Participatory Scenario Analysis in Forest Resource Management

Exploring Methods and Governance Challenges from a Rural Landscape Perspective

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Dedication

Till mina morföräldrar Elsa och Gunnar Carlsson,
och alla vi andra som också har skogen i hjärtat och hjärtat i skogen.

"Att förutsäga framtiden är nästan omöjligt, mycket ansvarsfullt och absolut nödvändigt. Det är nästan omöjligt därför att utvecklingen kan ta helt olika vägar. Det är mycket ansvarsfullt därför att förutsägelser om framtiden styr människors handlande. Det är absolut nödvändigt därför att människor står inför svåra beslut och behöver tänka igenom vad de olika valen innebär."
Janken Myrdal (2008:38)

Participatory Scenario Analysis in Forest Resource Management. Exploring Methods and Governance Challenges from a Rural Landscape Perspective.

Abstract

The forested landscape holds multiple socio-cultural, ecological, and economic values that are interlinked and dependent on each other. Policy makers, scientists, and practitioners increasingly emphasise the need for new governance procedures that consider multifunctional forest values and support decision making concerning trade-offs between them. At the same time, the diverse range of actors who own and use these values on local, national, and global levels must be considered.

This thesis explores how scenario analysis can strengthen participatory aspects in forest governance by engaging local forest actors in interviews and discussions concerning sustainable futures of their forest landscape and community in Vilhelmina municipality, Sweden. By combining qualitative and quantitative methods, three explorative (possible) scenarios and one normative (desirable) scenario are developed in participatory workshops, and presented as narratives and models of ecosystem services assessment. The thesis includes four scientific papers − three discuss the performance and usability of scenario methods and one discusses the need and opportunities for implementing a landscape perspective in forest planning.

By exploring innovative participatory methods and incorporating integrated landscape planning, the sectorial planning tradition can be developed into new collaborative governance procedures across interests, sectors, levels, and scientific disciplines and create coherent policies and management practices. The Model Forest concept is a useful example of a local collaborative arena where different actors can meet and discuss their common landscape. Scenario analysis is a suitable and creative tool as it provides information about potential and desired futures, enhances understanding for complexity, and facilitates discussion of planning options in a transdisciplinary manner. Scenario analysis can strengthen the local competence of action and help people define their needs and how these needs could be met. The diversity of knowledge and experiences among actors should be seen as a resource for creating new ideas and solutions. The balance between an increased participatory involvement in planning and research processes and the conditions for creating a successful high-quality process must be carefully considered when choosing methods.

Keywords: forest owners and stakeholders, forest policy, future studies, INTEGRAL, integrated landscape planning, multiple forest values, participation, rural development, scenario analysis, transdisciplinarity, Vilhelmina Model Forest.

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Svensk sammanfattning

Skogslandskapen runt om i Europa representerar olika lokala ekologiska, socio-ekonomiska, politiska och kulturella förhållanden, som formar deras utveckling. Men skogssektorn påverkas också av internationella konventioner och direktiv kring klimat och miljö, den globala marknaden för skogsråvaror och landsbygdspolitik. Ett politiskt beslut på europeisk nivå kan få olika utfall och konsekvenser beroende på det lokala landskapets förutsättningar. Mot bakgrund av detta skapades det europeiska forskningsprojektet INTEGRAL, där 20 olika lokala landskap i 10 länder ingick. Samma typ av forskning genomfördes i alla områden, med syfte att ta fram förslag på nya robusta policyer och planeringssätt för utvecklingen av skogslandskapen i Europa. Detta avhandlingsarbete kom till som en del av INTEGRAL.

Skogslandskapet rymmer många typer av socio-kulturella, ekologiska och ekonomiska värden som är sammanlänkade och beroende av varandra. Interaktioner mellan människa och natur, mellan markägare och användare, liksom mellan samhälle och individ präglar också landskapet. Därför är det viktigt att betrakta skogsresursen ur just ett landskapsperspektiv för att förstå hur de olika värdena och relationerna samspelar i skogens ekosystem och påverkas av faktorer såsom miljöförändringar, politisk styrning och skogsägares målsättningar. Genom att se helheten kan vi bättre förstå sambanden och dynamiken i förändringarna.

