Dissertationes Forestales 109

Integrating biodiversity conservation into forestry: an empirical analysis of institutional adaptation

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Academic Dissertation

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Integrating biodiversity conservation into forest management in non-industrial private forests requires changes in the practices of those public and private actors that have implementing responsibilities and whose strategic and operational opportunities are at stake. Understanding this kind of context-dependent institutional adaptation requires bridging between two analytical approaches: policy implementation and organizational adaptation, backed up with empirical analysis. The empirical analyses recapitulated in this thesis summary address organizational competences, specialization, professional judgment, and organizational networks. The analyses utilize qualitative and quantitative data from public and private sector organizations as well as associations.

The empirical analyses produced stronger signals of policy implementation than of organizational adaptation. The organizations recognized the policy and social demand for integrating biodiversity conservation into forest management and their professionals were in favor of conserving biodiversity. However, conservation was integrated to forest management so tightly that it could be said to be subsumed by mainstream forestry. The organizations had developed some competences for conservation but the competences did not differentiate among the organizations other than illustrating the functional differences between industry, administration and associations. The networks that organizations depended on consisted of traditional forestry actors and peers both in planning policy and at the operational level.

The results show that the demand for biodiversity conservation has triggered incremental changes in organizations. They can be considered inert regarding this challenge. Isomorphism is advanced by hierarchical guidance and standardization, and by professional norms. Analytically, this thesis contributes to the understanding of organizational behavior across the public and private sector boundaries. The combination of a policy implementation approach inherent in analysis of public policies in hierarchical administration settings, and organizational adaptation typically applied to private sector organizations, highlights the importance of institutional interpretation. Institutional interpretation serves the understanding of the empirically identified diversions from the basic tenets of the two approaches. Attention to institutions allows identification of the overlap of the traditionally segregated approaches.

Key words: Policy implementation, organizational adaptation, institutions, non-industrial private forestry, professional forester, networks

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Tiivistelmä: Luonnon monimuotoisuuden turvaaminen osaksi metsätaloutta – institutionaalisen sopeutumisen empiirinen tarkastelu

Yksityismetsien hoidon ja monimuotoisuuden turvaamisen yhdistäminen vaatii muutoksia metsien käsittelystä vastaavien julkisen ja yksityisen sektorin organisaatioiden toimintaan. Näiden organisaatioiden ja ammattilaisten institutionaalisen sopeutumisen ymmärtäminen edellyttää kahta tarkastelukulmaa. Politiikan toimeenpanonäkökulmaa on perinteisesti sovellettu arvioitaessa hallinnon hierarkkisten järjestelmien tavoitteiden tai ohjelmien toteutusta, kun taas organisaatioiden sopeutumisnäkökulmaa on tyypillisesti hyödynnetty kaupallisten tarkasteltaessa yritysten muutospaineita ja strategisia valintoja tarkastelussa. Metsäluonnon monimuotoisuuden turvaamisen haaste kanavoituu kuitenkin yksityismetsätalouden toimijoille sekä politiikkana, joka asettaa velvoitteita, että markkinoilla ja yhteiskunnassa esiintyvänä kysyntänä. Keskeisiä toimijoita monimuotoisuuden turvaamisessa ovat julkishallinnon organisaatiot, puuta ostavat yritykset ja metsätalouspalveluita tarjoavat yhdistykset ja yrittäjät. Politiikan toimeenpanon ja organisaatioiden sopeutumisen tarkastelutapojen yhdistäminen mahdollistaa koko organisaatiokentän tarkastelun tuoreella tavalla.

Tämä väitöskirja tarkastelee institutionaalista sopeutumista luonnon monimuotoisuuden eli biodiversiteetin turvaamishaasteeseen yksityismetsätalouden organisaatiokentässä. Työssä on analysoitu organisaatioiden osaamisjärjestelmiä ja erikoistumista, organisaatioverkostoja ja metsäammattilaisten päätöksentekoa. Määrällisten ja laadullisten analyysien aineistona on käytetty yksityismetsätalouden julkisten ja yksityisten organisaatioiden sekä yhdistysten haastattelu- ja kyselyaineistoja.

Tutkimuksen mukaan toimijat noudattivat enemmän politiikan toimeenpanon kuin organisaatioiden sopeutumisen logiikkaa. Biodiversiteetin turvaaminen oli standardoitua ja organisaatiot toimivat hyvin yhdenmukaisesti. Metsäammattilaiset katsoivat nimenomaan ohjeistetun ja vakiintuneen toiminnan kuuluvan päätäntävaltaansa. Organisaatiot olivat tunnistaneet luonnon monimuotoisuuden turvaamisen kysynnän ja metsäammattilaiset suhtautuivat siihen myönteisesti. Luontoasiat oli sisällytetty kuitenkin metsätaloustoimenpiteisiin ja metsänhoitoon niin kiinteästi, että biodiversiteetin turvaamisen voidaan sanoa sulautuneen muuhun metsänhoitoon.

Organisaatioiden biodiversiteetin turvaamisen osaamisjärjestelmät olivat hyvin samankaltaisia. Järjestelmät erosivat toisistaan vain niiden piirteiden osalta, jotka heijastivat organisaatioiden toimintalähtökohtia julkisen hallinnon organisaatioina, yksityisinä metsäalan yrityksinä tai metsänhoitoyhdistyksinä. Metsäkeskuksilla oli käytössään biodiversiteetin turvaamisen tukena muihin nähden enemmän paikkatietojärjestelmiä, kun taas yritykset olivat kehittäneet hallintajärjestelmiään ja sovelsivat erityisesti sertifiointijärjestelmiä. Yritykset hyödynsivät biodiversiteetin turvaamisessa metsänhoitoyhdistysten tavoin käytännön metsätalouden verkostoja, joihin kuuluivat puukaupan osapuolet ja korjuu-urakoitsijat. Tämä käytännön metsätalouden verkosto oli tarkastelluista osaamisjärjestelmistä ainoa, joka säännönmukaisesti vaikutti myönteisesti arvokkaiden elinympäristöjen rajaamiseen metsätaloustoimenpiteiden yhteydessä. Monimuotoisuustietoa vaihdettiin metsäalan toimijoiden kesken sekä käytännön

verkostoissa että politiikan suunnitteluverkostoissa. Hankeverkostoissa tiedonvaihtoa tapahtui myös muiden toimijoiden kanssa. Metsäammattilaisten elinympäristöjen rajaamisaikomuksiin vaikuttivat erityisesti muiden metsäammattilaisten näkemykset rajaamisesta sekä omat asenteet ja aikaisemmat rajaamispäätökset.

Tutkimuksen tulokset osoittavat, että perinteet, tavat ja metsäammattilaisten jakamat normit sekä organisaatioiden taipumus yhdenmukaisiin toimintatapoihin ohjaavat sitä, miten yksityismetsätalouden organisaatiot vastaavat biodiversiteetin turvaamisen haasteeseen. Tutkimus tuo lisätietoa sekä julkisen että yksityisen sektorin organisaatioiden käyttäytymisestä. Politiikan toimeenpanon ja organisaatioiden sopeutumisen tarkastelunäkökulmien yhdistäminen tuo esiin instituutioiden keskeisen roolin. Huomion kiinnittäminen instituutioihin organisaatioiden toiminnan muutosta tarkasteltaessa on välttämätöntä erityisesti empiirisesti havaitun jähmeyden ymmärtämiseksi.

Asiasanat: politiikan toimeenpano, organisaatioiden sopeutuminen, instituutiot, yksityismetsätalous, metsäammattilainen, verkostot

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This thesis is a product of a long process that has had many participants, contributors and spectators, all of whom I owe a lot. The people who have helped, supported, challenged and taught me cannot all be named but I wish to attempt to address those who were closest to the actual work. Before thanking them, I will recap the story of the research that constitutes this thesis. In 1996, when I was an eager Master's student at the Department of Forest Economics of the University of Helsinki, I got together with a couple of professors and students, and invited the then chief public servant responsible for the new Forest Act that would be enacted at the end of the year. In addition to learning about the novelties of this Act, the most radical being the inclusion of biodiversity targets, I realized that this kind of changes in policy would meet a lot of friction in their implementation, even if they were radical and well prepared. I learnt that actually their implementation was in the hands of many actors who might not even have implementing responsibilities.

After having gained some experience in policy analysis through evaluating environment and development co-operation and the National Forest Programme in the 1990s, I decided that what I then called "policy assimilation into practices" was worth researching in the newly arisen requirement to integrate biodiversity conservation into conventional forest management. I was able to tackle this problematic through a pilot study of the forest service providers in the Häme Uusimaa in 2003, in the evaluation of the collaborative networks of the Southern Finland Forest Biodiversity Programme (METSO) during 2004-2005 and in the evaluation of the Finnish Biodiversity Action Plan during 2005-2006. The big bulk of the empirical research on forestry organizations and forestry professionals was carried out as a part of the research project Law, Forests and Biodiversity (FORBID) during the period 2006-2008. These projects allowed me to acquaint with the policy and practice of integrating forest management and biodiversity conservation, to collaborate with interesting colleagues and to formulate the questions that I was most interested in: how is integration implemented, and how do the actors in the organizational field function relative to the demand for conservation, as strategic actors. The analyses and reporting of these results have been mingled with the project outputs and have partially been carried out as a rather delayed effort during the last few years, with the important academic, financial and social support of many actors.

I was supervised by four wise men representing very different approaches to analyzing forest policy. The advice of a rigorous forest-economics-modeler, an eloquent rural sociology and governance researcher, a holist policy analyst and evaluator, as well as a methodologically strong empiricist, was very multidisciplinary and demanding. I wish to thank Professor Jari Kuuluvainen with whom I enrolled in 2000 and who carried through this 10-year project diligently, Professor Steven Wolf with whom I conducted the pilot study and the research on competences and who has tried to secure new ideas and a critical approach, Professor Mikael Hildén who led the FORBID-project and whom I have had the privilege to work with through my entire career, and finally, Professor Heimo Karppinen who saved me with his concrete ideas that fed into the study of professional judgment. I thank these fellows for their prudent advice, which was the greatest privilege and the greatest challenge that I encountered in setting up, carrying out and reporting my research.

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Finally, I want to thank my dearest ones. My parents who have worked on their farm in Finland and in several developing countries, combining their diverse skills and social networks to solving concrete problems of sustainability, have sown the seeds of my concern for the humankind and the environment, and attached me to the rural Finland as well as to the multicultural world. I thank Kirsti and Aarre for my roots and for their friendship. My dear siblings who have enjoyed the same starting points, who now live in Barcelona and Los Angeles, are my best friends. I thank Anna and Heikki and their families for always being there to share the joys and pains of life.

It mustn’t have been only coincidence that I partnered with an Australian scientist in the Swedish Agricultural University in 1994. My dear husband Craig has given me self-confidence and love. We share the interest in biodiversity, natural resource management as well as in

combining academic and pragmatic solutions to problems. I thank Craig for supervising me more than any of the above mentioned supervisors and colleagues, for running the household and caring for the kids, and for spending time with me. Elmo and Milli, our dear children, learnt very early on what a PhD was. They knew that it comprised of some suffering and that even small achievements were worth a toast. I thank them for their love and patience and for being special persons. They are the best encouragement every day.

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Eeva Primmer

Littoinen, September 2010

LIST OF ORIGINAL ARTICLES

This dissertation consists of a summary and the following articles reprinted with the kind permission of the publishers.

I Wolf, S.A. and Primmer, E. 2006. Between incentives and action: A Pilot Study of Biodiversity Conservation Competences for Multifunctional Forest Management in Finland. Society and Natural Resources. 19(9): 845-861.
http://www. informaworld.com/smpp/content~db=all~content=a756745513

II Primmer, E., and S. A. Wolf. 2009. Empirical accounting of adaptation to environmental change: organizational competences and biodiversity conservation in Finnish forest management. Ecology and Society 14(2): 27.
http://www.ecologyandsociety.org/vol14/iss2/art27/

III Primmer, E., Karppinen, H. 2010. Professional judgment in non-industrial private forestry: Forester attitudes and social norms influencing biodiversity conservation, Forest Policy and Economics, 12:2, 136-146.
The journal: http://www.sciencedirect.com/science/journal/13899341

IV Primmer, E. 2010. Policy, project and operational networks: channels and conduits for learning in forest biodiversity conservation. Forest Policy and Economics. In Press.
The journal: http://www.sciencedirect.com/science/journal/13899341

Article I was developed and written together by the two co-authors. Wolf originated the research idea, whilst Primmer knew the research context. The research questions were developed and data were collected together. The main responsibility over the analyses was with Primmer while Wolf led the interpretation of the results.

Article II was developed together by the two authors, with the lead of Primmer. Wolf contributed to the research idea and choices of analytical approaches as well as interpretation of results. Primmer collected and analyzed the data, and led the writing process.

Article III was developed together by the two authors, with the lead of Primmer. Karppinen contributed to the research idea and the theoretical and analytical choices as well as interpretation of results. Primmer collected and analyzed the data, and led the writing process.

Article IV is a sole contribution by Primmer.

CONTENTS

CONCEPTS

Bounded rationality: if rationality is the basis and justification for choices that people and organizations make, bounded rationality refers to the real-world decisions being bounded by limited access to information, limited attention and limited capacity to calculate and predict.

Institutional adaptation: organizations and professionals adapting to change in their operational environment and implementing policy within a particular institutional framework.

Inertia: limited ability of organizations to recognize and react to changes in their operational environment.

Institutions: rules and regularities that prescribe the behavior of organizations and individuals; due to their slow evolution they often produce friction for change.

Isomorphism: a tendency of organizations and their practices to develop toward uniformity as a result of coercion, normative pressure or mimicking.

Logic of appropriateness: if optimizing decisions is based on logic of consequences and consideration of preferences, logic of appropriateness is based on a general frame set by formal and informal rules and the identity of the person making the decision in a certain situation.

Organizational adaptation: changes that organizations purposely make in their strategies regarding goals and competences as a reaction to changes in their operational environment.

Organizational competences: human, management and networking resources that organizations invest in and mobilize, to meet their strategies and to adapt.

Organizational field: a collection of organizations sharing institutions and constituencies. It is very close to the term 'sector' but can be broader or narrower; e.g. organizational field of non-industrial private forestry.

Organizational greening: organizations changing their goals and practices toward more environmentally friendly ones, either by readjusting their old practices or by starting new activities.

Organizational learning: organizations or parts of organizations or members of organizations refining existing organizational practices or exploring new ideas or, ultimately, reframing organizational functions.

Organizational network: collection of organizations that is linked through formally defined contacts, e.g. contract or shared membership in a working group, or in a less formal fashion, e.g. through information exchange.

Policy: purposive course of action with a direction or a goal and means for implementing the action. Public policies are the results of public decisions, either political or administrative. In case public policy is new or in contradiction with the goals of those who are the target of policy, policy implies persuasion.

Policy implementation: the means for and activities of executing and realizing public policy or actors pursuing a specific policy.

Professional judgment: the cognitive, value and social basis and justification for making decisions that are in the professional realm of the decision-maker.

Specialization: a choice by an organization or individual to focus on certain goals and allocate resources towards these goals, often with an aim to succeed relative to others. At the organizational level, can take place within or between organizations. Is considered to lead to division of labor.

Street-level bureaucracy: Relatively independent decisions made by those individuals who are implementing public policies in direct contact with the targets of the policy. Can refer to an entire system of public service, where decisions are made constantly, e.g. school, health care system, or Regional Forestry Centre.

1. INTRODUCTION

The Finnish forest sector, traditionally focused on forest management and timber production, is now faced with the challenge to conserve biodiversity. This challenge has been explicitly articulated in new policy goals and obligations as well as in demands of multiple stakeholders since the mid-1990s. Integrating biodiversity conservation into forest management on non-industrial private lands introduces complexity and requires changes in the practices of those public and private actors that have implementing responsibilities and whose strategic and operational opportunities are at stake.

But do the actors influencing the management of non-industrial private forests portray an example of responsible implementation and progressive organizational greening? How does a population of organizations and professionals that has emerged around forest management and timber production take on the integration challenge? Understanding this kind of context-dependent institutional adaptation requires bridging between two analytical approaches: policy implementation and organizational adaptation, backed up with empirical analysis.

As a starting point, the policy implementation approach assumes behavioral changes to follow from changes in policy (Brewer and deLeon 1983, Schneider and Ingram 1990), while the organizational adaptation approach assumes organizations to be alert in identifying changes in social demand and modify their strategies accordingly, in order to succeed (Nelson 1991, Teece et al. 1997). In applications of both these analytical approaches, constraints and challenges to the basic assumptions have been recognized. Policy is not implemented in a linear fashion because of the complexity of the issues and contexts that policies deal with, because policies concern large numbers of constituents, and because organizations and professionals base their judgment on a number of factors beyond the policy (Pressman and Wildavsky 1973). Organizations are not always adaptable because they might not recognize changes in the demands placed on them. They do not necessarily manage to develop required competences, specialize, learn, or utilize networks in ways that support adaptation (March and Olsen 1984, Hannan and Freeman 1984, Meeus and Oerlemans 2000). Investigating these mechanisms of adaptation – and friction in adaptation – is at the heart of this thesis. The thesis analyzes the ways in which forestry organizations and professionals take on the challenge to integrate biodiversity conservation into forest management in non-industrial private forests.

The literature on policy implementation recognizes that the complexity of the numerous, even conflicting, goals generates challenges for those responsible for implementation (Pressman and Wildavsky 1973, O'Toole 2000, DeLeon and DeLeon 2002). Research on organizational behavior particularly highlights challenges related to management of information, and coordination of multiple goals and tasks (Simon 1945, March 1994). The organizations and their professional staff apply the resources they possess in a range of ways; not only to implement policy but also, to maintain and improve their own position in the system (Lipsky 1980, Cyert and March 1992). In hierarchical organizations implementing forest policy, foresters are known to face these complexities and navigate between the goals of policy, their organization, their professional community, and their clientele (Kaufman 1960, Twight and Lyden 1988, Sabatier et al. 1995, Butler and Koontz 2005). However, less attention has been paid to the ways that forestry professionals, organizations, and populations of organizations in more complex organizational fields than hierarchical administration adapt to new demands. The complexities of organizational and professional decision-making have been identified to be critical in integrating biodiversity conservation into forestry (Eckerberg 1986, 1990, Kennedy and Koch 2004, Koontz and Bodine 2008). However, also this research has dominantly

addressed the public sector forestry administration taking up conservation challenges and omitted more complex populations of organizations.

To understand the adaptation of organizations, it is worth considering the organizations as strategic actors capable of recognizing and reacting to changes in their operational environment (Nelson and Winter 1982, March 1994). This idea entails that the organizations collaborate and compete with other organizations in the same organizational field. All organizations face some pressure to compete – or at least to survive, to acquire resources and to maintain legitimacy (Pfeffer and Salancik 2003). In this sense, public sector administrative organizations and collective forestry organizations can be considered to face the pressure and social demand for biodiversity conservation, in a similar way as the private sector forest industry companies. Correspondingly, all organizations across public and private sector boundaries can be assumed to develop strategic responses to the demand.

