, hoe minder het zijn handelen beïnvloedt. Uit studies is gebleken dat voor de meeste mensen 20 tot 30 jaar (al) te ver in de toekomst ligt om (mede) bepalend te zijn voor wat zij in het heden doen. Dit is in scherp contrast met de lange termijnen waarover in de bosbouw altijd wordt gesproken. De eerste case studie, uitgevoerd onder Duitse en Nederlandse bosbeheerders, heeft daarom de tijdsperspectieven en mogelijke limieten van deze tijdsperspectieven van bosbouwers onderzocht. De resultaten laten zien dat het lange termijn denken in bosbouw niet zo lange termijn is als altijd gedacht: 15 jaar in de toekomst lijkt voor de meeste bosbouwers de grens te zijn als het gaat om hun handelen.

Het tweede concept, tijdsoriëntaties, beschrijft de min of meer stabiele oriëntatie van individuen op het verleden, heden en de toekomst. Het belang van dit concept voor dit onderzoek ligt in het feit dat, hoewel alle drie tijdzones belangrijk zijn voor menselijk handelen, alleen individuen met een oriëntatie op de toekomst deze toekomst ook in hun handelingen lijken mee te nemen. Als er van uitgegaan wordt dat een bosbouwer een visionaire toekomstdenker is, dan zou je dus van hun ook een duidelijke oriëntatie op de toekomst mogen verwachten. De tegengestelde visie, dat een bosbouwer juist meer op het heden is gericht, zou anderzijds een tijdsoriëntatie doen vermoeden waarin het heden centraal staat en de toekomst veel minder belangrijk is. In de tweede case studie onder Nederlandse bosbouwers is daarom ook hun tijdsoriëntatie bepaald. De resultaten laten duidelijk zien dat hun handeling niet beperkt is tot een simpele voortzetting van het verleden en het heden, maar ook gebaseerd is op die toekomst.

Naast deze twee concepten heeft dit onderzoek ook de rol van de toekomst als een bron van onzekerheid onderzocht. Hoewel de toekomst objectief gezien onzeker is, betekent dat niet automatisch dat bosbouwers dit ook zo ervaren. Omdat de manier waarop individuen de wereld ervaren, bepaalt hoe zij handelen, is in de derde case studie gekeken naar de vraag hoe bosbouwers (uit de Verenigde Staten van Amerika en uit Duitstalig Centraal-Europa (Duitsland, Oostenrijk en Zwitserland)) onzekerheid ervaren. De resultaten tonen dat de toekomst in vergelijking met het verleden en het heden voor bosbouwers de meest zekere tijdsperiode is. Dit wijst erop dat bosbouwers zekerheid zoeken en een stabiele wereld creëren, die het hun mogelijk maakt gemakkelijker beslissingen te nemen, zelfs wanneer ze weten dat de toekomst onzeker is.

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De drie case studies hebben hiermee aangetoond dat het beeld van de (Westerse) bosbouwer als een visionaire toekomstdenker een illusie is. Het handelen in de bosbouw wordt alleen in beperkte mate bepaald door de toekomst, en bosbouwers lijken niet veel te verschillen van andere sectoren. De resultaten laten ook zien dat de traditionele rationele modellen die in de bosbouw gebruikt worden om handelen te beschrijven, ook niet verklaren hoe bosbouwers omgaan met onzekerheid. Uit het onderzoek komt naar voren dat het "sensemaking" concept de essentiële processen van het handelen van bosbouwers veel beter beschrijft. Sensemaking omvat alle activiteiten en processen waarmee individuen de werkelijkheid creëren en hier zin aan geven. Als een individu wordt geconfronteerd met iets wat onzeker is, creëren zij een werkelijkheid waarin deze onzekerheid wordt gereduceerd en die de context voor hun handelen vormt. Bosbouwers doen dit door een toekomst te creëren die relatief kort en vol zekerheden zit, die dan weliswaar niet een accurate voorstelling van de werkelijkheid weergeeft, maar voldoende plausibel en stabiel is om hun handelen op te baseren.

Dit zegt echter nog niets over de kwaliteit van lange termijn planning in de bosbouw. De uitkomsten van verschillende onderzoeken zijn niet eensluidend over de manier waarop lange termijn planning de kwaliteit van management beïnvloedt. Mocht men toch de toekomstgerichtheid van bosbouwers willen vergroten, dan zou men zich vooral moeten richten op de individuele eigenschappen die het sensemaking vermogen bevorderen, zoals improvisatievermogen, wijsheid, respectvolle interactie en communicatie. Een veelbelovend instrument is ook "scenario-denken". Met scenario-denken wordt ervan uitgegaan dat de toekomst weliswaar onbekend is, maar zou kunnen worden begrepen. Met scenario's kunnen bosbouwers alternatieve toekomsten bedenken en de consequenties van deze toekomsten overwegen. Ze kunnen dan overwegen hoe met zulke alternatieven om te gaan. Door de confrontatie met verschillende mogelijke toekomsten kunnen bosbouwers vooringenomenheid overwinnen. Scenario's kunnen bosbouwers ook meer vertrouwen geven als het om de toekomst gaat, het geeft hen ook meer controle over de toekomst en het kan ervoor zorgen dat bosbouwers sneller reageren op ontwikkelingen.