Skogslandskapets olika värden företräds av olika aktörer och institutioner, och har traditionellt planerats i separata sektorer. Skoglig planering sker i hög grad på bestånds- och fastighetsnivå, men sällan över fastighetsgränser. Trots att mer än hälften av den svenska produktiva skogsmarken ägs av icke-industriella privata skogsägare, är skötseln och rådgivningen tämligen strömlinjeformad, vilket resulterat i ett enhetligt skogslandskap med likåldriga virkesproduktionsinriktade skogsbestånd och viss generell naturhänsyn. Alltmer börjar dock andra skogliga värden lyftas fram, såsom möjligheter till biobaserade förnyelsebara energikällor och rekreationsvärden. Konflikter kring

naturresursanvändning och osäkerhet inför framtida klimatförändringar påverkar utvecklingen och skötseln av skogslandskapet. Behovet av att utveckla planeringsprocesser för att bättre kunna hantera och göra avvägningar mellan olika aktörers och sektorers intressen kring hur skogens resurser används påtalas allt oftare av beslutsfattare, forskare och praktiker. Samtidigt är detta en utmaning, då individers och samhällets värderingar förändras över tid och rum.

Utgångspunkten i denna avhandling är att bidra till bättre förutsättningar för en hållbar landsbygdsutveckling i det lokala skogslandskapet. Lokala deltagare tillfrågades om sin syn på det landskap de lever och verkar i och hur de vill att det ska utvecklas. Fallstudieområdet i min forskning har varit Vilhelmina, en kommun i Norrlands inland som karaktäriseras av boreal skog och fjällskog och där skogsbruk, renskötsel, biologisk mångfald, och det samiska kulturarvet är centrala värden. Skogen nyttjas också för rekreation, jakt och fiske, och bidrar till koldioxidbindning för att motverka klimatförändringar. Skogsbruket har traditionellt haft stor betydelse för en levande landsbygd, den har format människors och samhällets identitet, liksom varit en viktig byggsten för välfärden i Sverige på nationell och lokal nivå. Idag möter dock Vilhelmina, liksom hela inlandet, allt större utmaningar i form av färre arbetstillfällen och en förändrad marknad för skogsråvara. Det har i sin tur bidragit till utflyttning och en minskande och åldrande kvarvarande befolkning, med motsvarande utmaningar för att upprätthålla välfärd och service.

Genom att undersöka vilka faktorer som påverkar naturresurserna och samhället i ett landskap, och analysera deras tänkbara framtida utveckling, kan man finna vägar för att styra utvecklingen i önskad riktning. Scenarioanalys är ett verktyg för att utforska och beskriva olika perspektiv på framtidens utveckling. Denna avhandling utforskar just detta, hur scenarioanalys kan vara ett verktyg för att stärka deltagande i planeringsprocesser i skoglig resurshushållning, genom att engagera lokala skogliga intressenter i intervjuer och diskussioner kring en hållbar framtid för deras gemensamma skogslandskap och samhälle i Vilhelmina kommun. Kan scenarioanalys underlätta för deltagare att lyfta blicken och resonera utifrån ett landskapsperspektiv? Kan landskapsperspektivet och scenarioanalysen bidra till ökad förståelse för hur den lokala landsbygdskontexten fungerar i all sin komplexitet? Vilka andra verktyg kan stödja en landskapsinriktad planering som involverar intressenter i dialog kring den gemensamma skogsresursen? Hur fungerar det att kombinera olika kvalitativa och kvantitativa forskningsmetoder för att skapa framtidsscenarier som speglar landskapets värden?