Organizational adaptation research highlights specialization and differentiation Nelson, 1991, Teece et al. 1997). However the constraints generated by tendencies toward homogeneity and lack of alertness are also recognized (DiMaggio and Powell 1983, Hannan and Freeman 1984, Pfeffer and Salancik, 2003). Organizations differ in the ways in which they interpret and manage their operational environment, and in the choices they make when the environment changes. The organizational choices are about goals as well as professional staff and other competences. Developing new competences requires learning and innovation, which can lead to distinctive solutions and form the basis for specialization, organizational diversity, and competitiveness (Barney 1991, Nelson 1991, Ostrom 2005). However, specialization is known to be constrained by strong tendencies of organizations to develop and apply isomorphic competences and practices (DiMaggio and Powell 1983). In some cases, organizations are so inert that they do not identify the changes in their operational environment or cannot make required organizational changes in time to react to the evolving demands (Hannan and Freeman 1984). This leads to a risk of being outcompeted by more adaptable organizations (Damanpour 1996).

Public sector forestry organizations have been found to react to the biodiversity conservation demand by establishing specific ecosystem management and collaborative planning systems (Kennedy and Quigley 1998, Koontz and Bodine 2008, Raitio 2008). Even more directly reliant on their reputation, forest industry organizations have been found to adapt their behavior with changes in policy and social demand for increased conservation (Cashore and Vertinsky 2000). In this vein, it could be expected that the forestry organizations would take the conservation challenge as an opportunity, and strategically develop conservation competences to outcompete other organizations, even by exceeding the formal responsibilities (Kagan et al. 2003). However, the adaptation to arising conservation demands among forestry organizations has generally been described as uniform and incremental (Farrell et al. 2000, Kennedy and Koch 2004, Cubbage and Newman 2006, Dekker et al. 2007). The inertia of forest sector organizations and the sparse knowledge about the ways in which a distributed population of organizations adapts to conservation expectations motivate this thesis.

The organizational field that manages the non-industrial private forests in Finland is particularly interesting for analysis of responses to biodiversity conservation challenges. This is because it has some characteristics both of a hierarchically organized administration and of a fragmented population of different types of organizations. Small scale non-industrial private forests are the dominant forest ownership category in Finland. The management of these forests has a long history of central coordination backed up with legislation, policies, research, professional training, planning systems, extension, and incentives (Ollonqvist 1998). The coordination mechanisms, resting on a corporatist policy design, involving land-owners and the

forest industry, have been successful for a long time (Ollonqvist 2001, Donner-Amnell 2004). The non-industrial private forests are economically significant; accounting for 80 percent of the commercial timber removals in the country. The modern forest sector has contributed to the national GDP with an over 10 percent share up until the 1980s. Although the current share of the sector's contribution to GDP is less than 6 percent, it still accounts for 20 percent of the national net export income (Finnish Statistical… 2009). An elaborate institutional system has played an important part in generating the high level of prosperity from a resource base fragmented into small holdings (Ollonqvist 1998, 2001).

Although the over half a million non-industrial private forest owners are formally autonomous decision-makers, they are dependent on expert advice (Hujala et al. 2007), and have traditionally been exposed to rigid regulation (Siiskonen 2007). For this reason, the actors and structures functioning between the land-owners and the centrally developed forest policy are in a critical position to reflect and interpret the policy and social demand placed on the sector. This is particularly true for biodiversity conservation.

The central design of forest sector policy entails that forestry organizations and individual professionals have a responsibility to implement policies. This hierarchical responsibility applies particularly to the Regional Forestry Centres, i.e. organizations that constitute the local public sector forestry administration, and control, guide, and serve the non-industrial land-owners. However, the implementation of forest sector public policy is diffuse. It involves also the Forest Management Associations, consultants providing forest management services to land-owners, and forestry companies buying timber and planning and carrying out forestry operations in the non-industrial private forests. Additionally, land-owner organizations and individual land-owners as well as environmental administration and non-governmental organizations influence the management of these forests by expressing expectations, placing explicit demands and participating in information production and interpretation.

As a concrete recently institutionalized obligation, forestry organizations and professionals must comply with the Forest Act (1996) that requires biodiversity conservation. This Act obliges delineation of valuable habitats so that their characteristics are not destroyed in forestry operations. From a policy implementation viewpoint, it is interesting whether the actors in the organizational field comply with the obligation and what might explain possible defiance. Taking the organizational adaptation approach, it is interesting whether forestry professionals are motivated to conserve beyond the requirement of the Act (May 2004, Vatn 2005), and whether forestry organizations strategically aim at excelling in habitat delineation (Cashore and Vertisnky 2000, Kagan et al. 2003).

Before stating the research questions and introducing the policy implementation and organizational adaptation approaches in detail, it is important to consider institutions that frame the ways that organizations take on new challenges placed on them. Institutions are more or less strict prescriptions of behavior. They are "rules" that shape the design and implementation of natural resource policies, and the practices of the actors – or "players" who are involved in managing the natural resource (North 1990, 4-5, Ostrom 1990, Vatn 2005, Paavola 2007). Institutions are typically characterized by stability, regularity, rigidity, or resilience (North 1990, Ostrom 1990, Scott 2001). However, they evolve and are also a target of design and bargain (Goodin 1996). Therefore, attention to institutions is required in interpreting the overlap between the traditionally segregated policy implementation and organizational adaptation approaches, and particularly the analysis of the constraints and challenges to the basic assumptions of these approaches.

In this thesis I utilize the approaches of policy implementation and organizational adaptation together with careful institutional interpretation in empirical analysis of institutional

adaptation. The empirical analyses reported in Articles I, II, III and IV, address organizational competences, specialization, professional judgment, and organizational networks. The analyses employing quantitative and qualitative survey and interview data from public and private organizations as well as associations evidence the ways in which biodiversity conservation is integrated into forest management in the organizational field of non-industrial private forestry. By summarizing the empirical analyses, and placing the findings in the framework of policy implementation and organizational adaptation, this thesis discloses the organizational responses to the challenge of biodiversity conservation and contributes to the understanding of institutional adaptation in the integration of conservation and management.

The thesis summary is organized as follows: after stating the aims of the summary in section 2, I describe the use of institutional theory and elaborate on the analytical frameworks of policy implementation and organizational adaptation in section 3. In Section 4 I return to the research context of the thesis, i.e. the increased demand for biodiversity conservation faced by the organizational field of non-industrial private forest management. The methods and materials for the empirical work are presented in section 5. Section 6 reports the results of articles I, II, III, and IV, and answers the research questions. In the discussion in section 7, I place the findings in the two frameworks and derive important interactions between them. Here I disclose the dominating mechanism in the organizational field and consider the challenges of the empirical analyses. I conclude by summarizing the implications of this research for Finnish forest policy and institutional theory in section 8.

2. AIM OF THE THESIS

This thesis aims to elucidate how the actors in the organizational field of non-industrial private forestry in Finland take on the recent; yet stabilized, biodiversity conservation challenge. At a more general level, the purpose of this summary is to illustrate how empirical analysis of organizations and professionals can serve in understanding policy implementation and organizational adaptation as well as how bridging across these two approaches can advance institutional analysis. Toward this end, I summarize the empirical findings about organizational competences, specialization, professional judgment, and networks of forestry actors, reported in detail in Articles I, II, III and IV. The general research questions, which I answer in this thesis summary by drawing evidence from the empirical studies, are as follows:

1. Do organizations and professionals recognize the biodiversity conservation responsibilities imposed on them in policies and through social demand, and do they prioritize them?
2. Do organizations make targeted investments to conserve biodiversity: do they possess and mobilize biodiversity conservation competences?
3. How do organizations specialize; do public sector organizations, private sector organizations and associations differ in their biodiversity conservation behavior and their competences?
4. How do personal and social factors influence individual foresters' biodiversity conservation behavior?
5. How are different networks utilized in communicating about biodiversity conservation at multiple levels of the organizational field?

The policy implementation approach would emphasize those competences and practices that have been assigned clear targets and standardized responsibilities. The organizational adapta-

tion approach would hypothesize organizations to specialize and compete over biodiversity conservation if they take the social demand to genuinely exist. Many institutional theories predict less ardent behavior; they would actually predict incremental changes, inertia and homogenization. Consequently, the broader institutional theoretical framework allows interpretation of the outcome of the analysis that only produces partial evidence to support either analytical approach.

3. THEORETICAL FRAMEWORK

3.1. Institutional approaches to policy and organizations

Institutional analysis is about investigating patterns of behavior and the factors that influence them beyond the utility-maximizing or, more generally, optimizing rationality (March and Olsen 1984). These bear relevance for conservation and management of natural resources because natural resources can have collective resource characteristics even if their ownership is defined, because decisions regarding them can have spatially and temporally broad implications, and because the desired status of the resources is based on value judgments (Vatn 2005, Paavola 2007).

Institutions have been defined in numerous ways (for reviews, se e.g. Peters and Wright 1996, Scott 2001), but some characteristics are consistently placed on the analytic concept of institutions. A very general definition includes at least a stability, rigidity, or resilience characteristic (Meyer and Rowan 1977, North 1990, Ostrom 1990, Scott 2001). Another important characteristic is a prescriptive one; institutions are considered rules for action (Meyer and Rowan 1977, North 1990, Ostrom 1990). When analyzed from this angle, institutions apply to particular actors and their particular behaviors in particular conditions (Crawford and Ostrom 1995). Importantly, the prescription they carry has a normative tone, signaling what is permitted, obliged or forbidden (March and Olsen 1984, Crawford and Ostrom 1995).

It is common to distinguish between formal and informal institutions. Formal institutions include laws and regulations purposely designed to alter or stabilize behavior, and have formal enforcement mechanisms. Informal institutions are more culturally and socially embedded norms that evolve slowly over time as practices stabilize (DiMaggio and Powell 1983, North 1990, Ostrom 1990, Scott 2001). In this sense, they coincide with conventions, social norms or expressions of cultural cognitive patterns, and are enforced through social mechanisms (Clemens and Cook 1999). Legitimacy and routines are also important in stabilizing and institutionalizing behavior (DiMaggio and Powell 1983).

Following this logic, forest management and biodiversity conservation institutions include formal and informal prescriptions that actors adhere to. For example, systems are established to control and monitor foresters' conformance with laws and rules of forestry organizations (Kaufman 1960, Butler and Koontz 2005). Property and use rights or management responsibilities are assigned to particular actors (Kissling-Näf and Bisang 2001). In Finland, the formal requirement of biodiversity conservation in managed forests has been stated in the Forest Act (1996), and the roles of administrative organizations have been assigned in specific laws (Laki metsäkeskuksista… 1995, Laki metsänhoitoyhdistyksistä, 1998). Examples of informal; yet strong, institutions that foresters and forestry organizations adhere to include scientific management and professional indoctrination (Kaufman 1960, Twight and Lyden 1988, Farrell et al. 2000, Kennedy and Koch 2004), a production orientation (Pregernig 2001, Selby et al.

2007, Kindstrand et al. 2008), or considering forests as management units made up of stands (Jokinen 2006, Larsen and Nielsen 2007).

Practices tend to develop toward uniform patterns. This homogenization is an indication of successful enforcement or coercion, be it formal or informal, intended or unintended (Meyer and Rowan 1977, DiMaggio and Powell 1983, Scott 2001). Uniformity increases predictability, which in turn reduces the relative effort required for enforcement, and ultimately makes institutions self-reinforcing (North 1990). This kind of homogenization has relevance for the forest sector and forest administration globally. Kaufman (1960) has observed uniformity of the forestry administration despite its large geographical spread and context-dependence. More recently, forestry practices have been recognized to be extremely standardized both through hierarchical coercive mechanisms and through professional norms (Twight and Lyden 1988, Sabatier et al. 1995, Jokinen 2006, Kissling-Näf and Bisang 2001).

Although the implementation of policies rests on institutions (Lindblom 1959, March and Olsen 1984, Cashore and Howlett 2007, Rivera et al. 2009), much of the theory and empirical analysis of institutions actually addresses the coercive mechanisms by which institutions shape behavior without paying attention to hierarchically imposed policies. Due to the stability, the analytical consideration of institutions is often structural and in causal analyses institutions are considered as explanatory; the way in which institutions induce, direct and constrain behavior, is at the centre of attention. In this thesis, I employ the concept of institutions in my interpretation of the findings regarding policy implementation and organizational adaptation, particularly relative to the detected rigidities and friction as well as in bridging across these two approaches. The analysis will also serve as an empirical investigation of natural resource management institutions.

3.2. Policy implementation

Public policies are purposive courses of action that generally include; in addition to the direction or goal, particular means for implementing the action (Heclo 1972). They are continuously designed, negotiated, developed, implemented, and evaluated (Brewer and deLeon 1983, Cashore and Howlett 2007). Policy redirects actors' behavior and, to a large degree, also relies on the cooperation of actors (O'Toole and Montjoy 1984, Schneider and Ingram 1990). Public policy includes decisions about incentives, resources, and the administrative structure required for the implementation (Denhardt and Denhardt 2000). It generates, and rests on, legitimacy (Pfeffer and Salancik 2003). Policy instruments are usually broadly categorized into three groups: regulation, economic instruments, and informative instruments. These public policy instruments are expected to influence the target group, e.g. land-owners, in a rather direct fashion; without explicit attention to the role of the actors in the organizational field implementing the policy (Peters 2000). Although public policies are designed and implemented with the lead of governments, also administration and non-governmental organizations have an active role in influencing and formulating policy, in putting these policies into action, and in designing and implementing particular purposeful policies under their specific authority (O'Toole and Montjoy 1984, Cashore and Vertinsky 2000).

Traditionally, policies have been considered as outputs of sequential processes that consist of a set of stages from preparation through formulation and selection to implementation and evaluation (Brewer and deLeon 1983, Ellefson 1992, cf. Lindblom 1959). Behind this linear model reside ideas of clear goals, measurable targets, standardized procedures, hierarchical control, and neutral administration (Peters and Wright 1996, Goodin et al. 2006). There is also a strong assumption about the separation between goals and means as well as between value

and fact arguments (Simon, 1945). The assumptions have enabled implementation research and evaluation in a broad range of public policy areas (O'Toole 2000, Saetren 2005). However, they have also received criticism by theoreticians and analysts of public policy and policy implementation (Simon 1945, Lindblom 1959, Heclo 1972, Pressman and Wildavsky 1973, Peters and Wright 1996, Goodin et al. 2006).

Particular policies and policy instruments aimed at influencing the behavior of actors are based on some assumptions about their behavior and its adaptability. Although these assumptions are often very tacit, there has also been explicit effort toward identifying them at the level of theory construction (Schneider and Ingram 1990) and through analysis of the logic and chain of policy intervention (Pressman and Wildavsky 1973, Hoogerwerf 1990, Scriven 1998, Mickwitz 2003a). Schneider and Ingram (1990) analyze the assumptions behind policy instruments, including authority, incentives and capacity, as well as symbolic and learning instruments.

While authority and regulation rest on the assumption about legitimacy of hierarchical arrangements, voluntary incentives and economic instruments are designed with a background assumption that actors maximize utility or at least react to changes in monetary values. Capacity tools, or what are often called informative tools, rely on the assumption that additional information is needed, and will be taken on and applied by the actors. Symbolic policy tools are based on the assumption that actors are motivated and that their motivations can be redirected by appealing to values and social norms, even without any tangible commitments (March and Olsen 1984). Symbolic action and rhetoric substituting for tangible policy changes (or contradicting policy) has also been labeled policy of intentions (Pressman and Wildavsky 1973) or even hypocrisy (Brunsson, 1993). Learning tools are for implementing policy goals that are complex and poorly understood or evolving fast; their use is based on an assumption of adaptive capacity among the actors (Nelson 1991, Argyris and Schön 1996).

In forest policy, combinations of the above mentioned instruments are applied, with some special characteristics. Regarding the authoritative policy tools, Schneider and Ingram's assumption about the legitimacy of existing structures is explicitly based both on the typically long history of regulation (Kaufman 1960, Ollonqvist 1998, Siiskonen 2007), and the tendency to make incremental changes (Sabatier et al. 1995, Kissling-Näf and Bisang 2001). Integrating ecological aspects in policy has made no exception to this logic of incremental change of relatively broadly applied standards, compliance with which has been the responsibility of the forest management organizations and professionals, perhaps mostly in the public sector (Butler and Koontz 2005, Cubbage and Newman 2006, Fig.1).

Incentives have been used to promote particular forestry practices, based on the assumptions about divergence between what has been considered socially optimal and what have been considered the private interests of the actors (Hyde et al. 1987). Particularly with the aim to increase voluntary conservation, incentives and market-based policy instruments have recently been championed (Cashore 2002, Langpap 2006, Juutinen et al. 2008, Kauneckis and York 2009). Analyses of incentives have generally paid little attention to the organizations between policy and practice. Conversely, incentives have been assumed to directly influence the land-owners and private sector forestry actors.

Forest policies and policies regarding, first environmental integrity, then ecological sustainability, and now forest biodiversity conservation have been backed up by scientific understanding and arguments about the ecosystem, natural resource, and the behavior of land-owners (Farrell et al. 2000, Kennedy and Koch 2004, Cubbage et al. 2007, Dekker et al. 2007). Due to the heavy reliance on science and standards, also the capacity or information instruments play an important role both in forestry and ecological sustainability (Farrell et al. 2000). Sym-

bolic policy instruments in forestry are embedded in the informal practices of the hierarchical, scientific and technical character of the policy in the sector.

The ideas of linear, hierarchical, controlled, and standardized policy implementation constitute one possible mechanism that can be assumed to effectively generate socially desirable outputs. It is also a dominating assumption behind forest policy design and implementation, although it captures only a part of the complex ecological and social reality. In the analysis of integration of biodiversity conservation into forest management, I search for signals of this hierarchical implementation mechanism in the organizational field of non-industrial private forestry – but not in isolation. I compare policy implementation with organizational adaptation, another potential broad mechanism (Fig. 1). To understand the overlap between these approaches, and particularly their challenges, I draw on institutional interpretation.