Hoewel scenario's al in de bosbouw worden gebruikt, zijn de toepassingen sterk kwantitatief gericht. Het is echter juist de kwalitatieve benadering van scenario's waarin intuïtief en creatief denken centraal staan, dat scenario denken zo interessant maakt. En dit wordt tot nu toe nog weinig gebruikt in de bosbouw. Het zou echter een goede aanvulling of zelfs een vervanging kunnen zijn van het adaptieve management. Dit adaptieve management is een flexibel en aanpassingsgericht beheer op basis van continue aanpassing van beheerrichtlijnen en – maatregelen door het leren van resultaten dat de laatste jaren in de bosbouw een belangrijke plaats heeft ingenomen. De grootste uitdaging daarbij is om de bosbouwers van het belang van ontwikkelde scenario's te overtuigen; bosbouwers moeten de scenario's niet alleen gebruiken, maar ook internaliseren. Dit kan alleen als bosbouwers ook daadwerkelijk een proces van "leren" instappen. In welke mate dit mogelijk is, hangt niet alleen van de cognitieve grenzen van een persoon af, maar ook van de culturele en structurele kenmerken

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van een organisatie waarin die persoon werkt. De grootste horde wat dat betreft, is het creëren van een organisatiecultuur waarin “leren” is geïnstitutionaliseerd.

Zelfs als bosbouwers succesvol zijn alle vaardigheden en technieken die er zijn om de toekomst te begrijpen en er mee om te gaan, te institutionaliseren, is de bosbouw toch nog altijd een praktijk vol met verrassingen. Van oudsher worden deze verrassingen vaak als ongewenst en negatief gezien. Weinig aandacht is er geweest voor verrassingen als iets dat positief is en kansen biedt. Vanuit een sociologisch perspectief is het de uitdaging onzekerheid te verkleinen, vanuit een economisch/ondernemersperspectief is het daarentegen de uitdaging zoveel mogelijk vrijheid te creëren. Juist het herkennen van kansen en het goed gebruik maken van die kansen is de uitdaging voor de bosbouwers. Het zou wel eens het voortbestaan van de bosbouw kunnen bepalen.

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# About the Author

Marjanke Alberttine Hoogstra was born on the 3rd of December 1972 in Stadskanaal, the Netherlands. She graduated in 1996 from the Wageningen University with an MSc in Forestry, specialization Forest Policy and Economics. After graduating, a temporary position as researcher 'Forest Reserves' began at the Institute of Forest and Nature Research (IBN-DLO, now Alterra – Research Institute for the Green Environment) in Wageningen. In 1997, she started a 2 years post MSc program in Decision Making at the Technical University Delft, the Netherlands. The last year of this post MSc degree took place at the Institute of Forest and Nature Research (IBN-DLO), where she carried out a project developing a Decision Support System (DSS) for forestry. After graduating, a research position with the IBN-DLO began within the 'Ecology and Economics' team. In 2001, she started as Assistant Professor 'Business Management' at the Forest and Nature Conservation Policy group of Wageningen University. In 2002 the PhD research on time and uncertainty in forest management was initiated. For this research, in 2005 and 2007 study leaves were granted and visits to the Institute of Forest and Environmental Policy (section Markets and Marketing) and the Institute of Forestry Economics of the Albert-Ludwigs-University in Freiburg, Germany, were carried out. The PhD study was finished in 2008 while working with the Forest and Nature Conservation Policy group of Wageningen University.

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# Training and Supervision Plan

| Description | Year | Credits (ECTS) |
|---|---|---|
| *General courses:* | | |
| • Introductory course Didactics (Wageningen University) | 2002 | 3 |
| • Organizing and supervising MSc theses (Wageningen University) | 2002 | 0.7 |
| • Individual coaching meetings | 2002/2006 | 1 |
| *Multi-disciplinary courses/activities:* | | |
| • Introduction course Mansholt Graduate School of Social Sciences MG3S | 2006 | 1.5 |
| • Multi-disciplinary seminar MG3S | 2008 | 1 |
| • Presentation "Zeit als Aspekt der Unsicherheit in Forstbetriebe", Forstökonomisches Kolloquium, Faculty of Forestry, University of West Hungary, Sopron, Hungary | 2003 | 1 |
| • Presentation "Von der Zukunft lernen? Ein Dialog über die Vorhersage und die Gestaltung der Zukunft von Forst- und Holzwirtschaft", 28. Freiburger Winterkolloquium Forst und Holz, Albert-Ludwigs-University Freiburg, Germany | 2008 | 1 |
| *Discipline-specific courses:* | | |
| • Behavioural economics (MG3S) | 2005 | 4 |
| • Economic Aspects of Forest and Nature Conservation (Forest and Nature Conservation Policy, FNP-32306, Wageningen University) | 2006 | 6 |
| • Entrepreneurship in Forestry in Europe / EU COST E30 "Economic Integration of Urban Consumers' Demands and Rural Forest Production" | 2002 - 2005 | 3.5 |
| • Time and Uncertainty in Forest Enterprises (Forest and Environmental Policy, University of Freiburg, Germany) | 2005 | 5 |
| • Strategic Planning in Forestry (Institute of Forestry Economics, University of Freiburg, Germany) | 2007 | 5 |
| • Research Seminars Forest and Nature Conservation Policy (Forest and Nature Conservation Policy, Wageningen University) | 2002 - 2008 | 3 |
| • Research seminars Forstökonomisches Kolloquium | 2002 - 2008 | 2 |
| *Various teaching and supervising activities at the Forest and Nature Conservation Policy Group* | 2002 - 2008 | 4 |
| *Total* | | *41.7* |

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