För att besvara dessa frågor, intervjuades inledningsvis lokala skogsägare och intressenter kring vad de tycker och tänker om skogsbruket i Sverige, hur man ser på skogslandskapets användning, vilka faktorer som ligger till grund för beslutsfattande och hur man resonerar kring sin egen och andras skogsskötsel, samt hur villig man är att ta hänsyn till olika intressen. Därefter arrangerades en workshop där deltagarna fick diskutera vad de tror kommer att påverka framtiden för den svenska skogen och skogsskötseln genom att tillsammans identifiera de viktigaste faktorerna som driver förändring i landskapet (sociala, teknologiska, ekonomiska, ekologiska, politiska), samt hur dessa faktorer påverkar varandra. Med hjälp av denna information konstruerades ett antal scenarier för hur det lokala skogslandskapet i Vilhelmina skulle kunna se ut 30 år framåt i tiden. I en andra workshop fick deltagarna ge sina synpunkter på dessa möjliga scenarier och sedan formulera målsättningar i ett önskvärt framtidsscenario, och vad som skulle behövas för att kunna nå dit. De önskvärda lokala visionerna togs sedan med till en nationell workshop där representanter för olika skogliga intressen på nationell nivå fick diskutera hur dessa visioner skulle kunna nås med politiska styrmedel och insatser. Deltagarna i projektet som helhet har varit representanter för skogsägare, samisk kultur och rennäring, turismverksamhet, natur- och miljöhänsyn, geologi, lokalproducerad mat och utbildningsverksamhet, liksom för myndigheter, skogsägarföreningar och skogsföretag.

Resultaten består, förutom av deltagarnas utvärderingar av workshoparna, av tre explorativa (möjliga) framtidsscenarier, och ett normativt (önskvärt) scenario som har utvecklats genom att kombinera kvalitativa och kvantitativa metoder. Scenarierna presenteras som berättelser, illustrationer och som kvantitativa resultat i form av ekosystemtjänstproduktion. Avhandlingen bygger på fyra vetenskapliga artiklar, varav tre diskuterar hur scenarioanalys fungerar som metod, och den fjärde artikeln lyfter behovet av och föreslår möjligheter för att implementera ett landskapsperspektiv i skoglig planering.

Forskningsprojektet har landat i flera iakttagelser och slutsatser. Först och främst, hur centralt samspelet mellan människa och skog är för landsbygdens utveckling och vikten av att prata om naturen och samhället som integrerade delar. Betydelsen av människors möjlighet till att skapa och uttrycka handlingskompetens kring sina behov i lokalsamhället och naturresursernas användning är viktig för en hållbar utveckling, inte minst ur demokrati-synpunkt. Landskapsperspektivet är därför nödvändigt för att samla intressenter till diskussioner om sitt gemensamma landskap. Det kan också bidra till att utveckla policyer och skötselstrategier som gör det möjligt för aktörer att mötas över sektorsgränser, ämnesdiscipliner och politiska nivåer.

En annan viktig slutsats är att ett gemensamt skapande av framtidsscenarier är en användbar och kreativ metod för att involvera representanter för många olika skogliga intressen i en dialog bortom fastighetsgränser och traditionell sektorsplanering. Framförallt hjälper scenarioanalys människor att förbereda sig inför framtiden, att definiera sina behov och identifiera vägar för hur dessa kan tillfredsställas. Lokala intressenters kunskap och erfarenheter är viktiga resurser för att skapa nya lösningar, strategier och målsättningar. Den politiska arenan bör vara öppen för nya idéer och forum där många olika aktörer kan samlas och diskutera sina intressen kring skoglandskapets användning - för att öka förståelsen för motstående perspektiv och eventuellt nå samsyn, i riktning mot ökad demokrati i förvaltningsprocesser. Samtidigt är det viktigt att använda metoder i scenarioarbetet som skapar en meningsfull process för alla deltagare – en process som präglas av förtroende, legitimitet, transparens, ansvarskänsla och hänsyn i nära kontakt med beslutsfattare. Det behövs lokala forum för att skapa koordinerat samarbete, kunskapsutbyte och förtroende mellan olika aktörer. I sådana planeringsprocesser är det viktigt att deltagarnas roller är tydliga och att representationen av intressen är god. I synnerhet på lokal nivå, där sådana forum är ovanliga, men där effekterna av naturresursernas brukande är som synliga och nära människors vardag, behöver planering av det gemensamma skogslandskapets användning diskuteras mer. Vilhelmina Modellskog är ett bra exempel på en lokal samarbetsarena där sådana möten kan ske och underlättas av en landskaps-koordinator.