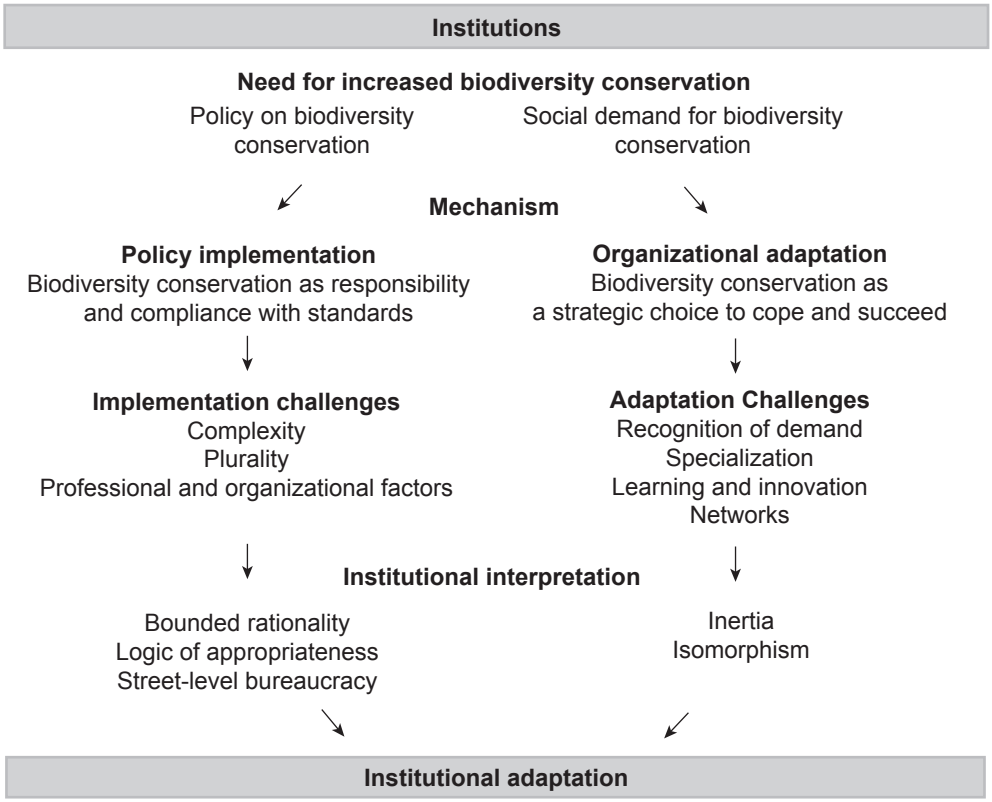

Figure 1. Framework for the analysis of integration of biodiversity conservation into forestry, derived from the theories of policy implementation and organizational adaptation, with institutional interpretation.

3.3. Implementation challenges

The main criticisms against the linear hierarchical policy implementation ideas include complexity, plurality and professional and organizational practices. The impossibility of control is due to institutional and also substantial (here: ecological) complexity as well as limited resources for exercising the control (Pressman and Wildavsky 1973, Peters and Wright, 1996, Denhardt and Denhardt, 2000, Goodin et al. 2006; Ostrom 2007). Forest policy design has addressed the complexity challenges by integrating ecological considerations into the goals of sustainable forestry and, more analytically, by relying on an expanding range of ecological research (Farrell et al. 2000, Schultz 2008). Implementation of policies aimed at coping with ecological complexity introduces challenges for those with implementing responsibilities (Eckerberg 1986, 1990, Koontz and Bodine 2008). Furthermore, the generally increasing need to consider pluralistic goals and a growing range of constituents has questioned the feasibility and legitimacy of the hierarchical logic (Hajer and Wagenaar 2003, Goodin et al. 2006, deLeon and Varda 2009). This tendency has pushed policy implementation research to consider bottom-up approaches to policy implementation (DeLeon and DeLeon 2002), and deliberative policy analysis (Hajer and Wagenaar 2003).

The need for increased pluralism is heightened by the potential narrowness of the set of constituents that dominate policy. In Finnish forest policy, the focal actors have included the forest administration, forest industry and land-owners (Ollonqvist 1998, Berglund 2001, Donner-Amnell 2004). As a response to the plurality claims and as a general governance development, policy is increasingly considered to be formulated and implemented in networks, which places high requirements on the capacity to deal with multiple interests and channels of knowledge as well as to adapt and learn. Plurality and participation have received much attention in forest policy design and implementation. Empirical work with this focus has also addressed integration of conservation with forest management (Eckerberg 1990, Koontz 1999, Appelstrand 2002, Primmer and Kyllönen 2006, Davenport et al. 2007, Koontz and Bodine 2008, Raitio 2008).

An additional criticism against the hierarchical linearity assumption is that it pays little attention to the organizational field and professional practices importantly shaping policy implementation (Simon 1945, Lindblom 1959, Pressman and Wildavsky 1973, Lipsky 1980). Although this criticism has been made early on, it has been integrated to policy analysis in an underrated fashion (Peters, 2000, Jones 2002, Bendor 2003).

Administrative behavior and factors that shape organizational decisions have been analyzed in an illuminating fashion already 65 years ago by the renowned Herbert Simon (1945). First, Simon asserts that in all judgment and decision-making, policy or administration, factual and value justifications mix. Similarly, in a decision-making and implementation process, means and ends are not entirely separable. In the early writings Simon lays the basis for what he has become known for, analysis of rationality that is bounded by limited access to information, limited attention, and limited capacity to calculate and predict (Simon 1955, Simon 1984, March and Simon 1993, Simon 1997). Due to these limitations, decisions are based on "satisficing" (Simon 1997, 118), rather than on optimizing on all aspects (or utility maximizing). Additionally, Simon highlights the influence the identity, habit and organizational routines as well as organizational culture have on decisions.

Simon's collaboration with his colleague and successor James March, has developed the cognitive basis for understanding organizational decisions. Understanding the ways in which individuals in organizations and the organizations as entities direct attention and search solutions is an important step toward understanding how organizations implement public policy or

their own organizational strategy. March has developed these cognitive bases of organizational decisions further. If optimizing decisions is based on logic of consequences, March considers organizational decisions to more typically follow what he calls "logic of appropriateness" where the organization provides the decision-makers frames for their identity as well as the formal and informal rules to follow (March 1994). Additionally, March has made an important contribution to analyzing organizational learning and related organizational choices (March 1991). These organizational factors influence implementation of forest policy considerably. The forestry organizations or individual foresters cannot consider all possible consequences and optimize to meet particular policy goals. Rather, they satisfice, and carry out practices that fit in a socially approved range (Twight and Lyden 1988, Eckerberg 1990, Sabatier et al. 1995).

The organizations and professionals functioning between policy and practice play a key role both in knowing the potential pitfalls of implementation and in shaping the ways in which stated policies are accommodated with the local realities as well as ways to deal with the local constituents (Simon 1945, Pressman and Wildavsky 1973, Lipsky 1980, Argyris and Schön 1996). The professionals in the local context function as "street-level bureaucrats", having the often rather ambitious and ambiguous policy goals to implement as relatively independent decision-makers (Lipsky 1980).

Forestry professionals work in this kind of conditions. They follow such general targets that their interpretation and operationalization into the local ecological, social, and economic conditions remains in their hands, despite the high level of guidance and standardization (Kaufman 1960, Twight and Lyden 1988). Particularly the ecological and biodiversity conservation targets are so complex that it is for the professionals to judge their practical implications (Eckerberg 1986, 1990, Farrell et al. 2000, Kennedy et al. 2001, Pregernig 2002, Larsen and Nielsen 2007).

These professionals and their organizations have an important role in adjusting their practices also according to the goals of their clientele (Koontz 1999, Davenport et al., 2007, Fernandez-Gimenez et al. 2008). More generally, professionals and organizations learn and develop the ways to combine their own goals with the evolving policy and social demand (Sabatier et al. 1995, Argyris and Schön 1996, Larsen and Nielsen 2007). In addition, the decisions made by professionals are influenced by the beliefs they hold and the norms they share (Eckerberg 1986, 1990, Kennedy and Koch 2004 Selby et al. 2007, Pregernig 2001, 2002). Their motivation to follow, or even exceed, particular norms is likely to stem from a combination of sense of obligation, and social and moral reward (May 2004, Vatn 2005). Professional decisions, like other decisions, are influenced by a combination of attitudes, subjective norms, and perception of control over the decision (Ajzen 1988, Buchan 2005). Some of the balancing between conservation and management will generate value conflicts that the professionals deal with on their own (Hukkinen 1999).

The complexity of policy and context, the plurality of constituents and their expectations as well as the characteristics of professional judgment are likely to importantly shape the integration of conservation and management (Fig. 1). I address these challenges for implementation in the empirical section by analyzing professional judgment and the degree to which it is shaped by factors outside the hierarchical system. I supplement this analysis with investigations of competences and networks as well as their range and breadth. In interpreting the evidence for diversion from the hierarchical implementation assumption I draw on theories of bounded rationality, logic of appropriateness, and professional judgment. Taking these implementation challenges seriously will advance the understanding of natural resource policy implementation and strengthen its connections to institutional and organizational analysis.

3.4. Organizational adaptation

As described above, one of the criticisms against the linear hierarchical model of public policy is the impossibility and costliness of control (Peters and Wright 1996, Denhardt and Denhardt 2000, Goodin et al. 2006). The ideas of the so called "new public management" have placed pressure on the public administration to economize, outsource, increase accountability, and utilize the capabilities of stakeholders (Denhardt and Denhardt 2000). This has led analysts of public policies and management to consider cross-disciplinary ways to study the institutions and organizations (Lynn 1998). Drawing less on economic arguments, and more on legitimacy and democracy ones, the change has also been called a shift from government to "network governance", and induced analyses of participation (Hajer and Wagenaar 2003, Rhodes 2007).

The new public management ideas have pushed public sector organizations to apply private sector management principles, while the network governance proponents have emphasized collaboration. With both trends highlighting openness, and introducing the collaboration between the public sector and private sector, they necessarily influence all types of organizations in the same organizational field. Both forest industry companies and public sector organizations now have to consider their stakeholders and the opportunities that the policy provides them with. With the corporate governance ideas penetrating across organizational fields, it becomes relevant to consider strategic choices and corporate governance among all the organizational actors.

Another reason for considering the corporate governance and network organization logic is the potential that lies in organizational adaptation to changes in the operational environment (Fig.1). Both public and private organizations depend on external financial, physical and information resources, and also on all other actors in the organizational field (Pfeffer and Salanzik 2003, 2). For organizations to survive and succeed, they must be aware of and adjust to changes (Pfeffer and Salancik 2003, Hannan and Freeman 1989, Nelson 1991, March 1994). Legitimacy and the views of various constituents are among these external factors that might change (Cyert and March 1992, Niskanen et al. 2008). Success in terms of gaining profits, market-share, budgetary allocations, mandates or legitimacy is a prerequisite for organizational survival.

The evolution of stakeholder pressure and social demand in the forest sector has characteristically emphasized greening of production processes, ecologically sustainable management, and biodiversity conservation (Cashore and Vertinsky 2000, Kennedy et al. 2001). These calls have been recognized by forestry organizations in both the public and the private sector (Kennedy and Quigley 1998, Cashore and Vertinsky 2000). Many public sector organizations have incorporated ecosystem management and biodiversity conservation into their management systems (Butler and Koontz 2005, Raitio 2008). Private sector organizations have additionally sought to acknowledge and gain added value from the investments in greening forestry and forest industry (Halme 2002, Mikkilä et al. 2005). Particularly the increased application of eco-certification standards signals that companies consider corporate greening as a potential (Gulbrandsen 2000, Cashore 2002, Cashore et al. 2005, Bartley 2007). It remains open, however, whether the pace of change in the forest sector is sufficient to meet the legitimacy challenges and to what degree the actors engaged in non-industrial private forest management acknowledge the demand for increased conservation.

According to Pfeffer and Salancik (2003, 2), the key to organizations' survival is their ability to acquire and maintain resources. From the so-called resource-based perspective, the behavior of organizations is not explained simply by external pressures but rather, organizations are active strategic actors (Barney 1991, Nelson 1991, Foss 1997, Teece et al. 1997).

Their strategies are based on more or less purposeful decisions about what functions to focus on and on what resources to mobilize to produce these functions (Simon 1997, Teece et al. 1997). The resources are mobilized to compete with other organizations concentrating on the same functions (Nelson and Winter 1982), to maintain legitimacy (Cyert and March 1992), to generate more resources (Pfeffer and Salancik 2003), and to simply fulfill the organization's mission (Simon 1997).

Particularly distinct, or "idiosyncratic", resources developed and held by the organizations as well as the organizational diversity following from the distinction are considered important in this type of competitive situations (Barney 1991, Teece 1997, Nelson 1991). Idiosyncratic resources generate idiosyncratic innovations, and diversity spawns a selection mechanism where successful innovations contribute to outperforming those organizations that do not generate new competences (Damanpour 1991, Nelson 1991). The resources and competences that organizations invest in and mobilize include skilled labor, management resources, and networks (Cyert and March 1992, Lado and Wilson 1994, Zander and Kogut 1995, Ritter and Gemünden 2003).

Organizations have been recognized to produce opportunities for success through strategic investments in sustainability of natural resource use and in competences that advance integration of environmental considerations (Hart 1995, Porter and van der Linde 1995, Russo and Fouts 1997, Sharma and Vredenburg 1998, Menguc and Ozanne 2005). These findings are critical, as it is clear that environmental investments also generate costs that may not pay back (Schaltegger and Synnestvedt 2002). Uniqueness and distinctiveness have been found to be crucial also for making these environmental competences to generate competitive advantage (Porter and van der Linde 1995, Sharma and Vredenburgb 1998).

In some cases, environmental regulation has triggered industrial organizations to pursue this kind of progressive greening; accompanied with strategic development of competences that allow conserving the environment beyond what is formally required (Halme 2002, Kagan et al. 2003, Mickwitz 2003b, Gunningham et al. 2004, Mikkilä et al. 2005). With such strategies, organizations can influence future regulation and contribute to the greening development in their organizational field. But this kind of progressive strategy is not always shared across entire populations of organizations. Instead, some organizations or groups of organizations can actually try to influence the policy design and push for less strict regulation, or avoid, or even invest resources in resisting the policy (Oliver 1991; Cashore and Vertinsky 2000; Pfeffer and Salancik 2003). If powerful enough, they might manipulate the entire regulation process (Oliver 1991, Kautto 2007).

To react to the external corporate greening pressure in a strategic fashion, organizations must learn. For learning, an important choice of resource mobilization within the organization is that of whether to fine-tune existing functions and exploit existing resources and technologies in an increasingly efficient manner – through simplification or specialization within the organization, or whether to explore new ideas and possibly reframe the organizational functions altogether (March 1991, Levinthal and March 1993, Argyris and Schön 1996). Emphasis on exploring and search should be high when organizations experience pressure from the operational environment and develop competences to cope with the pressure (Nelson 1991, Cyert and March 1992, Meeus and Oerlemans 2000). To be able to absorb new ideas, learn and innovate, the organizations need a certain level of prior competences and competences specialized in exploring (Nelson 1991). Exploring and searching for ways to deal with emerging issues benefit from networks where organizations exchange information and ideas, and establish reciprocal relationships (Powell 1990). Although explorative and exploitative learning has not been

a target of analysis in forest management, research on forest sector innovations has found information sourcing competences to contribute to learning (Rametsteiner and Weiss 2006).

Networks and participation have been considered to improve natural resource management by enhancing connections, information flow and mutual understanding as well as attention to broader sets of constituents and pluralistic goals (Moffat et al. 2001, Schusler et al. 2003, Stringer et al. 2006, Wolf and Hufnagl-Eichiner 2007, Paloniemi and Tikka 2008). In these analyses, ecological sustainability and biodiversity conservation have been addressed indirectly; network competences and learning regarding conservation has not been the explicit focus of the studies. In another vein, investment in information management systems supporting biodiversity conservation has been analyzed (Eriksson and Hammer 2006, Koontz and Bodine 2008). Bridging the analysis of the degree to which forest management organizations invest in in-house competencies and research on networking competences toward coping with the demand for increased biodiversity conservation has not been done. The nature of organizational investments in learning and these organizations' tendency to specialize in conservation merits empirical attention.

Alertness to social demand is the first condition for organizational adaptation. In the empirical analysis I search for signals of this type of recognition for the increasing demand for biodiversity conservation among the actors in the organizational field (Fig. 1). Then I analyze the degree to which the recognition materializes as organizational investments in competences and even specialization, and ways in which networks support learning in integrated conservation. This analysis combined with policy implementation analyses strengthens the understanding of organizational strategic factors relative to policy.

3.5. Adaptation challenges

Despite the potential gains in terms of increased competitiveness and legitimacy, learning and innovation are often difficult and require risky investments that may not pay off (Hannan and Freeman, 1984). The organizations may not view the change in their operational environment as generating a pressure to deviate from existing patterns; they might be inert (Fig. 1). Particularly if their stated goals, forms of authority, and core technology are difficult to change, the organizations might be too slow in reacting to the environmental change. Large and old organizations that have not experienced heightened social pressure, have been found to innovate and adapt less (Damanpour 1996). This might be because the investments they make in technical fine-tuning tie their resources from exploring and generate self-maintaining structures, or, they may over-invest in exploring, at the cost of technical learning (Levinthal and March 1993).

Both the inertia that produces slow reaction to changes in demand, and the misplaced investments, can result in organizations loosing their position in the organizational field, and being replaced with new and more adaptable organizations (Hannan and Freeman 1984). Inadequate organizational competences to respond to increased conservation demand have shaken the position of forest sector organizations and questioned the legitimacy of forestry administration from time to time (Kennedy and Quigley 1998, Cashore and Vertinsky 2000, Koontz and Bodine 2008, Raitio 2008), but there is little evidence that these organizations would not overcome these crises. As Schraml (2005) has found in his study of German forestry associations, actors in this sector tend to survive despite the external shocks, whether this is due to genuine adaptation to external demand, or more superficial symbolic action.

Another challenge for organizational adaptation is the tendency of organizations to develop homogenous patterns rather than to diversify (DiMaggio and Powell, 1983, Fig. 1). This

development, famously called isomorphism by DiMaggio and Powell (1983), can reduce innovations and efficiency. DiMaggio and Powell identify three mechanisms, by which organizational patterns become isomorphic: coercive, mimetic and normative. Coercive mechanisms refer to explicit enforcement, where e.g. law and public administration set requirements and standards for organizations to follow uniform processes (Meyer and Rowan, 1977). The coercive mechanism can actually be considered closely related to the earlier described policy implementation mechanisms (Rivera et al., 2009).

Mimetic and normative institutionalization processes are less explicit. Imitating other successful and legitimate actors will save organizations in searching costs and place them in a role easily understood by other actors (March 1991, Scott 2001). Normative pressures toward homogenization stem from professionalism (DiMaggio and Powell 1983). Along with the organizational field ageing, legitimate practices are defined by professions, rather than policy. However, norms can be also shared in other sub-cultures and peer-groups that generate social obligation and define rules of appropriateness (Scott 2001, March 1994). Professionalism and professional networking, clear responsibilities and role division, as well as unclear targets are proposed to increase normative pressure toward institutionalization in an organizational field (DiMaggio and Powell 1983). Also isolation can lead to increased isomorphism within the field (Hannan and Freeman 1986). Both isolation and professional uniformity have been characteristic of the forest sector (Kaufman 1960, Kennedy and Koch 2004).