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Contents

List of Publications

This thesis is based on the work contained in the following papers, referred to by Roman numerals in the text:

I Carlsson, J., Eriksson, L. O., Öhman, K., & Nordström, E-M. (2015). Combining scientific and stakeholder knowledge in future scenario development - A forest landscape case study in northern Sweden. *Forest Policy and Economics*, 61, 122-134

II Eriksson, L. O., Nordström, E-M., Eggers, J., Sandström, S., & Carlsson, J. (submitted manuscript) Modelling ecosystem services and forest owner behaviour through scenario analysis on a landscape level.

III Wallin, I., Carlsson, J., Hansen, H-P. (2016). Envisioning future forested landscapes in Sweden – Revealing local-national discrepancies through participatory action research. *Forest Policy and Economics*, 73, 25-40.

IV Carlsson, J., Bjärstig, T., Svensson, J., Nordström, E-M., & Lidestav, G. (submitted manuscript) Opportunities for integrated landscape planning – the broker, the arena, and the tool.

The contribution of Julia Carlsson to the papers included in this thesis was as follows:

I Conducted the research design and planning, data collection, analysis of results, and the writing and review process, with counselling from supervisors.

II Participated in research design, preparation of data, and analysis of the results, with the major contribution in the definitions of ownership type categories and forest management regimes. Contributed to the writing (mainly the Introduction section) and editing of the paper.

III Developed the research design and evaluation material in close cooperation with the co-authors (with supervisors in the national workshop). Conducted the workshops and assisted in analysis and evaluation. Contributed to the writing and review process.

IV Prepared and conducted the interviews, transcribed, coded and analysed the results. Initiated and wrote major parts of the paper with counselling and writing contributions from the co-authors.

Abbreviations

AR	Action Research
CAB	County Administrative Board
CSA	Case Study Area
CP	Critique Phase
CUAR	Critical Utopian Action Research
ELC	European Landscape Convention
ES	Ecosystem Services
EQO	Environmental Quality Objectives
FSC	Forest Stewardship Council
FMP	Forest Management Plan
GFMP	Green Forest Management Plan
ILO	International Labour Organisations
NFI	National Forest Inventory
NGO	Non-Governmental Organisation
NIPF	Non-Industrial Private Forest
NPB	National Property Board
NTFP	Non-Timber Forest Products
RP	Realisation Phase
SEPA	Swedish Environmental Protection Agency
SFA	Swedish Forest Agency
SFM	Sustainable Forest Management
UP	Utopia Phase
VMF	Vilhelmina Model Forest

1 Introduction

1.1 The multifunctional forested landscape

As an important natural resource that provides multiple ecological and social values, forested landscapes have a rich and diverse meaning for people and society in Sweden. The industrial timber production has significantly contributed to the development of the Swedish welfare system on a national and local level through its role as an export and employment sector. The forested landscape has shaped the national and local identity as a base for rural subsistence (Holmgren, 2015). Apart from wood products, values, and functions (e.g. biodiversity, watersheds, food, cultural heritage, recreation, erosion and flood protection, climate adaptation and mitigation) are increasingly being recognised as important in the forest ecosystem (Almered Olsson *et al.,* 2004; Sandström & Lindkvist, 2009). The complex ecosystem structure and long life cycles of the boreal forests are affected by environmental factors such as storms, fires, and floods, as well as human-initiated activities such as timber felling, fertilisation, hunting and infrastructural development. Societal changes in demography, economics and policy as well as technological and industrial development influence the ecological processes in forests (Sotirov *et al.,* 2015).

In the local setting of Vilhelmina municipality, situated in northern interior Sweden, a range of values co-exist in the forested and mountainous landscape. Since time immemorial, the indigenous Sami communities have lived in close connection with the forest resources. In the latter half of the 20th century, the development of the forest industry has affected, among others, reindeer herding and nature protection values. Currently, the development of the tourism sector, non-timber forest products extraction, and hydro- and wind power are increasingly competing with the traditional values, resulting in a complex institutional situation with many different actors (Svensson *et al.,* 2012). These

competing vales, functions and demands on forest resources inevitably result in land use conflicts between policy makers, land owners, and user groups, both between and within local and national levels (Beland Lindahl, 2008; Sandström & Lindkvist, 2009; Appelstrand, 2012). In Sweden, half of the forest land is owned by non-industrial private forest owners, whose property rights are strongly acknowledged, influencing human-environment relations and creating interdependencies between members of society and property holders (Ambjörnsson *et al.,* 2016).

1.2 Meeting governance challenges with integrated landscape planning

The scientific community as well as stakeholders argue for the need to develop sustainable forestry by shifting from the planning of single components of forest stands and estates to widening the perspective to the landscape level. This perspective would facilitate the governance of multiple values as well as would enhance resilience, risk management and adaptive capacity for meeting societal and environmental changes in a sustainable way (Farcy & Devillez, 2005; Willebrand *et al.,* 2006; Maginnis & Sayer, 2013). Landscape multi-functionality is widely adopted as a desirable objective of spatial land management; not only addressing how values and functions are retained and enhanced but also addressing the synergy and interactivity between them (Selman, 2012). Analysing different combinations of land uses and management alternatives for multifunctional landscapes is a crucial part of planning and resource management (de Groot, 2006). Increasingly, policies at multiple levels pronounce the need to encompass both social and ecological systems in governance and management of natural resources (Angelstam *et al.,* 2013; Wu, 2013; Jørgensen *et al.,* 2016). An integrated landscape planning (ILP) approach to the forested landscape aims at exploring how dynamic forest ecosystems are exposed to changing environmental conditions that are influenced by forest governance and management (e.g. forest-related policies, markets for forest goods and services, actor's preferences and management strategies), as well as societal factors of economic and demographic development, technological innovations, public opinion, and cultural and political changes (Sotirov *et al.,* 2013). This approach describes how "sustainable forest management," "multifunctional forestry," or "ecosystem approach" can be implemented. In addition, ILP aims to integrate long-term and short-term planning by bringing together actors representing different interests for joint actions. That is, this approach aims to stimulate participatory processes characterised by co-operation, shared understanding, and knowledge

exchange in an attempt to stimulate coordinated and coherent policies and management practices across sectors and governance levels (Sotirov *et al.*, 2013).

Being able to manage and accommodate the many conflicts in a process characterised by trust and legitimacy will potentially strengthen a sustainable and integrative landscape management. However, it is difficult to assess the multiple functions of forests at the local landscape level and to reach a fair and equitable satisfaction within different stakeholder groups, as emphasized in sustainability definitions and international agreements (Hytönen 1995; Maginnis & Sayer, 2013), especially as people's valuation of resources changes dynamically in space and in time. In addition, many of the challenges that confront ILP take place outside the forest sector, such as in the energy and biofuels sectors, the infrastructure for peri-urban settlements, and the measures for climate change mitigation and adaptation (Eckerberg, 2015). Therefore, the ongoing and potential conflicts between different forest stakeholders need to be handled through new governance procedures (Appelstrand, 2012; Böhling & Arzberger, 2014; Secco *et al.,* 2014). The current forest policy and management paradigm in Sweden, where, on one hand, the forest is mainly a natural resource that provides raw material, and, on the other, nature conservation and recreational values are emphasised (Appelstrand, 2012), calls for a broadened approach in order to consider multiple forest values, uses, and functions as well as the use of collaborative processes (Appelstrand, 2002). This broadened approach implies at least two needs: (i) to discuss how competing societal demands on the landscape level of forest ecosystems can be balanced both within forestry (e.g., balancing timber production, energy wood, and nature conservation) and between forestry and other land uses (e.g., infrastructure, recreation, and wind power) and (ii) to translate this challenge into planning and management strategies (Sotirov *et al.*, 2013).