In addition to changes in their organizational and institutional environment, organizations must consider also broader contextual changes, stemming from ecological environmental processes (Holling 2001, Young 2002, Olsson et al. 2004, Folke et al. 2005). Along with the urgency that the physical environmental changes, e.g. climate change, place on learning and innovating, attempts have been made to understand requirements for successful responses to complex and abrupt changes (Campbell et al. 2001, Holling 2001, Folke et al. 2005). In these models, adaptation is seen as ability to adjust practices as the knowledge-base regarding the ecological phenomena is strengthened (Holling 2001). On the other hand, adaptation is considered to rely on an ability to engage multiple actors with the aim to enhance social learning (Tàbara & Pahl-Wostl 2007, Lebel et al. 2006, Armitage et al. 2008, Bodin and Krona 2009). The status of Finnish forest biodiversity has become a social concern precisely through these two channels. Particular pressures on biodiversity have been identified by scientists (Hanski 2001, Siitonen 2001). Their concerns have been backed up and challenged by various stakeholders (Berglund 2001, Hellström 2001, Rantala and Primmer 2003, Saarikoski et al. 2010).

As the forest sector organizations have been demonstrated to be inert, yet enduring, and extremely isomorphic, it is important to address these characteristics, at least at the level of interpretation (Fig. 1). In the analysis of integration of biodiversity conservation into forest management, I return to these characteristics as explanations for little evidence of strategic competence development and specialization. Particularly because my empirical analyses addresses public and private organizations alike, the interpretation serves advancing the understanding of such frictions in meeting change that span across an entire organizational field.

3.6. Forest sector policy implementation and organizational adaptation

As evident from above, forest management organizations have typically not been analyzed as strategic actors adapting to social demand, with the exceptions of forest industry companies and their application of eco-certification (Cashore and Vertinsky 2000, Cashore 2002, Cashore et al. 2005, Gulbrandsen 2004), and some network studies (Moffat et al. 2001, Wolf and Hufnagl-Eichiner 2007). Otherwise, analysis of forest management organizations as

adaptive actors has dominantly had the policy implementation emphasis (Twight and Lyden 1988, Butler and Koontz, 2005). Alternatively, it has been focused on their effectiveness in carrying out their responsibilities (Viitala 1996, Viitala and Hänninen 1998, Schraml 2005). This emphasis has been typical also more broadly in studies of natural resource management facing environmental challenges (Farrell et al. 2000, Wilhere 2002, Pahl-Wostl 2009).

A partial explanation for the focus on organizations as implementing bodies is the interest in massive hierarchies that have been responsible for state forest management (Kaufman 1960, Twight and Lyden 1988, Raitio 2008) while the diverse organizational field of non-industrial private forests has received less attention (cf. Viitala 1996, Viitala and Hänninen 1998, Schraml 2005). Omission of the organizational factors in the analyses of small scale private land management can possibly be explained also by the continued focus on land-owners as critical targets of forest policy and integrated conservation (Karppinen 1998, Kurttila et al. 2001, Uliczka et al. 2004, Fischer and Bliss 2006, Bergseng and Vatn 2009, Kauneckis and York 2009). Despite the land-owners' heavy dependence on extension and planning services provided by public and private organizations (Wolf and Hufnagl-Eichiner 2007, Hujala et al. 2007), the ways in which these organizations develop the service functions have received little attention.

An angle that has been applied in studying forest management actors has been that of learning and participation (Klooster 2002, Cash et al. 2003, Fernadez-Gimenez 2008, Tàbara and Pahl-Wostl 2007). This research has explored stakeholder viewpoints, or considered forest managing organizations as facilitators and managers of participatory natural resource management processes and projects. Although these analyses have reported signals of adaptation, the forest sector organizational field displays more tendencies of hierarchy and inertia.

As Kaufman (2006) says in his Afterword to the classic book from 1960, forestry administration has faced and taken on the new challenges, but reluctantly and with much emphasis on uniformity. Forestry organizations have adopted multifunctional and adaptive ecosystem management systems incrementally, in an inert fashion (Twight and Lyden 1988, Koontz and Bodine 2008). Learning about the degree to which these tendencies can be observed in the organizations that manage Finnish non-industrial private forests will importantly enhance the understanding of the institutional adaptation in this organizational field. Analytically, an empirical investigation of policy implementation and organizational adaptation will advance the understanding of the connections between these two approaches, and the required reliance on institutional interpretation.

4. EMPIRICAL CONTEXT: POLICY CHALLENGES AND ORGANIZATIONAL FIELD

4.1. Biodiversity conservation and forestry

The need to conserve biodiversity has been called for urgently during the last two decades, although environmental concerns regarding the sustainability of forest management have been expressed already decades earlier. The global forest cover is shrinking. In areas that remain forested, intensive management leading to fragmentation and homogenization of the ecosystems pose serious threats to biodiversity (Pimm et al. 1995, MA 2005, Mikusiński et al. 2007). The formal protection status of these forest areas is low (Schmitt et al. 2009), and increased protection faces marked political challenges (Sand 2001). Therefore, the actors involved in managing forests and shaping forest management have an important role in integrating biodiversity conservation with commercial forestry. This challenge of integrating

forest management and biodiversity conservation has also been addressed under the rubrics of "sustainable use of biodiversity" (CBD 1992).

Actually, the need to conserve biodiversity also in managed areas has been clearly stated (Hartley 2002, Lindenmayer and Franklin 2002, Balmford et al. 2005, MA 2005). Biodiversity conservation has been on the agenda of international and national forest policy since the start of the 1990s (Farrell et al. 2001, Cubbage and Newman 2006, Dekker et al. 2007). Globally, the United Nations Conference on Sustainable Development (UNCED) in 1992, recognized forest biodiversity in the non-legally binding Forest Principles. The second Conference of Parties (COP) of the Convention on Biological Diversity (CBD) highlighted the maintenance of forest ecosystems as crucial to the conservation of biological diversity and recognized the need for accumulating knowledge on links between forests and biological diversity and to this end, established an open-ended Intergovernmental Panel on Forests (IPF) in 1995. Since the, the successors of IPF, the Intergovernmental Forum on Forests (IFF) and the United Nations Forum on Forests (UNFF), have advanced protection and sustainable use of forests; in 2007, the UNFF adopted a resolution with an aim to increase the area of protected forests and area of sustainably managed forests, as well as the proportion of forest products from these sustainably managed forests.

In Europe, the Ministerial Conference on the Protection of Forests in Europe (MCPFE) was founded in 1990 to advance sustainable management of the Europe's forests. The 1993 MCPFE produced a so-called Helsinki Resolution on General Guidelines for the Conservation of the Biodiversity of European Forests, and the Conference in Vienna in 2003 produced a resolution on Conserving and Enhancing Forest Biological Diversity in Europe. In Finland, the above international processes induced the development of the so-called Environmental Programme of Forestry in 1994, which outlined several biodiversity conservation challenges and, importantly, the need for reform in forest and nature conservation legislation. The Forest Act of 1996 stated biodiversity conservation as a parallel target for sustainable timber production. The Forest Act was succeeded with National Forest Programmes that included biodiversity conservation objectives 1999 and 2008, and specific Southern Finland Forest Biodiversity Programmes in 2002 and 2008.

The knowledge accumulating and policy formulating institutions of sustainable forest management have a long history of integrating the new ecologically justified principles (Farrell et al. 2001, Kennedy and Koch 2004, Cubbage and Newman 2006). However, the ways in which these principles become integrated to the practice of forest management resting on forestry organizations and individual foresters has received less attention, although their role has been highlighted (Eckerberg 1986, Butler and Koontz 2005).

Similar to the development in the specific area of forestry and biodiversity conservation, the so called policy integration (Underdal 1980) is much better understood in policy design than in organizational practice. This is the case, despite the multilevel character of policy often being highlighted. Also environmental policy integration is recognized to require backing up at multiple levels of policy; ranging from wordings of goals and laws, via standards and budget allocations, to actual field-level practice (Lafferty and Hovden 2003, Lenschow 2002, Kivimaa and Mickwitz 2006, Nilsson and Eckerberg 2007). The heightened attention to the level of design overlooks the fact that whether and how the integration takes place is in the hands of the actors implementing the policy.

Expectations for increased conservation have also been voiced in the markets, which has led to the industrial forestry organizations developing their environmental responsibility schemes (Halme 2002, Mikkilä et al. 2005) and joining various eco-certification schemes (Cashore and Vertinsky 2000, Cashore 2002, Cashore et al. 2005, Gulbrandsen 2004, Bartley 2007).

4.2. Finnish forest policy and biodiversity conservation

In the Finnish context, integrating biodiversity conservation with the traditional aim of forestry, namely timber production, is characterized by two conflicting features. First, the forest sector has internalized and integrated conservation aspects to the mainstream silviculture and timber production. Biodiversity conservation is stated as a goal in the Forest Act (1996), in the National Forest Programme (2008), and in Regional Forest Programmes (Saarikoski et al. 2010). Silvicultural guidelines include biodiversity conservation practices, forest inventories include valuable habitat information, and foresters have received nature management training (Tapio 2001, Yrjönen 2004). The second tendency in biodiversity integration with forest management is that of forest biodiversity conservation having generated fierce conflicts (Reunala and Heikinheimo 1987, Hellström 2001, Hiedanpää 2005). The views supporting either goal – conservation or production – continue to be separated and polarized (Rantala and Primmer 2003, Tikkanen et al. 2003). The tendency to emphasize production over conservation is stronger among forestry organizations and professionals than among their constituents (Tikkanen et al. 2003, Selby et al. 2006). National and regional forest policy design is somewhat framed by the tension between conservation and production (Rantala and Primmer 2003, Primmer and Kyllönen 2006, Berninger et al. 2009, Saarikoski et al. 2010).

The pressing demand for increased biodiversity conservation has resulted in increasing attempts to address conservation. In addition to including biodiversity conservation in the legislation, new conservation instruments have been experimented in implementing the Southern Finland Forest Biodiversity Programme (GoF 2002). These include conservation contracts on non-industrial private lands and pilot projects aimed at establishing collaborative networks (GoF 2002, Primmer and Keinonen, 2006). The new instruments have generated new opportunities for the forestry actors to market biodiversity conservation to land-owners and develop more competences in this area (Primmer and Keinonen 2006, Paloniemi and Tikka 2008). Additionally, the forest sector faces increasing demands for combining multiple functions of the forests in both policy and practice. To this end, the Forest Act has enhanced pluralism and devolution by introducing a regional level policy coordination mechanism, the Regional Forest Programmes (Forest Act 1996, Leskinen 2004, Saarikoski et al. 2010). Also the pilot project of collaborative networks has addressed the opportunities for advancing conservation alongside other functions of forests (GoF 2002). With these substantial changes in policy, the ways of their implementation and the forms of organizational adaptation become interesting.

The on-the-ground operationalization of the biodiversity conservation goals takes the form of an obligation to conserve the characteristics of particular habitats in all forestry operations (Forest Act 1996, §10). This practice has been standardized through guidelines, training courses and a handful of legal inspections and court cases (Laakso et al. 2003, Yrjönen 2004, Fredrikson 2008, Similä et al. manuscript). According to the auditing of the habitat conservation practice, the success – or compliance – is at a high level; the characteristics of the habitats have been completely protected in over 80 percent of the audited managed sites, and almost protected in another 10 percent (Tapio 2009). However, evaluations of habitat inventorying practice have recognized the limits of the forestry actors' capability to detect all valuable habitats, and to delineate them sufficiently (Kotiaho and Selonen 2006, Pykälä 2007).

In practice, the obligation to conserve habitats rests on the organizations and professionals who hold the resources and competence to recognize the habitats and in whose planning or marking of the operation the habitats should be delineated. In addition to these legally defined habitats, forestry actors are mandated to delineate other valuable habitats according to Guidelines (Tapio 2001) and eco-certification (FFCS 2003) on a voluntary basis. As the

implementation success of the Forest Act habitat conservation has been criticized (Pykälä 2007), and the practice of conservation of the other habitat types is poorly known, studying the actors who are responsible for and able to conserve habitats is likely to illuminate the resources and norms that shape this new but already stabilized practice.

4.3. Organizational field

Finnish forestry has a long history of corporatist governance in which representatives of political and economic interest groups negotiate policies with representatives of the state, with the support of research organizations that have a clear role in the organizational field (Palo and Hellström 1993, Ollonqvist 1998, Berglund 2001, Donner-Amnell 2004). The resulting policies are implemented with economic incentives, incremental changes in regulations, and highly professionalized extension and planning systems. The sector has integrated waves of change in a centrally coordinated fashion by fine-tuning silvicultural practices, supporting investments in timber growth, promoting harvests, and introducing sustainability criteria (Ollonqvist 1998).

The organizational field of non-industrial private forestry that experiences the plurality, multifunctionality and conservation demands includes public sector agencies, particularly Regional Forestry Centres and Regional Environment Centres (as of the start of 2010, the Regional Environmental Centres were merged under larger regional state administrative agencies: Centres for Economic Development, Transport and the Environment), private sector forest industry companies, small scale entrepreneurs, Local Forest Management Associations, environmental non-governmental organizations and knowledge producing organizations. These types of organizations have specific roles at different levels of policy. For example, interest organizations place pressure on policy, and participate in formal policy formulation but have less to do with the actual forest management practice. Similarly, also environmental authorities and knowledge producing organizations, such as research and educational institutes have some role in advancing management standards and systems, and formulating policy but they do not operate in the forest directly. The crucial on-the-ground decisions of forest management – and of integration of biodiversity conservation – are made by those forest management organizations and their professional staff who plan forestry operations. These include the 13 Regional Forestry Centres, 110 Local Forest Management Associations, three large forest industry companies and a number of forestry entrepreneurs.

The Regional Forestry Centres have a coordinating role, as a part of the hierarchical administration of non-industrial private forest management They have authority duties, such as monitoring of law and decisions on financing. These organizations also carry out basic forest inventory and planning in their regions and provide extension services as well as conduct some large scale silvicultural activities. Both the authority duties and services of the Regional Forestry Centres include biodiversity conservation tasks. At the regional level, these organizations communicate horizontally with other regional authorities, e.g. the Regional Environment Centres regarding biodiversity. Vertically they function between the national level ministry and Forestry Development Centre Tapio on the one hand, and the local level actors, including the forest owner, on the other. The Regional Forestry Centres and the Forestry Development Centre Tapio have been proposed to be merged in 2012 (GoF 2010). The proposed new Forestry Centre Act would define the one national organization to be a development and implementation body, directly under the Ministry of Agriculture and Forestry. The dual role in providing authority duties and commercial services (i.e. conducting business) has recently generated controversy. The controversy centers around potential market distortions generated by state

aid allocated to Regional Forestry Centres and so-called forest management fee collected from land-owners to finance the Local Forest Management Associations. The proposed new Act has been developed to overcome the conflict of interest, through a clearer separation of administrative and commercial functions.

Closest to the forest owner are the Local Forest Management Associations that provide them with forest management services at low service fees and a tax-like forest management fee. Local Forest Management Associations are governed by councils consisting of land-owner members, and they are directly linked to the Land-Owner Unions that are regional advocacy organizations. As the Local Forest Management Associations are in close contact with the land-owners and understand the local operational environment, they have been identified as bridging actors between the administration and land-owners in introducing new conservation initiatives (Primmer and Keinonen 2006).

The large-scale forest industry companies are global businesses with sophisticated forest inventory, timber harvesting, and logistic systems. These organizations influence Finnish national forest policy through their advocacy organizations while at the local level they focus on timber purchase and related marketing and planning services. As highly visible actors in an extremely competitive globalized sector, these organizations have been shown to be sensitive to social and environmental responsibility concerns (Halme 2002, Mikkilä et al. 2005). In addition to the very large firms, there is a group of a limited but increasing number of self-employed foresters and very small firms (with less than 10 employees). These consulting foresters provide management planning and harvesting services. They typically do not specialize in environmental or conservation consultancy but recognize a need to learn about conservation (Markkola 2008).

With the long history of Finnish forestry and forest policy, the organizational field of Finnish non-industrial private forestry that faces a new, yet stabilized, challenge of biodiversity conservation is extremely interesting. The need to conserve biodiversity is imposed on the forestry organizations coordinating and operating between central forest policy and numerous constituencies. They have a dual role: to implement the policy and, on the other hand, to navigate in the operational environment and maintain or improve their position as compared to others in the organizational field. These organizations and their foresters are the target of my empirical analysis, which serves the analytical investigation of policy implementation and organizational adaptation, and developing the understanding of institutional adaptation.

5. MATERIALS AND METHODS

5.1. Data

The empirical analyses utilized four different sets of interview and survey data, components of which were analyzed in different combinations and reported in Articles I, II, III and IV (Table 1). The data were collected to address both 1) the factors shaping biodiversity conservation integration and 2) ways in which integration is embedded in practices.

The first dataset consisted of structured interviews with representatives of 16 forest management service providing organizations, sampled from all strata from a population of 53 relevant organizations (Table 1, Article I). The respondents of the interviews carried out in 2003 were managers or owners, and responsible for biodiversity conservation services in their organization. A list of interview topics was provided to the respondents in advance, and the interviews were carried out in a structured fashion with the help of a form (Appendix I). Human

capital was inquired regarding the workers directly involved in biodiversity conservation, with measures of education, training and experience. Organizational routines were addressed with in-house management procedures, standardized quality systems, externally audited quality systems and organizational training. Networking was measured with estimates of frequency of external input use and value of external input from 14 possible sources.

The second dataset constituted the core of this thesis. This survey with 311 foresters who planned forestry operations or carried out long-term forest planning in Regional Forestry Centres, Local Forest Management Associations, large forest industry companies and small scale forestry entrepreneurial organizations was pre-tested with representatives of each of the strata addressed. The pre-testing consisted of filling in the questionnaire with a face-to-face think-aloud, and a retrospective discussion with the respondent (Sudman et al. 1996). The survey was sent to 563 foresters at the end of March 2006, with a reminder to non-respondents ten days later, and a second questionnaire to remaining non-respondents another 10 days later (Survey form in Appendix II). With 311 satisfactory responses, the response rate was 58 percent. Potential sample bias was tested with t-tests of all variables between responses received directly, and those received after a reminder. There was no difference between the two waves of responses, which signals that the sample was not biased (Armstrong and Overton, 1977).

The survey addressed the competences that the organizations mobilized in an integrated biodiversity conservation practice, i.e. delineation of valuable habitats (Article II). To measure the practice, delineation behavior was addressed by number of habitats delineated and by delineation rate, i.e. habitats delineated per planned hectare. To analyze the competences that the organizations mobilized in conserving habitats, data on human capital, organizational resources and information sourcing in networks were collected. Human capital was measured with the respondents' education, biodiversity training, and experience. The measures for organizational resources included information on tools, organizational practices, and enabling working conditions utilized in habitat conservation.

The mail survey data of planning foresters addressed also the judgment of foresters in delineation situations by analyzing their attitudes, social norms and perceived behavioral control, and intentions to delineate habitats beyond what was required by law (Article III). Delineating beyond what was legally required was addressed through two delineation intentions: delineation of Forest Act habitats in a more stringent fashion than what the law requires and delineation of other habitats. These two intentions differed in their level of standardization, with the delineation of other valuable habitats being much less regulated and much more ambiguous, and hence, more voluntary. The intentions were explained by attitudes, social norms and perceived behavioral control, as well as previous behavior. Drawing on Ajzen (1988), the attitudes were further explained by behavioral beliefs about the outcome of the behavior and valuation of this outcome. Correspondingly, social norms (or subjective norm) were explained by normative beliefs about a range of constituents' expectations regarding the behavior, and the willingness of the respondent to conform with these expectations.

The third dataset consisted of survey responses on information exchange among project organizations in collaborative network projects of the Southern Finland Forest Biodiversity Programme (Primmer and Keinonen 2006). The data were collected at a point where the network projects had been running for one and half years. The survey of 19 representatives of member organizations in these networks addressed utilization and applicability of information received from other network organizations. The three-point scale for utilization was: regularly, occasionally, never, and for applicability; extremely valuable, somewhat valuable, not valuable. The fourth dataset included thematic interviews with 13 Regional Forest Council members who had participated in preparing Regional Forest Programmes in two regions (Saa-

Table 1. Overview of data.

Data	Structured inter-views of responsible repre-sentatives of forest management service providing organizations	Mail-survey of foresters planning forestry operations and conducting long term forest planning	Survey of collabora-tive forest biodiver-sity conservation network members	Interviews of repre-sentatives of organiza-tions that participated in preparing Regional Forest Programmes
Year	2003	2006	2005	2008
N	16	311	19	13
Sample	Targeted sample of all relevant organization types in the area	Random 25% sample drawn from four strata, response rate 58%	Targeted sample of all network organization types in each network	Selected representa-tives of network par-ticipants
Coverage	– Häme-Uusimaa Forestry Centre region	– National	– Häme region – Lohja region – Central Carelia – Ostrobothnia	– Pirkanmaa Region – South-Western Finland
Number of respondents by organization type	– 2 Forestry Centre – 3 Local Forest Management Association – 5 Forest industry company – 3 Forest service entrepreneur – 1 Environment Centre – 1 Forestry Development Centre Tapio – 1 Environmental NGO	– 55 Forestry Centre – 111 Local Forest Management Association – 132 Forest industry company – 3 Forest service entrepreneur	– 6 Forestry Centre – 3 Local Forest Management Association – 3 Environment Centre – 2 Land owner organization – 1 Environmental NGO – 2 Education – 2 Environmental authority of city	– 5 Forestry Centre – 1 Local Forest Management Association – 1 Environment Centre – 2 Land owner organization – 3 Environmental NGO – 1 Education
Empirical measurements	Conservation competences – Human capital – Management systems – Networks	Habitat delineation – Delineation volume – Delineation rate – Delineation intentions Conservation competences – Human capital – Organizational resources – Information sourcing – Habitat delineation Professional judgment – Attitudes – Social norms – Perceived control – Habit – Habitat delineation intention Networks – Information sourcing – Constituent expectations	Networks – Information use regularity – Applicability of information – Forum of information exchange	Networks – Information use – Appreciation – forum of information exchange
Analyses	Qualitative and quantitative	Quantitative	Qualitative and quantitative	Qualitative and categorizing
Reported in article(s)	Article I	Articles II , III and IV	Article IV	Article IV

rikoski et al. 2010). The interviews, transcribed for analysis, addressed information exchange with other organizations participating in the program preparation as well as appreciation of the other organizations and collaboration with them. As the third and fourth dataset addressed information flow regarding biodiversity conservation between the same organization types as the primary dataset of forest planning organizations, they provided an excellent point of comparison across different networking modes between these organizations (Article IV).

5.2. Analyses

The analyses were focused on understanding the distribution and inter-relationships between the measured variables. The pilot study, reported in Article I, developed the approach and methods to understand the responses of the forest sector to the increasing demand for biodiversity conservation. The responses were measured by investments in conservation competences, grouped under human capital, organizational management and linkages to other organizations. Correlation analyses were utilized to understand the connection between different competences, particularly between the organizations' internal and external competences. This served in understanding the extent to which there were complementarities and substitution between conservation competences.

The survey data on conservation competences as well as conservation behavior measured by delineation (number of habitats delineated) and delineation rate (habitats delineated per hectare planned) were analyzed to detect a role distribution among the four organization types: Regional Forestry Centres, Local Forest Management Associations, forest industry companies and entrepreneurs (Article II). This was done with analyses of variance that demonstrated differences and similarities among the organization types both in delineation and in competences. Regression analyses were conducted to examine the explanatory power of conservation competences on habitat delineation and habitat delineation rate in the entire population, and also in the different strata representing the organization types – except for the entrepreneurs because of the low number of cases in this stratum.

Forester judgment was analyzed principally with regression analyses, to detect the relative influence that attitudes, social norms (i.e. subjective norms, Ajzen, 1991), and perception of control had on delineation intentions (Ajzen 1988, Article III). The salience of behavioral beliefs and normative beliefs was analyzed based on the distribution of answers. The influence of beliefs on attitudes and social norms was explored with step-wise regression analyses in order to understand what beliefs were behind the general attitude and norm measures. Finally, the analyses were integrated with external variables, with past behavior as the main explanatory variable from outside the Ajzen (1988) model.

The final set of analyses was conducted to measure networking with regularity of information use and appreciation of network actors (Article IV). Descriptive statistics of the survey data employed in this analysis were compared with qualitative categories illustrating information reception and appreciation. The open-ended accounts of the survey of collaborative forest biodiversity conservation network members and the interview data on Regional Forest Programme networks were analyzed qualitatively to understand the forum of information exchange, as well as type of information flows in policy, project and in operational networks.

6. RESULTS

6.1. Summary of the results of the empirical analyses

The pilot study of the competences of public and private collective forest service organizations depicted awareness of the biodiversity conservation responsibilities and opportunities among the actors (Article I). Methodologically, the study contributed to the understanding of adaptation, learning and innovation by developing measures of competences and testing them in forest service organizations in Uusimaa, a socio-economically and ecologically important region in Finland. Conservation competences were noticeably embedded in routine forest management activities, and did not represent an area of specialization. The analyses disclosed the range and distribution of human, organizational and network resources among the relevant actors, and revealed a connection between the organizations' internal and external competences. The study demonstrated that organizations require a certain level of internal organizational competences to be able to utilize knowledge residing outside the boundaries of their own organization.

The accounting of the competences based on the survey of foresters from public agencies, private companies, associations and consultants displayed the role division between these actors but also highlighted the uniformity of the sector (Article II). The article applied and developed the competence or resource-based theory of the organization in a natural resource management context, and tested its hypotheses by regressing the competences onto measures of delineation behavior. The detected differences between the organizations in delineation and competences stemmed from their formal and functional roles in the organizational field. Regional Forestry Centres delineated large numbers of habitats compared to the other organizations, but the forest industry organizations delineated at a slightly higher rate than did the others. According to the results of the analysis of variance, the Regional Forestry Centres invested relatively heavily in spatial tools, particularly when compared with industry and entrepreneurs. The regression analyses where organization types were included as explanatory variables along with the competences further highlighted this role division between the actors.

The Forestry Centre foresters were relatively less experienced (younger) in comparison with the industry ones. Relative to foresters working in other organizations, those working in Forestry Centres were significantly less dependent on information from actors directly engaged in forestry operations and more tightly connected with the forestry administration. In contrast, foresters working in large scale commercial firms were more experienced (and older). Their organizations had invested relatively heavily in procedures and particularly in third party eco-certification compared to all other organization types. Industry and Local Forest Management Associations relied more heavily on information from actors directly involved in forestry operations than did Regional Forestry Centres. Controlling for the organization type, competences had a very small effect on habitat conservation. Out of all competences, communication among actors directly engaged in timber trade and field operations was consistently the competence that had the most significant effect on habitat delineation.

The analysis of professional judgment of planning foresters indicated that these professionals intended to delineate habitats beyond the legally defined minimum (Article III). The analysis applied the theory of planned behavior (Ajzen 1988), and demonstrated its applicability in a previously unexplored forestry professional context. The intentions, reflecting voluntary conservation, were influenced strongly by attitudes and social norms. Particularly the expectations of peers influenced the norm subjectively held by the foresters, which signaled the dominance of a professional norm in this type of decision-making. Also land own-

ers, forestry administration and certification auditors had an impact on the social norms. The foresters' past behavior predicted the delineation intentions, implying tradition and habit to have an important role in defining the way biodiversity conservation is integrated into forest management. As past behavior influenced also attitudes, social norms and control, the practice is likely to be relatively stable.

The analysis of networks and learning among organizations in policy networks, project networks, and operational networks included a literature review of network approaches and learning as well as empirical evidence on information flows and appreciation in these types of networks functioning at different levels of non-industrial private forestry in Finland (Article IV). In this way, it described the mechanism and the capacity of the networks to adapt to the policy demand for biodiversity conservation. The literature review and the analysis demonstrated how the formality and openness of information exchange shape learning mechanisms. The policy, project and operational networks generated partly different ways of learning. Learning in the networks as judged by information flow and appreciation among network organisations took place in formal and informal fora as well as through open channels and restricted conduits.

Networks could be identified to define the boundaries tightly when the knowledge transfer – or transaction of some other sort – had important implications for the interests of the member organisations. This was the case of policy networks for those members that would have had much to loose if the domain was redefined, or with parties to a timber trade transaction in operational networks. As this led to defining the ways in which information was exchanged, learning was directed toward problem solving. Rigid definitions might lead to problems being framed and tackled in conventional ways, not through open-minded search. On a positive note, formal networks provided access to knowledge to their members, even when ties were weak.

In more open situations, where network members joined the network on a voluntary basis, and transactions were less defined, learning was characterised as a common effort. This was the case in the project networks, and possibly among forester peer networks. However, when networks rested on loyalty and trust, or in case of weaker ties, network members might choose to avoid difficult topics and deliberation that would risk collaboration, e.g. with the land-owners in the project networks. If the open channel-like links break down, e.g. because of lack of resources, or loss of momentum, the ties might remain as acquaintances.

6.2. Do organizations and professionals recognize the biodiversity conservation responsibilities imposed on them in policies and through social demand, and do they prioritize them?

Judging by the reported investments in biodiversity conservation competences, professional judgment, networking among organizations, and biodiversity conservation practice, the organizational field of non-industrial private forestry recognized responsibilities and social demand for biodiversity conservation. The indications of conservation effort were tightly connected to the existing routines around forest management, rather than an area of specialization.

The top level managers of biodiversity conservation in the different types of organizations in Häme-Uusimaa region reported being equipped to conserve biodiversity (Article I). Their accounts indicated that biodiversity conservation was integrated into forest management and silviculture, rather than representing a separate area of specialization. Thirteen out of sixteen respondents reported that 100 percent of their forest management employees had biodiversity conservation tasks. The results of the survey reflected a similarly spread and integrated responsibility of conservation (Article II). The respondents interpreted the conservation practice in

a similarly integrated fashion. Out of the 190 foresters' responses to an open-ended question regarding their role in biodiversity conservation, over half indicated that conservation was done in connection with planning and/or marking forestry operations.

Although 2/3 of the foresters considered biodiversity conservation as a part of their job description, ninety percent of them evaluated the proportion of working time allocated to biodiversity conservation to be less than ten percent. Forty percent reported allocating zero percent of their time to biodiversity conservation (Article II). Integration of biodiversity conservation in routines was internalized by the foresters – yet in a manner relying heavily on formal standards. When planning forestry operations, most foresters intended to delineate habitats more than what the law required but they considered that they were more independent in carrying out the legally defined delineation than in voluntary delineation of other valuable habitats.

In the policy and project networks, biodiversity conservation was considered to be a part of the forestry actors' mandate, although these networks included also members who were specialized in biodiversity (Article IV). The Regional Forestry Centres interpreted the formal biodiversity conservation requirements generally placed on forestry actors (Articles II, III, and IV). As they functioned as authorities, coordinated regional forest policy, and interpreted the best practice guidelines, they were importantly shaping the ways in which biodiversity integration was framed.

6.3. Do organizations make targeted investments to conserve biodiversity: do they possess and mobilize biodiversity conservation competences?

The forestry organizations reported having invested in some level of biodiversity conservation competences, i.e. human resources, tools and procedures as well as networks (Articles I and II). A majority of the pilot study organization's employees had participated in the so-called nature management training (Article I). Among the planning foresters responding to the national survey, a typical respondent had completed three out of four possible different types of biodiversity training courses (Article II). Both the pilot study and the survey respondents mostly held technical forester degrees. Out of the pilot study organizations, one organization had recently hired a conservation biologist and three other organizations reported to be in the process of hiring a biodiversity specialist (Article I).

All organizations possessed some level of organizational competencies that the pilot study and the survey addressed. The pilot study identified a broader range in these investments with only a proportion of organizations applying standardized quality management systems and just a fraction having externally audited or certified systems (Article I). In the national survey of foresters, the respondents generally reported their organizations to apply those 19 management systems (communication, information management, and support systems) that were addressed in the survey (Article II). The respondents' expectations were for these levels of investments to be maintained, in some cases expanded. One third of the respondents did not have access to spatial planning systems, but these resources were expected to improve. Financial resources and time were considered less sufficient, and were expected to become scarcer.

The organizations generally retrieved information from a range of actors. The pilot study respondents reported using on the average three out of four potential external information sources, and valued the external information highly (Article I). Among the foresters who responded to the survey, information use from external sources was not at an equally high level but clearly they utilized external information sources, most commonly forestry administration and the forestry operations actors who had hands-on roles in making decisions, planning, and executing forestry operations in the field.

As reported above in the summary of Article II, competences were mobilized to benefit habitat conservation to a very limited degree. Controlling for the organization type, regression analyses showed competences to have a very small effect on habitat conservation. Communication among actors directly engaged in timber trade and field operations was clearly the one competence that stood out, having a significant positive effect on habitat delineation, with biodiversity training having a marginally insignificant effect. In general, close to all competences had a positive sign, suggesting that they could support biodiversity conservation.

6.4. How do organizations specialize; do public sector organizations, private sector organizations and associations differ in their biodiversity conservation behavior and their competences?

The empirical analyses did not show evidence of strong specialization. The variation in competences was small and most of the detected role division could be attributed to the functional roles of the organizations. Conservation competences were integrated with sustainable forest management skills, management systems, and information exchange, which contributed to the investments being distributed relatively evenly in the population of organizations.

In the pilot study of the broad population of organizations in the Häme Uusimaa-Region, the organizations displayed somewhat of a spread in competences, although e.g. the education of these organizations' workers responsible for biodiversity conservation was very uniform (Article I). The amount of biodiversity training and the use of externally standardized and audited management systems varied, which was likely to be partly due to the organizations representing varying sizes and a range of roles in the area.

According to the national survey, the population of organizations planning forestry and forestry operations accessed relatively uniform competences in all analyzed areas: human capital, organizational resources and information sourcing (Article II). Education was an example of how the labor force of these organizations came from almost one mold. Based on 288 responses to an open-ended question about the title of the vocational degree, 284 foresters held forestry degrees.

The results pointed to the specialization being defined more by the roles of public sector agencies, private sector timber purchasing companies and collective land-owner servicing associations, rather than by the organizations excelling in and competing on competences (Article II). The Regional Forestry Centres held a key role in interpreting and operationalizing biodiversity policy (Articles II, IV), and they inventoried high numbers of habitats, as their planning covered large areas (Article II). The differences suggested a possibility that relative to Regional Forestry Centre foresters responsible for large scale long-term planning, actors responsible for commercial operations on site delineated habitats at a higher rate. However, the difference in the delineation rates between the organization types was not statistically significant. The regression analysis of the delineation rate showed that, controlling for competences, industry identified habitats more frequently than did the base-case Regional Forestry Centre.

There was some indication in the Häme-Uusimaa region that some organizations had made investments in competences ahead of others, perhaps due to their ambition in keeping with the policy. This was demonstrated by clustering of competences (Article I). The organizations investing in conservation competencies at relatively high levels utilized both internal fine-tuning of processes and external exploring. These organizations implementing self-designed quality management systems and investing heavily in providing in-house training to their employees were substantially integrated into professional networks.

The public sector Regional Forestry Centres were technically advanced (Article II). Relative to foresters working in other organizations, their foresters were significantly less dependent on information from actors directly engaged in forestry operations and were more tightly connected with forestry administration. The industry organizations and Local Forest Management Associations that engaged directly with the land-owners relied on operational networks. Industry organizations utilized more organizational procedures and certification systems than the other organization types. As networking with operational actors i.e., people directly involved in selling, buying and cutting timber in the local context, was the only competence consistently explaining conservation practice, also the signals of specialization, albeit weak, were tied to the very practices of forestry operations.

6.5. How do personal and social factors influence individual foresters' biodiversity conservation behavior?

Attitudes and social norms influenced the habitat conservation intentions of the planning foresters, which signaled that important responsibility and professional freedom in biodiversity conservation was held by individual foresters (Article III). The foresters reported to be generally in favor of conserving biodiversity, and to intend to delineate habitats beyond their legal obligation. The favorable attitudes were explained most by a very general belief that leaving the habitats outside forestry operations would conserve biological diversity. Also personal conservation oriented goals and previous habitat conservation behavior explained the positive attitude.

Even more important than attitudes in explaining habitat delineation intentions were social norms (Article III). These norms were most heavily shaped by subjective normative beliefs regarding the expectations of other forestry professionals, with also the forest owners' expectations having an impact. Forestry administration influenced the social norm regarding Forest Act habitat delineation, and certification auditors had a similar effect on the social norm about voluntary conservation of other valuable habitats. Like attitude, also the normative beliefs were influenced by past delineation decisions, as well as personal conservation and recreation goals.

Together with the perceived behavioral control, the attitude and normative belief measures explained about 40 percent of both delineation intentions analyzed. Exceeding the more clearly standardized Forest Act habitat delineation requirements was explained more by attitude than normative belief, whilst in the case of the more ambiguous and even more voluntary delineation of other valuable habitats, the normative belief had a stronger influence than attitude.

Perceived control had some effect on Forest Act habitat delineation intention but did not have a notable effect on other valuable habitat delineation intention. The professionals actually felt they were less under guidance when they were following the standard practice of Forest Act habitat delineation. This, together with the reported past behavior explaining a great share of particularly the Forest Act habitat delineation intentions, demonstrated the importance of standards and routines in shaping the professional practice. The strong influence of past behavior and social norms on delineation intentions is in line with the finding that employee experience was negatively correlated with a number of organizational conservation competencies and networks in the Häme-Uusimaa pilot study (Article I).

6.6. How are different networks utilized in communicating about biodiversity conservation at multiple levels of the organizational field?

The policy, project and operational networks generated partly different ways of learning. While project networks bridged across sector-boundaries and utilized both direct and open access to up-to-date research-based understanding as well as practical knowledge of biodiversity conservation, policy networks were more strongly reliant on formal patterns of information exchange and communicated interests at a level distanced from practice. Operational networks on the other hand, rested on strong contacts between peers, likely of an informal character, but their biodiversity conservation learning relied on information flows through conduit-like closed links. Where information exchange was formally defined, informal ties were valuable for tackling emerging issues. Utilizing open channels and allowing spill-overs could improve adaptation and explorative learning.

The networks among the actors in the organizational field were generally dense, also partly with regard to biodiversity conservation. All analyses of networks, i.e. reported information flows and appreciation, showed that the Regional Forestry Centres held an important position, in which they could interpret between technology, ecology and obligations. The interpretation took place in coordination of the regional forest policy and operationalization of guidelines and standards as well as trough habitat inventories, databases and expertise. As was highlighted in the reporting of the role division between the organizations, the Regional Forestry Centres clearly held a key position in delivering information (Articles II and IV) and their views were appreciated (Articles III and IV).

The tightest connections could be identified among forestry organizations. These actors had most limited contact with public agencies not directly regulating forestry, and with environmental NGOs (Article II). Another disconnect could be detected between the operational forest management actors involved in timber trade and the public sector actors representing policy and research (Articles II and IV). In some way, the distance between the public sector and operational actors was detected also at the very operational level, as the Regional Forestry Centre planners' contacts with operational forestry actors were clearly sparser than those of the other foresters (Article II).

Out of the possible clusters of information sources, the most common sources used in biodiversity conservation tasks were forestry administration and forestry operations actors that had hands-on roles in making decisions, planning and executing forestry operations in the field. As reported above, networking with these forestry operations actors contributed clearly to habitat conservation (Article II). Additionally, the analysis of normative belief, i.e. beliefs about expectations of constituents and willingness to conform to them, demonstrated that peer foresters, land owners, forestry administration and certification auditors were highly regarded (Article III).

Judged by the information flow and appreciation among network organizations, learning in the networks in the organizational field could take place in formal and informal contacts and fora as well as through open channels and more closed contract-like ties. The policy networks, being fixed to patterns of formal communication, traditional roles of information contribution and interest-driven goal definition, were likely to focus on maintaining particular coalitions rather than reframing the policy issues or exploring new information channels. Operational networks of foresters had an opportunity to learn in the local contexts through combining informal communication and formal contacts regarding timber trade and implementing policy. These networks were however less likely to search for new solutions and reframe biodiversity conservation, as they were tied to their standard practices. Project networks combined the

utilization of channel-like, openly available and up-to-date research-based understanding of biodiversity with intensive communication among network members. This way, project networks were most likely to employ an adaptive approach to learning through integrating new information with collaboration and deliberation.

7. DISCUSSION

7.1. The policy Implementation mechanism and its challenges

My findings regarding the role division and competences in non-industrial private forestry organizations disclose the dominance of the hierarchical policy implementation mechanism over organizational adaptation as a driver of biodiversity conservation in the organizational field. An essential signal of this is the standardization of habitat conservation that has been advanced by guidelines and demonstrated to actualize in practice (Yrjönen 2004, Kotiaho and Selonen 2006, Pykälä 2007). The low variation in competences I discovered illustrates standardization across skills and procedures. This can be due to the standardized education in forestry that rests on the history of the forestry profession (Eckerberg 1990, Kennedy and Koch 2005, DiMaggio and Powell 1983). The linear hierarchy with measurable targets and standardized procedures as well as decisions trickling down the administration is the idea behind public policy (Peters and Wright 1996, Goodin et al. 2006). It has been demonstrated in many studies of the hierarchical public sector forest organizations (Kaufman 1960, Twight and Lyden 1988, Cubbage et al. 1993, Sabatier et al. 1995). What is new is my finding that a large population of public and private sector organizations serving a dispersed clientele functions in this way. This evidences the role of actors outside public administration in implementing public policy (O'Toole and Montjoy 1984).

Hierarchical implementation is demonstrated particularly by the fact that individual foresters view themselves most independent in making the most standardized conservation decisions, although freedom could be considered limited by standards. Standards are likely to generate security and predictability for the foresters (Jokinen 2006), as well as clarify their position in the organization (March 1991) and as regards their clientele (Lipsky 1980). Standards reduce possible cognitive challenges experienced by the foresters, stemming from diverse expectations from the constituents and from having to manage tradeoffs in integrating conservation and management (Sabatier et al. 1995, Hukkinen 1999, Kennedy and Koch 2004).

For policies to trickle down the hierarchy, and be implemented in the forest, those professionals that have the contact to land-owners and loggers are in a key position. The judgment of these professionals is the final step where policy is integrated with demands of local constituents, and ecological knowledge is fitted in the economically and bureaucratically feasible frame, in a concrete forest management decision (Lipsky 1980, Eckerberg 1986). As my results show professional judgment to rely heavily on attitudes and norms shared among foresters, the education and normative isomorphism explanations identified by DiMaggio and Powell (1983) are reinforced. Strengthened with the domination of habit that I detected, the professional judgment follows what March (1994) has called the logic of appropriateness. This kind of logic reinforces institutions that are not easily addressed or readjusted with policy (Lipsky 1980, O'Toole and Montjoy 1984). The hierarchically organized policy implementation can therefore be importantly constrained by the normative conventions shared among foresters. This implies that the influence of new conservation policies on forest management could remain marginal, even just symbolic (Schneider and Ingram 1990), rather than radically change the practice.

My empirical results show how communication is structured, with the Regional Forestry Centres having a key role in formulating and communicating policy and standards. The results also display the networking in the field to concentrate among the forestry actors and around forestry operations, although formal contacts exist to e.g. environmental administration and NGOs. In this sense, the organizational field of non-industrial private forestry is both hierarchically organized and self-sufficient – and even isolated – in a way that state forestry administrations have earlier been demonstrated to be (Kaufman 1960, Koontz and Bodine 2008, Raitio 2008). Learning and adaptation regarding integrating biodiversity conservation with forest management in these centrally coordinated networks can be limited by traditional role division. Such role divisions are difficult to overcome in formal networks (Nilsson and Eckerberg 2007), and when formal contracts define information exchange (Owen-Smith and Powell 2004).

The project networks established for collaborative forest biodiversity conservation, with truly integrated goals and limited life-time, exhibited an important exception in that they bridged both across different organization types with otherwise clear functional roles, and between the forest sector organizations and the environmental organizations. Perhaps this complementary function as regards hierarchical policy implementation is the reason why networks and collaboration are often championed as structures for learning in analyses and practical situations of integrated and adaptive natural resource management (Folke et al. 2005, Stringer et al. 2006; Nilsson and Eckerberg 2007). Project networks with cross-cutting mandates provide opportunities for exploring beyond existing frames. As integrating biodiversity conservation increases the complexity of forest management, this type of learning will clearly be valuable.

Although integration poses a complexity challenge, the insular character of the sector is likely to contribute to the incremental fashion in which new policies are filtered into to existing standards and practices. As the sector has a strong say in the goal definition, it is not likely to divert significantly from the existing policy (Lindblom 1959, March and Olsen 1984). The Finnish forest sector has historically been economically and politically powerful. It has managed to develop policy to address concerns as they have arisen, in a fashion that has served the sectoral expectations (Ollonqvist 1998, 2001, Donner-Amnell 2004). Incremental fine-tuning can possibly also be attributed to the slowly evolving and accumulating character of the scientific understandings and systems of sustainable forestry (Farrel et al. 2000, Kennedy and Koch 2004). Forestry research has traditionally been closely connected to the development of Finnish forest policy (Ollonqvist 1998, Berglund 2001).

7.2. The organizational adaptation Mechanism and its challenges

My results demonstrate that the organizations have developed their biodiversity competences, but not in a fashion that would evidence strong strategic investment in this area, or even particular alertness. Very uniform competences defined merely by traditional functional roles of the organizations signal little differentiation or specialization. This, together with the above described dominance of incremental changes integrated to core practices, is illustrative of a traditional, inert organizational field. Like Schraml (2005) has found in Germany, some characteristics of the forest management organizations do not evolve as a response to social demand.

However, some organizational adaptation logic is signaled by my finding that the forest industry companies, most directly dependent on reputation, invest in procedures and eco-certification. They manage to channel their conservation competences toward habitat conservation practice slightly more than the public sector organizations. Private sector organizations are delineating habitats in connection with planning operations that will be carried

out immediately and, hence, have more immediate legitimacy concerns than public sector organizations, whose foresters make decisions that will be actualized later in the future. It is possible that the public sector organizations have accountability concerns as regards their reputation among land-owners more than among constituents with environmental demands. At the higher management level – perhaps similar to high level policy goals – organizations identify conservation commitments as important for legitimacy, and even for competing in the market. This is in line with the organizational adaptation expectations (Sharma and Vredenburg 1998). My results do not clearly support the assumption that legitimacy concerns would be similarly serious for public sector organizations facing cutbacks in budgets and mandates (Denhardt and Denhardt 2000).

The organizational adaptation mechanism is premised on the assumption that clients, stakeholders and constituents in general would place such clear demands on the organizations that the organizations would take them into consideration and actually adjust their investments and practices accordingly (Nelson 1991). As the forest sector organizations are facing multiple demands from a growing range of constituents (Kennedy et al. 2001, Niskanen et al. 2008), their investments in new competences and their practices can be expected to develop accordingly – that is, if they adapt. The organizations could, if they were forerunners, influence the entire organizational field by generating expectations for progressive conservation behavior (Kagan et al. 2003, Gunningham et al. 2004). This would require a combination of aggressive demand and political and regulatory threat (Kagan et al. 2003, Langpap and Wu 2004, Cashore and Howlett 2007).

Perhaps the little evidence that I found for organizational adaptation can be explained by the Forest Act having generated a rather narrowly defined area of regulation where actors resort to standards. The isomorphic development is possibly enforced by the stringently interpreted regulatory intervention. If the potential innovations in biodiversity conservation competences do not match this regulation, and other opportunities for applying them do not exist, investments in the new competences might not pay off (Porter and Van der Linde 1995, Cashore and Vertinsky 2000, Schaltegger and Synnestvedt 2002).

It is also possible that the social demand for increased conservation is not experienced as strongly in the non-industrial private management, as it has been found to be taken by the forest industry (Halme 2002, Mikkilä et al. 2005). As the forest industry depends on timber from private forests, it could be claimed that the forest industry has not fully carried through the corporate greening commitments that it has claimed to make. The low level of alertness to social demand among the actors might be produced by the corporatist character of Finnish forest policy; there is simply less external pressure. A corporatist system enhances normative and coercive isomorphism because the actors in the organizational field have access to the policy design. Resistance against the established conservation policy is lower compared to for example USA and the UK where policy design can be less influenced by the organizations (Cashore and Vertinsky 2000, Rivera et al. 2009).

Networks of actors provide fora for learning as well as for communicating and testing new ideas (Powell 1990, March 1991). My empirical analyses demonstrate that networking is clearly focused on contacts among forestry actors. Contacts with environmental organizations are weaker and more formal, concentrating on the higher management level of the organization or dynamic project situations. This repeats the message that the organizational field is relatively isolated and the structures are rather fixed. The finding that the most operational networks contribute most to conservation combined with the observation that this practice is not strongly linked with up-to-date biodiversity knowledge constitutes possibly a core message for adaptation: practical ideas regarding forest biodiversity conservation are not integrated

with the scientific understanding of what benefits biodiversity and how different conservation options should be prioritized. As the adaptive social-ecological systems literature has pointed out, learning across the domains of scientific research and practical experience can be a bottleneck in facing change (Holling 2005, Armitage et al. 2008).

7.3. Interpretation of institutional adaptation

My analyses evidence the postulates of hierarchical policy implementation and also some of organizational adaptation. However, both mechanisms are only partial explanations of the observed practice in the organizational field. Actually, many of the findings illustrate divergence from the basic tenets of the two theoretical approaches. Interpretation of these findings presents a critical opportunity for fine-tuning and bridging across the mechanisms of policy implementation and organizational adaptation. This interpretation necessarily draws attention to institutions.

It is typical for the empirical analyses of policy implementation to be critical of the linear assumptions (Simon 1945, Pressman and Wildavsky 1973, Lipsky 1980, Sabatier et al. 1995). Also, reviews of implementation research highlight distortions from the assumptions of hierarchical public policy (O'Toole 2000, deLeon and deLeon 2002, Saetren 2005). However, the policy implementation literature draws little on the notions of institutional analysis of organizationsThe frictions that I identified have been detected also in earlier analyses of forest policy and of attempts to conserve biodiversity in the forest sector. These studies have noted the complexity of both the policy target and the implementation context (Butler and Koontz 2005, Koontz and Bodine 2008, Schultz 2008), the attention to the often contradicting expectations of plural constituents (Sabatier et al. 1995, Koontz 1999), as well as the professional and organizational goals and practices (Eckerberg 1986, Twight and Lyden 1988, Sabatier et al. 1995, Koontz 1999). To add value to the mere acknowledging of these complexities, I propose the institutions framing and interfering in policy implementation to be worthy of explicit attention.

Organizational adaptation literature has had less fixed tenets than that dealing with hierarchical policy implementation. Therefore, it raises less criticism. In the search for success factors, innovation, learning, and corporate greening, attention is generally not focused on failure but rather on the success of these efforts (Russo and Fouts 1997, Sharma and Vredenburg 1998; Meeus and Oerlemans 2000). As an exception, it is generally agreed that large and old organizations are more self-sufficient and inert than smaller and younger ones (Hannnan and Freeman 1984; Damanpour 1996). Attention to institutions supports the understanding of the tendency of organizations to follow their historically formed practices, rather than searching for new successful strategies (Nelson and Winter 1982, March and Olsen 1986, March 1991).

As many seminal authors define institutions as rules that evolve slowly, they are important sources of friction and rigidity (Meyer and Rowan 1977, North 1990, Ostrom 1990). Their framing of what practices are considered appropriate generates preference for incremental changes (March 1994). Institutionalism acknowledges that addressing increasing complexity with standard practices is considered legitimate (Meyer and Rowan 1977), and cost-efficient (Nelson and Winter 1982, North 1990). Diverting from what has become to be considered appropriate can be difficult and risky. This leads to uniformity in organizational solutions, which has been termed isomorphism (Meyer and Rowan 1977, DiMaggio and Powell 1983).

If entire populations of organizations and their staff follow very tacit rules leading to isomorphism and inertia, the mechanisms that enforce this behavior must be understood. Out of three such mechanisms identified by DiMaggio and Powell (1983), the coercive and

normative mechanisms seem to bear relevance for investigated organizational field I have investigated – and mimetic isomorphism less so. The coercive mechanisms are those formal regulations, structures, and incentives that impose duties on organizations, but also the more informal legitimating mechanisms that are tightly connected to the administrative structure (Simon 1945, Meyer and Rowan 1977). The coercive mechanisms of isomorphism are actually those of hierarchical, standardized policy implementation. This is rarely highlighted in research on isomorphism but has been brought up in a recent analysis of protection policies (Rivera et al. 2009).

Interfering and interacting with this mechanism is a normative isomorphic mechanism that highlights the power of professions (Lipsky 1980, DiMaggio and Powell 1983, Scott 2001). It acknowledges the logic of appropriateness in professional decision-making (March 1994). The forestry profession has a strong institutionalizing role in the organizational field. It is historically well established (Kaufman 1960, Kennedy and Koch 2004), and capable of addressing new cognitive and legitimacy challenges to some degree (Farrell et al. 2000). It can be said to resemble, e.g. that of doctors in the health care sector (Ruef et al. 1998). Professionalism can lead to the organizational field focusing on fine-tuning of existing models and practices, in a bounded fashion, and at the expense of exploring and searching for new ideas in networks beyond the extended professional ones (Powell 1990, March 1991). Professional ideas are transferred in the organizational field by educational organizations and exchange of the labor force, as well as the monitoring systems that are in the hands of the profession (Simon 1945, Lipsky 1980, Scott 2000). It is no wonder that individual professionals, like the foresters in my study, consider the opinion of peers important in decision-making.

The third mechanism that DiMaggio and Powell (1983) identify as generating isomorphism is a mimetic one. Organizations copy well-functioning solutions from successful others (Nelson and Winter 1982). This idea of institutionalization clearly conflicts the idea of success stemming from idiosyncratic competences and subsequent organizational diversity (Barney 1991, Nelson 1991, Teece 1997, Sharma and Vredenburg 1998). My empirical results show little evidence of specialization resting on and generating organizational diversity or the organizations generally copying each others' practices. The isomorphism and inertia in the field tend actors to follow an inert, isomorphic strategy, rather than excelling in integrated biodiversity conservation. As discussed earlier, this can be due to the social demand being interpreted in a centralized fashion. The weak operational influence of the detected organizational greening strategies indicate some slight mimetic pressures among the private sector forest industry companies, however.

The interplay between institutional forces and organizational strategies in the forest sector have been analyzed by Cashore (Cashore and Vertinsky 2000, Cashore and Howlett 2007). This work demonstrates how fixed patterns of forestry actors can evolve as a response to changing pressures from the operational environment and from policy, and how the organizations benefit from networks in their responses. It is possible that the demand for biodiversity conservation and the controversies surrounding it would have peaked earlier in Finland. The uniformity of the response in the organizational field would signal that the integration policy is already in a mature implementation phase (Rivera et al. 2009). Alternatively, the incremental approach of the organizational actors is a weak early signal of modest "patching up" and transposing old institutions to meet the new conservation requirements (Genschel 1997, Cashore and Howlett 2007).

However, this does not decrease the dilemma that the actors in the organizational field must deal with. The difficulty in integrating environmental concerns with economic activity is an ongoing one. Conserving biodiversity in connection with producing timber necessarily

involves contradicting societal interests. Forestry as an economic activity is characterized with clear property rights, whilst biodiversity is a collective good (Paavola 2007). The collective good character of natural environment shapes the rationality and institutions of environmental conservation, placing importance on value arguments and collective constructions of problems in environmental policy (Ostrom 1990, Vatn 2005). For this reason, regulating biodiversity conservation requires collective logic, rather than mere efficiency logic (Paavola 2007). Collective logic can be integrated to economically grounded decision-making through political or social demand but understanding the mechanisms by which these demands turn into practice requires analysis of policy implementation and organizational adaptation; as well as attention to bounded rationality, logic of appropriateness, street level bureaucracy, inertia and isomorphism. A prerequisite for this kind of analysis is relaxing the polarized notions of conservation policy as a constraint on economic activity, and from the opposite perspective, economic activity as a threat for the environment.

The results presented in this thesis demonstrate that the partially contradictory goals of conservation and management are clearly present in the organizational and professional decisions in non-industrial private forests but that the integration challenge is considered a pragmatic one. The degree and mode of integration is in the hands of the actors making these decisions and importantly shaped by formal and informal institutions; by policy and standards and professional norms shared in networks.

The approach developed here has relevance for other integration challenges encountered in organizing the production of collective goods and services. Environmental policies often face the challenge of integrating conservation with an economic activity. Although some related policy issues, like managing forests for combating climate change, might not have similar conflicts between production and conservation, they also have the characteristic of public policy meeting the strategies of public and private actors, and the friction in adapting to change. Analysis of institutional adaptation utilizing the approach developed in this thesis could range from natural resources to other policy areas, for example health care policies.

7.4. Analytical challenges

I have analyzed the mechanisms of integrating biodiversity conservation into forest management from cross-sectional qualitative and quantitative data. Although utilizing cross-sectional data in the study of historically determined development is not likely to capture the entire range of mechanisms contributing to policy implementation (O'Toole 2000) or organizational adaptation (Avital 2000), there is value in analysis of actual current practice. The data for the empirical work of this thesis have been collected at points in time where the operationalizations of the conservation responsibilities and strategies have already been established, and the practice has stabilized. The evolution since the 1990s, when biodiversity conservation demands have first been explicated and biodiversity conservation has become a policy issue penetrating natural resource policies, have been the basis of this research. The design, analyses and interpretation have paid attention to this evolution of forest policy and forest biodiversity conservation in Finland[1].

[1] These include my own work on history of Forest policy design (Primmer and Vahantaniemi 2005), participation in forest policy design (Primmer and Kyllönen 2006) as well as networking in forest biodiversity conservation (Primmer and Keinonen 2006) and implementation of biodiversity conservation targets (Auvinen et al. 2007). Additionally, the important research of Ollonqvist (1998, 2001) on mechanisms and substantial emphases of forest policy design and implementation and Hellström (2001) on forest conflicts, have been complemented with the analyses of the practices of forest management and administration by Jokinen (2006) and Leskinen (2004) as well as the framings of forest policy issues by Berglund (2001) and the evolution of the Forest industry's position in the field by Donner-Amnell (2004).

The thesis reports empirical analyses of different types of data, including open interviews, semi-structured interviews and a mail survey. It is important to keep in mind that interview and survey data, like data always, include potential for bias and error (Sudman et al. 1996). Respondents might not understand the questions or they might respond strategically, or in ways that they believe they are expected to answer, or even lie. To control for these cognitive and strategic risks as well as other potential pitfalls in data collection and analysis as well as interpretation of results, I have conducted careful planning and rigorous testing (Section 5). Evaluation of conservation outcomes would require also field investigations (Eckerberg 1990). My thesis has taken the up-to-date inventories and ecological analyses of delineation outcome as a starting point (Yrjönen 2004, Kotiaho and Selonen 2006, Pykälä 2007).

Because the mechanisms of policy implementation and organizational adaptation are complex, just like the ecological problems that the organizations address and the institutional contexts that they are embedded in, empirical research on them is often qualitative. However, there is a tendency to rely heavily on quantitatively verified arguments regarding policy (Funtowich and Ravetz 1993, Vatn 2005, 2009). This tendency has motivated my choice of a cross-sectional analysis of the populations and generating evidence by more or less quantitative analysis. By paying close attention to the context and utilizing also qualitative accounts, the thesis bridges between qualitative interpretative studies and quantitative analysis.

The quantitative analyses have allowed investigation of tendencies and dominant characteristics of the organizational and professional population, as well as the causal relationships between these characteristics and practice. These analyses have, however, possibly not been sensitive to the weak signals of new practices arising in the organizational field. The population of organizations and professionals that the study has addressed includes the mainstream actors, with less attention to exceptional cases, e.g. recently established new entrepreneurs offering nature planning services. Although the population of entrepreneurs sampled for the survey includes also this type of actors, and as this group of organizations displays broad variance of competences, understanding of the strategies of these actors will require qualitative analysis.

Almost needless to mention, the shortage in depth of the qualitative analysis or the statistical rigor of the analyses of the survey responses have been compensated with the breadth of analysis that the combination of these methods has allowed. More in-depth understanding of organizational and professional practices would benefit from further qualitative analyses, including investigation of outcomes and relating those to the statements made by the interviewees. Statistical analyses of organizational investments in conservation competencies and practices across the population would reveal more about general tendencies in the sector.

Importantly, the analyses spanning across organizational boundaries and across the public and private sectors is challenging but contributes to the understanding of the organizational field significantly. The interface of public policy typically evaluated in hierarchical administrations and organizational strategies that are generally best understood in business corporate situations has been the starting point of this analysis. As the results highlight the tendency to follow a hierarchic approach rather than a competitive strategic approach among the actors in the field, the testing of these approaches across the organization types has served its purpose. The specific comparison of organization types and the analysis of networks have also addressed the organizational roles in the field directly.

8. CONCLUSIONS

I have analyzed the Finnish organizational field of non-industrial private forestry and the responses of the actors in this field to the recent, yet stabilized biodiversity conservation challenge. I have employed policy implementation and organizational adaptation theories to investigate the mechanisms of adaptation in the organizational field. In interpreting my findings, I have bridged across the two theories paying attention to institutions. The empirical analyses produced weaker signals of organizational adaptation than of policy implementation.

Earlier treatments of policy implementation have found that policy is seldom implemented in a linear fashion because of the complexity of the issues and contexts that policies deal with, because policies concern large numbers of constituents, and because organizations and professionals place their judgment on a number of other factors than the policy. Considerations of organizations as strategic actors have also found organizations to not always adapt, because they do not necessarily recognize changes in the demands placed on them, they might not manage to develop required competences and specialize, or learn and utilize networks in ways that support adaptation. Many of these caveats are reinforced by the results of my empirical analyses of actors in the organizational field of Finnish non-industrial private forestry, along with support for the policy implementation assumptions.

The investigated organizations and professionals have recognized the policy and social demand for integration of biodiversity conservation into forest management. Organizations managing non-industrial private forests have developed some competences for conservation, and their professionals report to be in favor of conserving biodiversity. In this sense, the actors can be considered to meet the challenge to integrate biodiversity conservation into forest management. But this positive message is notably undermined by the general finding of biodiversity conservation being actually integrated to forest management so tightly that it can be said to be subsumed by mainstream forestry.

Biodiversity conservation is not an area of differentiation or strategic specialization in the organizations, with the exception of a weak indication of the private sector forest industry organizations having invested in organizational procedures and their relatively successful, yet frail, channeling of conservation competences toward habitat conservation. Generally, the organizational field displays remarkable uniformity, or isomorphism. The results signal a hierarchical coercive and standardized approach to conservation where also professional norms can be the source of uniformity. The dominance of the forestry actors in policy and operational networks reinforces this interpretation. The detected isomorphism can be a sign of inertia in a sector that has traditionally been self-sufficient in policy formulation. Inertia can be caused by little attention to social demand for conservation among the organizations, or it can be a consequence of organizations placing low priority on biodiversity conservation.

The concrete conservation decisions made by forestry professionals are strongly molded by the expectations of their peers. Information sourcing from actors involved in forestry operations is the most effective conservation competence in this practice. In this sense, the forestry profession and the active forest management actors frame biodiversity conservation, while the social demand external to the organizational field has little influence on the practice. However, the finding that tight networks of operational actors actually advance conservation, albeit modestly, is an important indication of the significance of horizontal communication for conservation.

To advance biodiversity conservation in commercially managed non-industrial private forests, the sector should harness the capacity of the actors to take up additional tasks, fine-tune their practices, and meet the set standards as well as share practices. However, at the same

time, both pressure and space for innovation and diversified approached would be needed to generate opportunities for progressive organizational adaptation. This requires a combination of ambitious targets, strict minimum obligations and operational freedom. The policy design should be based on informed consideration of what coercive logics function at the level of the sector, the organizations and the individual.

Analytically, this thesis contributes to the analysis of organizational behavior and interpretation of policy across the public and private sector boundaries. The combination of a hierarchical policy implementation approach inherent in analysis of public policies, and organizational adaptation typically applied to private sector organizations, demonstrates which mechanisms apply across an organizational field. Together, these advance the understanding of institutional adaptation to environmental change.

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Biodiversity Conservation in Finnish Forest Management

I) Background

To begin, we would like to ask a few questions about your organization to better understand what you do. Our approach here is to understand your engagement in forest management services, and then to discuss activities directly relevant to biodiversity conservation.

1. Which of the following types of forest management services do you provide? Please identify the three most important service roles of your organization (% income or % resources)

SERVICES	Provided	Rank top 2
Logging		
Silviculture		
Trade (brokerage)		
Forest management planning		
Extension		
Training		
Nature management planning (maintenance or restoration of ecological features)[1]		
Restoration of protected areas		
Recreation planning		
Financial planning services		
Other:		

2. To whom do you provide forest management services?

CLIENTS	Yes/no	Rank top 2
Private non-industrial forest owners		
Municipality, Church		
Forest industry companies		
Small and medium size wood processing entrepreneurs		
Local Forest Management Association		
Regional Forestry Centre		
Environmental administration (Regional Environment Centre and Ministry of the Environment)		
Forestry Development Centre Tapio		
Ministry of Agriculture and Forestry		
Other:		

[1] Mentioned in the Forest Act, often includes key features of the habitat (Forest act habitats, other) and leaving standing trees on logging sites.

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In those cases where clients include non-industrial or industrial forest owners, we need clarification. What is the typical/average size of your clients' forestland holdings?

<20 ha _____%
20-50 ha _____%
>50 ha _____%

TOTAL 100%

Approximately, what percentage of your forest owner clients live on property?

_____%

Approximately, what percentage of your forest owner clients are farmers

_____%

3. Where do you provide services? If territory is not formally delineated (e.g., forestry center), draw on A4 map of municipalities.

4. How large is your organization? Here we are asking overall (total) size.

Total annual Revenue or Budget	<100 000	O
(highlight which)	100 000 –500 000	O
	>500 000	O
	Eur	
# employees (Full time equivalents)		fte
# Hectares of forest under management		ha

5. Now thinking specifically only about forest management service provision, we will ask these same questions.

Total annual Revenue or Budget	<100 000	O
(highlight which)	100 000 –500 000	O
	>500 000	O
	Eur	
# employees (Full time equivalents)		fte
# Hectares of forest under management		ha

6. Number of years organization has been in existence

_____ Years

APPENDIX 1

7. Organizational Evolution, describe briefly the history of your organization

8. We would like to know if service provision of your organization is growing.

Total annual Revenue or Budget 5 years ago (highlight which)	<100 000 100 000 –500 000 >500 000 Eur	O O O
# employees (Full time equivalents)		fte
# Hectares of forest under management		ha

II. Internal resources for biodiversity conservation in your organisation

The term forest biodiversity refers to abundance and variety of different forest environment types, populations, ecosystems as well as species and their genome[2]*. The Forest Act states that "forests ought to be managed in a manner that secures the general conditions for maintaining habitats characteristic to forest biodiversity"*[3]*.*

Please reflect on these questions briefly before we enter into looking at your resources used for services related to protecting biodiversity:

9. Please describe briefly your practices of dealing with habitats of special significance of the Forest Act[4].

11. In what ways has this procedure changed over time?

Now we will inquire about your internal human resources and procedures related to biodiversity protection.

11. Within your organization, how many employees are engaged in biodiversity conservation service provision?

_____ persons

[2] Metla 2001. Metsätilastollinen vuosikirja.
[3] Forest Act 1996. 10§ (this is what is says, truly!)
[4] Who does what (recognises them, suggests refraining from any management, suggests nature management operations)?

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12. We will next ask questions on the education and experience of the employees working with biodiversity conservation. If there were zero employees engaged in conservation activities, then we will ask the following questions on your central service provision resources.

If more than 5, focus on leaders/managers.

	Title	Formal Education (level and specialization)	Relevant training (# weeks)	# years forest mngt. experience	Tasks (brief)
1.		O Comprehensive school O High school O Technical school O Polytechnic ___specialization_____ O University degree _____ O Post-graduate degree _____			
2.		O Comprehensive school O High school O Technical school O Polytechnic O University degree O Post-graduate degree			
3.		O Comprehensive school O High school O Technical school O Polytechnic O University degree O Post-graduate degree			
4.		O Comprehensive school O High school O Technical school O Polytechnic O University degree O Post-graduate degree			
5.		O Comprehensive school O High school O Technical school O Polytechnic O University degree O Post-graduate degree			

Recent BD Training:

14. Please describe any training specifically focused on biodiversity conservation in which your employees have participated in the last 5 years.

Course	**Duration (# days)**	**Trainer**	**Number participated**

14. Is your organization now looking to hire people with skills related to biodiversity conservation, or do you expect to hire such people in the future? If yes, please describe what skills you are looking for and when you expect to hire this person.

Now we will ask questions about your procedures and systems related to biodiversity protection.

15. What formal organizational commitments and procedures for biodiversity conservation do you have/apply.

A. Mission statement
- O Yes. Obtain a copy
- O No

B. Record keeping of biodiversity conservation actions
- O No
- O Yes. What kind _____
  how are they used?_____

C. Research/Experimentation
- O No
- O Alone
- O With others. Whom?_____

D. Quality system
- O Certification, what_____
- O Other quality system (e.g. EMAS, ISO14000), what _____
- O Landscape ecological planning (e.g. Metsähallitus)
- O Guidelines of Good Forest Management (Tapio)
- O Other forest management guidelines, Specify_____

Describe your possible quality system:
_____

E. Internal Audit
- O No
- O Yes, specify_____

F. Training and oversight of operational forest workers (machine contractors and loggers)
- O No
- O Yes, specify_____

G. Specialised equipment or tools for securing biodiversity
- O No
- O Yes. Specify _____

H. Formal commitment to continuous improvement or learning

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- O No
- O Yes. Specify _____

Can you please provide any specific examples of improvements or areas in which you seek to make improvements?
_____

I. Other special procedures for taking biodiversity into consideration in decisions.
- O No
- O Yes, specify_____

J. Can you name any other internal resources that have significance in terms of biodiversity related tasks?

III) External linkages: access to relevant extra-organisational resources

The previous set of questions focused on internal resources within your organization. Possibly, these internal assets for biodiversity conservation are complemented by linkages with external sources of expertise. Do you have such external collaboration or communication relationships that support your efforts to accomplish biodiversity conservation within forestry operations?

Now we would like to ask a few questions about external inputs that support your service activities related to biodiversity conservation. These inputs take different forms, like information, guidelines, maps, tools and systems, consultation.

16. What are the three most important (Ask first the most important, then second most important, then third most important) external organizations that provide this type of inputs to you. (Now fill in the frequency, usefulness, etc.)

For each of the organizations listed here, please tell me the frequency with which you receive information or services relevant for biodiversity conservation, the value of that information, whether or not you pay a fee for the service.

We will now list other organisations….

Organization	We receive information, what	Usefulness of information	Cost
Ministry of Agriculture and Forestry	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Forestry Development CntreTapio	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Forest owners' union	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee

Environmental administration (Ministry and Regional Environment Centres)	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Regional Forestry Centre	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
LFMA	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Nature and environmental NGOs	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
MTK	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Forest Industry	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Metla	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Individual forest owners	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Private forest service providers (entrepreneurs)	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Other local authorities	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Media	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee
Other	O Regularly O Occasionally O Never	O Extremely useful O Useful O Not useful	O Free O Fee

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IV Behaviour/attitudes:

17. Please tell us, when planning and carrying out the following nature management operations, whether you operate at the level required by the law (or the Tapio guidelines) or according to some other, more demanding, procedure. Has this practice changed during the last 5 years, will it change during the next 5 years?

Protecting biodiversity	Current practice	5 years ago	In 5 years
Delineation of habitats of special significance	O Law level O Exceeding the law level, based on: _____	O Less O Same level O More	O Less O Same level O More
Leaving decayed wood	O Law level O Exceeding the law level, based on: _____	O Less O Same level O More	O Less O Same level O More
Leaving standing trees	O Law level O Exceeding the law level, based on: _____	O Less O Same level O More	O Less O Same level O More
Leaving buffer zones	O Law level O Exceeding the law level, based on: _____	O Less O Same level O More	O Less O Same level O More
Making nature management plans	O Law level O Exceeding the law level, based on: _____	O Less O Same level O More	O Less O Same level O More

Can you list any other operational practices that would contribute to biodiversity conservation in your service activity?

_____
_____

Sources of these capabilities within your organization and their significance

27. In terms of biodiversity conservation, how important are the following resources within your organization? For each one, assign a score on a scale of 1-5 with 5 being the highest.

1 2 3 4 5
O O O O O Formally educated personnel
O O O O O Specialized education in ecology/conservation biology/conservation planning

O O O O O On the job experience
O O O O O Additional training
O O O O O Procedures, e.g. quality systems
O O O O O Connections with outside organizations

19. Do you compete over clients in biodiversity services (or other services)?
- O Yes
- O No

Do you compete or collaborate with any of the following:

	Compete		Collaborate	
	Yes	No	Yes	No
LFMA's	O	O	O	O
Forest industry companies	O	O	O	O
Private forest service providers	O	O	O	O
Regional Forestry CEntres	O	O	O	O
Other authorities	O	O	O	O
Other, specify	O	O	O	O

Opinion Questions

20. Forest owners with whom I interact place a high value on biodiversity conservation.
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

21. Forest management service providers with whom I interact place a high value on biodiversity conservation
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

22. Forest policy decision-makers place a high value on biodiversity conservation
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

23. Finns place a high value on biodiversity conservation
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

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24. Our organization has human personnel, systems, procedures and resources through which we can effectively protect biodiversity
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

25. Finnish Forestry actors generally have human personnel, systems, procedures and resources through which they can effectively protect biodiversity
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

26. Our organization openly shares technical information on biodiversity conservation with other organizations.
- O Strongly Disagree
- O Disagree
- O Neither agree nor disagree
- O Agree
- O Strongly agree

HOW TO ANSWER:

Answer all the questions. Tick one option that best describes your situation, unless other instructions for answering are provided. In open questions and spaces for specification, please write down your answer with clear numbers or letters.

A. THIS DEALS WITH YOUR ORGANIZATION AND YOUR TASKS

1. Name of organization _____

2. Forestry Centre region, mark the forestry centre, in the area of which you primarily operate.

1 O Rannikko
2 O Lounais-Suomi
3 O Häme-Uusimaa
4 O Kymi
5 O Pirkanmaa
6 O Etelä-Savo
7 O Etelä-Pohjanmaa
8 O Keski-Suomi
9 O Pohjois-Savo
10 O Pohjois-Karjala
11 O Keski-Pohjanmaa
12 O Kainuu
13 O Pohjois-Pohjanmaa
14 O Lappi

3. Job title _____

4. What tasks are included in your job description (tick one or more alternatives)

1 O Forest planning
2 O Forest inventory or assessment
3 O Extension
4 O Timber purchase
5 O Forestry operations (planning or execution)
6 O Monimuotoisuuden turvaamistehtäviä
7 O Other, specify:

_____
_____

If your tasks include biodiversity conservation, please describe these tasks:

_____
_____
_____

What proportion of your work time do you use on these tasks? _____ percent of my work time.

5. Do you have subordinates or do you supervise people who are not directly your subordinates? Mark the number, and specify who else you possibly supervise.

1 O No
2 O Yes, I have _____subordinates.

3 O Yes, I supervise _____persons outside my own organization,

Whom: _____

6. What is the job title of your supervisor? _____

B. THIS SECTION IS ABOUT YOUR FORESTRY OPERATION PLANNING AND MARKING IN 2005

7. Please estimate how many forestry operations you planned in 2005?
Merkitse arviosi sekä suunnitelemiesi leimikoiden lukumäärästä että hehtaarimäärästä. _____ operations, which equals _____ hectares.

8. Please estimate how many stands there were in one marked / planned operation on the average? _____ stands

9. In h many operations did you do the marking in the forest? _____ operations

10. Estimate how many of the following types of nature habitats there were in your operation markings/plans, within or adjacent to them?

		Number of sites
1	Forest Act habitat	_____ kpl
2	Habitat of Nature Conservation Act	_____ kpl
3	A species of particular conservation value of Nature Conservation Act	_____ kpl
4	Nesting tree of a protected bird species	_____ kpl
5	Nature Directive species (e.g. flying scuirrel)	_____ kpl
6	Rare habitat of Forest Certification	_____ kpl
7	Other valuable habitat	_____ kpl

11. How did you act when marking/planning operations in 2005?

		Always	Often	Some times	Rarely	Never
1	I left the Forest Act habitat intact despite my evaluation suggesting that it could have been managed without destroying its special characteristics	5O	4O	3O	2O	1O
2	I delineated uncertain cases of Forest Act habitats outside operations	5O	4O	3O	2O	1O
3	I delineated the Forest Act with a marginal, i.e. larger than my understanding of the minimum requirement.	5O	4O	3O	2O	1O
4	I delineated other valuable habitats outside operations	5O	4O	3O	2O	1O

C. THIS SECTION IS ABOUT INFORMATION FLOW UNDELRYING SUPPORTING YOUR DELINEATION DECISIONS.

12. How many of the Forest Act habitats that you delineated were not originally included in data that you had available? _____ kpl

13. And on how many did the forest owner have no previous information on? _____ kpl

14. How often did you obtain information about a Potential Forest Act habitat within or adjacent to your marking site from the following sources?

Consider all different ways in which you received information. Consider also habitats which were not inside your marking site, but also those adjacent to it.

		Always	Often	Some times	Rarely	Never
1	Inventory data of Forest Act habitatas	5O	4O	3O	2O	1O
2	Forest plan	5O	4O	3O	2O	1O
3	Forest owner	5O	4O	3O	2O	1O
4	Regional Forestry Centre	5O	4O	3O	2O	1O
5	Regional Environment Centre	5O	4O	3O	2O	1O
6	Land use register	5O	4O	3O	2O	1O
7	Municipal zoning agency	5O	4O	3O	2O	1O
8	Regional zoning organization	5O	4O	3O	2O	1O
9	Forestry Development Centre Tapio	5O	4O	3O	2O	1O
10	Finnish Environment Institute	5O	4O	3O	2O	1O
11	Own organization: supervisor	5O	4O	3O	2O	1O
12	Own organization: colleague	5O	4O	3O	2O	1O
13	Own organization: person responsible for biodiversity	5O	4O	3O	2O	1O
14	Own organization: employees	5O	4O	3O	2O	1O
15	Other forestry professionals	5O	4O	3O	2O	1O
16	Local Forest Management Association	5O	4O	3O	2O	1O
17	Timber buyer	5O	4O	3O	2O	1O
18	Logging contractor	5O	4O	3O	2O	1O
19	Nature NGO	5O	4O	3O	2O	1O
20	Other source, specify _____	5O	4O	3O	2O	1O

15. How often did the following actors receive information on a Forest Act habitat from you?

		Always	Often	Some times	Rarely	Never
1	Forest owner	5O	4O	3O	2O	1O
2	Local Forest Management Association	5O	4O	3O	2O	1O
3	Regional Forestry Centre	5O	4O	3O	2O	1O
4	Own organization: supervisor	5O	4O	3O	2O	1O
5	Own organization: colleague	5O	4O	3O	2O	1O
6	Own organization: person responsible for biodiversity	5O	4O	3O	2O	1O
7	Own organization: employees	5O	4O	3O	2O	1O
8	Logging contractor	5O	4O	3O	2O	1O
9	Other, specify:	5O	4O	3O	2O	1O

16. How about other valuable habitats?

		Always	Often	Some times	Rarely	Never
1	Forest owner	5O	4O	3O	2O	1O
2	Local Forest Management Association	5O	4O	3O	2O	1O
3	Regional Forestry Centre	5O	4O	3O	2O	1O
4	Own organization: supervisor	5O	4O	3O	2O	1O
5	Own organization: colleague	5O	4O	3O	2O	1O
6	Own organization: person responsible for biodiversity	5O	4O	3O	2O	1O
7	Own organization: employees	5O	4O	3O	2O	1O
8	Logging contractor	5O	4O	3O	2O	1O
9	Other, specify:	5O	4O	3O	2O	1O

D. THIS SECTION IS ABOUT YOUR PERSONAL VIEWS.

17. How important are the following general goals for forests are for you when marking forestry operations?

		Important						Not important
1	Income for forest owners	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	Habitats for species	+3O	+2O	+1O	0O	-1O	-2O	-3O
3	Conservation of forest nature	+3O	+2O	+1O	0O	-1O	-2O	-3O
4	Conservation of soil and water	+3O	+2O	+1O	0O	-1O	-2O	-3O
5	Landscape values	+3O	+2O	+1O	0O	-1O	-2O	-3O
6	Recreational use	+3O	+2O	+1O	0O	-1O	-2O	-3O
7	Berry and mushroom picking	+3O	+2O	+1O	0O	-1O	-2O	-3O
8	Hunting	+3O	+2O	+1O	0O	-1O	-2O	-3O
9	Regional economy	+3O	+2O	+1O	0O	-1O	-2O	-3O
10	National economy	+3O	+2O	+1O	0O	-1O	-2O	-3O
11	Employment	+3O	+2O	+1O	0O	-1O	-2O	-3O
12	Raw material for industry	+3O	+2O	+1O	0O	-1O	-2O	-3O
13	Cultural significance	+3O	+2O	+1O	0O	-1O	-2O	-3O

18. What is your view on the following actions?

		Positive						Negative
1	Delineating Forest Act habitats entirely outside operations despite my evaluation that the site could be managed without destroying its special characteristics.	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	Delineating other valuable habitats outside operations	+3O	+2O	+1O	0O	-1O	-2O	-3O

19. What is your view on the following statements?		Likely						Unlikely
1	Leaving a Forest Act habitat or other valuable habitat outside the operation will conserve biological diversity.	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	The larger the nature habitat is delineated the more biodiversity it conserves.	+3O	+2O	+1O	0O	-1O	-2O	-3O
3	The habitats left outside operations possess special characteristics.	+3O	+2O	+1O	0O	-1O	-2O	-3O
4	A forest in natural status will contribute to biodiversity conservation.	+3O	+2O	+1O	0O	-1O	-2O	-3O
5	Inventoried and conserved habitats are too small and dispersed.	+3O	+2O	+1O	0O	-1O	-2O	-3O
6	Delineating small habitats outside operations will be enough for conserving biodiversity.	+3O	+2O	+1O	0O	-1O	-2O	-3O
7	Leaving Forest Act habitats entirely outside operations leads does not lead to income loss	+3O	+2O	+1O	0O	-1O	-2O	-3O
8	Endangered species are dependent on Forest Act habitats and other valuable habitats.	+3O	+2O	+1O	0O	-1O	-2O	-3O
9	Commercial use of forests does not threat biodiversity.	+3O	+2O	+1O	0O	-1O	-2O	-3O

20. How important are the following factors for you?		Important						Not important
1	Biodiversity	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	As big habitats as possible	+3O	+2O	+1O	0O	-1O	-2O	-3O
3	Special characteristics of the habitats	+3O	+2O	+1O	0O	-1O	-2O	-3O
4	The natural status of the forest	+3O	+2O	+1O	0O	-1O	-2O	-3O
5	Uniform or closely located areas left outside forestry use	+3O	+2O	+1O	0O	-1O	-2O	-3O
6	Small size of habitats delineated outside operations.	+3O	+2O	+1O	0O	-1O	-2O	-3O
7	Forestry income	+3O	+2O	+1O	0O	-1O	-2O	-3O
8	Endangered species	+3O	+2O	+1O	0O	-1O	-2O	-3O
9	Commercial use of forests	+3O	+2O	+1O	0O	-1O	-2O	-3O

E. HERE ARE QUESTIONS ABOUT HOW YOU SEE OTHER ACTORS' VIEWS

	Habitat should be delineated entirely outside operation						Habitat should not be delineated entirely outside operation
21. What views do actors important for you generally have about delineation of <u>Forest Act habitats</u> entirely outside operations, although the site could be managed without destroying its special characteristics?	+3O	+2O	+1O	0O	-1O	-2O	-3O

22. How do the following actors expect you to delienate <u>Forest Act habitats</u>?		Habitat should be delineated entirely outside operation						Habitat should not be delineated entirely outside operation
1	Forest owner	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	Forestry professionals	+3O	+2O	+1O	0O	-1O	-2O	-3O
3	Forestry authorities	+3O	+2O	+1O	0O	-1O	-2O	-3O
4	Environmental authorities	+3O	+2O	+1O	0O	-1O	-2O	-3O
5	Certification auditors	+3O	+2O	+1O	0O	-1O	-2O	-3O
6	Nature NGOs	+3O	+2O	+1O	0O	-1O	-2O	-3O
7	Own organization: supervisor	+3O	+2O	+1O	0O	-1O	-2O	-3O
8	Own organization: colleague	+3O	+2O	+1O	0O	-1O	-2O	-3O
9	Own organization: person responsible for biodiversity	+3O	+2O	+1O	0O	-1O	-2O	-3O
10	Timber buyer	+3O	+2O	+1O	0O	-1O	-2O	-3O
11	Logger	+3O	+2O	+1O	0O	-1O	-2O	-3O
12	Local people	+3O	+2O	+1O	0O	-1O	-2O	-3O
13	Other, specify _____	+3O	+2O	+1O	0O	-1O	-2O	-3O

	Habitat should be delineated outside operation						Habitat should not be delineated outside operation
23. What views do actors important for you generally have about delineation of <u>other valuable habitats</u> outside operations?	+3O	+2O	+1O	0O	-1O	-2O	-3O

24. How do the following actors expect you to delienate <u>other valuable habitats</u>?		Habitat should be delineated outside operation						Habitat should not be delineated outside operation
1	Forest owner	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	Forestry professionals	+3O	+2O	+1O	0O	-1O	-2O	-3O
3	Forestry authorities	+3O	+2O	+1O	0O	-1O	-2O	-3O
4	Environmental authorities	+3O	+2O	+1O	0O	-1O	-2O	-3O
5	Certification auditors	+3O	+2O	+1O	0O	-1O	-2O	-3O
6	Nature NGOs	+3O	+2O	+1O	0O	-1O	-2O	-3O
7	Own organization: supervisor	+3O	+2O	+1O	0O	-1O	-2O	-3O
8	Own organization: colleague	+3O	+2O	+1O	0O	-1O	-2O	-3O
9	Own organization: person responsible for biodiversity	+3O	+2O	+1O	0O	-1O	-2O	-3O
10	Timber buyer	+3O	+2O	+1O	0O	-1O	-2O	-3O
11	Logger	+3O	+2O	+1O	0O	-1O	-2O	-3O
12	Local people	+3O	+2O	+1O	0O	-1O	-2O	-3O
13	Other, specify_____	+3O	+2O	+1O	0O	-1O	-2O	-3O

25. To what degree do you take into consideration the expectations of the following stakeholders when making habitat delineations?

		Significantly						Not at all
1	Forest owner	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	Forestry professionals	+3O	+2O	+1O	0O	-1O	-2O	-3O
3	Forestry authorities	+3O	+2O	+1O	0O	-1O	-2O	-3O
4	Environmental authorities	+3O	+2O	+1O	0O	-1O	-2O	-3O
5	Certification auditors	+3O	+2O	+1O	0O	-1O	-2O	-3O
6	Nature NGOs	+3O	+2O	+1O	0O	-1O	-2O	-3O
7	Own organization: supervisor	+3O	+2O	+1O	0O	-1O	-2O	-3O
8	Own organization: colleague	+3O	+2O	+1O	0O	-1O	-2O	-3O
9	Own organization: person responsible for biodiversity	+3O	+2O	+1O	0O	-1O	-2O	-3O
10	Timber buyer	+3O	+2O	+1O	0O	-1O	-2O	-3O
11	Logger	+3O	+2O	+1O	0O	-1O	-2O	-3O
12	Local people	+3O	+2O	+1O	0O	-1O	-2O	-3O
13	Other, specify _____	+3O	+2O	+1O	0O	-1O	-2O	-3O

F. THIS IS ABOUT YOUR FUTURE MARKING AND DELINEATION IN 2006 AS WELL AS YOUR INFLUENCE OVER DECISIONS

26. How do you intend to act in 2006?		Likely						Unlikely
1	I will leave Forest Act habitats entirely outside operations despite my evaluation suggesting that the site could be managed without destroying its special characteristics.	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	I will delineate other valuable habitats outside operations	+3O	+2O	+1O	0O	-1O	-2O	-3O

27. How independent do you consider your following delineation decisions?		Independent						Under guidance
1	Delineating Forest Act habitats entirely outside operations despite my evaluation suggesting that the site could be managed without destroying its special characteristics.	+3O	+2O	+1O	0O	-1O	-2O	-3O
2	Delineating other valuable habitats outside operations	+3O	+2O	+1O	0O	-1O	-2O	-3O

G. HERE WE ASK YOU ABOUT THE TOOLS, RESOURCES AND WORKING CONDITIONS THAT YOUR ORGANIZATION PROVIDES TO YOU

28. Does your organization have a biodiversity related mission statement or written objectives?

1O No
2O Yes, a mission statement.
3O Yes, other written objective.
4O I don't know.

29. Does your organization provide you with the following tools and resources in your habitat delineation work, and how do you expect these to develop during the next two years?		a. Currently		b. Development during next two years		
		Yes	No	Stay same	Improve	Worsen
1	Field computer or GPS	1O	2O	1O	2O	3O
2	Maps	1O	2O	1O	2O	3O
3	GIS data	1O	2O	1O	2O	3O
4	Guidelines	1O	2O	1O	2O	3O
5	Co-workers' help	1O	2O	1O	2O	3O
6	Assisting staff	1O	2O	1O	2O	3O
7	Time	1O	2O	1O	2O	3O
8	Financial resources	1O	2O	1O	2O	3O

30. Does your organization provide the following general working conditions related to habitat delineation, and how do you expect these to develop during the next two years?		a. Currently		b. Development during next two years		
		Yes	No	Stay same	Improve	Worsen
1	Training	1O	2O	1O	2O	3O
2	Instructions and policies	1O	2O	1O	2O	3O
3	Guidelines for exceptions/ rare situations	1O	2O	1O	2O	3O
4	Information management	1O	2O	1O	2O	3O
5	Documentation	1O	2O	1O	2O	3O
6	Monitoring and auditing	1O	2O	1O	2O	3O
7	Continuous improvement of practices	1O	2O	1O	2O	3O
8	Involvement of workers in developing organizational practices	1O	2O	1O	2O	3O
9	Communication within organization	1O	2O	1O	2O	3O
10	Contact with clients	1O	2O	1O	2O	3O
11	Contact with stakeholders	1O	2O	1O	2O	3O

31. Does your organization have:		Yes	No, and will not come to my knowledge	Not yet, but there are plans	I don't know
1	ISO 14001 environmental management system	1O	2O	3O	4O
2	EMAS environmental management system	1O	2O	3O	4O
3	FFCS Finnish Forest certification system	1O	2O	3O	4O
4	PEFC Pan-European Forest certification system	1O	2O	3O	4O
5	Other quality system, specify _____	1O	2O	3O	4O

H. THIS IS ABOUT YOUR PROFESSIONAL AND BIODIVERSITY RELATED TRAINING

32. Your professional training
1O No vocational education
2O Technical school degree
3O Technical college degree
4O Polytechnic degree
5O University degree

33. Name of degree _____

34. Educational institution _____

35. Year of degree _____

36. If you have lower degree in the same profession, when is it from? _____

37. What professional training do persons in similar positions to yours have in your organization?
1O No vocational education
2O Technical school degree
3O Technical college degree
4O Polytechnic degree
5O University degree

38. And your supervisor?
1O No vocational education
2O Technical school degree
3O Technical college degree
4O Polytechnic degree
5O University degree

39. And your subordinates or other people you supervise?
1O No vocational education
2O Technical school degree
3O Technical college degree
4O Polytechnic degree
5O University degree

40. For how many years have you worked in your current organization? _____years

41. Have you completed the nature management degree?
1O No
2O Yes, year _____

42. Have you completed other biodiversity related training or courses <u>outside your organization</u> during the years 2001-2006?
1O No
2O Yes, _____ days

43. Have you completed other biodiversity related training or courses <u>offered by your organization</u> during the years 2001-2006?
1O No
2O Yes, _____ days

44. Provide examples of training and courses _____

45. How much have persons in similar positions to yours completed training or courses related to biodiversity conservation?
1O About the same amount as me
2O Less than me
3O More than me

46. And your supervisor?
1O About the same amount as me
2O Less than me
3O More than me

47. And your subordinates or other people you supervise
1O About the same amount as me
2O Less than me
3O More than me

48. Have you completed forest ecology courses in an educational institution during 1997-2006?
1O No
2O Yes_____ weeks or _____credits

Where:
3O Technical college
4O Polytechnic
5O University

I. THIS LAST SECTION IS ABOUT YOUR BACKGROUND INFORMATION SO THAT WE CAN UNDERSTAND THE CHARACTERISTICS OF DIFFERENT GROUPS. THIS WILL NOT BE USED TO IDENTIFY RESPONDENTS.

49. Age _____ years

50. Gender
1O Male
2O Female

51. Residence:
1O Countryside
2O Village or semi-urban
3O Urban (20 000- 100 000 asukasta)
4O Urban (yli 100 000 asukasta)

52. Forest ownership
1O I own or my family owns _____hectares of forest
2O I don't own forest

Send the completed form in the attached envelope.

Thank your for your response!