Swedish governance is characterised by a stable long-term development of institutions and practice (Enander, 2007), with a vertically integrated forest sector, cutting-edge forestry technologies and a silvicultural focus on sustaining discounted profits, the latter driving towards economically optimal rotation ages (Brukas *et al.,* 2013). Traditionally, natural and cultural values have been looked upon as separate sectors, likely because they have mainly been studied by different disciplines without any common platform of training or methodology. In the real landscape, however, these values occur within the same areas and systems and should be dealt with in an integrated way (Jørgensen *et al.,* 2016). The diverse sectors represented by multiple actors create a governance system which on the one hand is fragmented, and on the other hand, has a traditionally co-operative approach in rural development in

Sweden. Integration within and across sectors is required in order to deliver an increased range of landscape values (Angelstam *et al.*, 2015). Mora et al. (2013) argue that a landscape approach requires local forums for aligning ecosystem specificities, territorial dynamics, and cross-sectoral relationships. To incorporate ILP in practice, actors must have forums where they can share knowledge and develop ways for further cooperation. In addition, improved consultation processes and tools need to be developed to handle the administrative and political governance challenges. The political arena needs to be open to new ideas and this openness can be encouraged by providing forums for different actors to discuss conflicting views and interests, a process that enables participatory democracy.

1.3 The need for participatory and collaborative planning processes

"Local participation", "bottom-up-planning", "participatory planning", "including stakeholders" and "local empowerment" have become catch words in governance and planning processes (Soliva *et al.*, 2008). Participatory planning encourages a better consideration of values, interests, and transdisciplinary knowledge in decision-making, trust in public institutions and acceptance of decisions made, and a better implementation of policy measures. To achieve fair and democratic negotiations between stakeholders, participatory processes should be based on formal procedures where the roles of the different participants are clearly defined and representation is secured (Weiss *et al.*, 2002). When establishing a participatory process, certain considerations need to be made regarding who owns and initiates the process, whose interests are included, and to clarify how this demand, often raised in international directives and conventions, will benefit the participants.

Participation is often a matter of collaboration. When people are involved in a collaborative process, they develop a sense of shared responsibility and ownership of the process and its implementation (Wondolleck & Yaffee, 2000; Borrini-Feyerabend, 2004; Keough & Blahna, 2006; Reed, 2008). Also, a shared understanding facilitated by well-developed communication and social learning processes enhances the possibilities to deal with complexity (Weiss *et al.*, 2002; Currie-Alder, 2003; Blackmore, 2010). It is important to develop social capital in the form of networks and social trust as these relationships facilitate coordination and cooperation, a prerequisite for civic engagement and collaboration as well as social sustainability and resilience (Wondolleck & Yaffee, 2000; Tippett *et al.*, 2007; Selman, 2012). The ability to influence one's living conditions and community development, to create action for local

concerns, and to foster trust and cohesiveness enhances the social capacity in a rural community. Discussing local, "close" issues often works as a motivation factor for participatory engagement in planning processes, enhancing accountability and use of local knowledge (Stojanovska *et al.*, 2014). More research is needed to understand what issues can be solved locally and how surrounding governance systems interact with the local level (Beland Lindahl, 2008).

However, there are few examples of local forums where different stakeholders meet to discuss and plan land use issues in their common landscape and management of multiple forest values continuously across areas with a diverse ownership structure. The dialogue process between stakeholders representing different values and perspectives needs to be improved (Henningsson *et al.*, 2015). Here, the Model Forest concept makes a relevant and useful example of a collaborative network arena as it links forestry, agriculture, recreation, and many other sectors within a given landscape (Bonnell *et al.*, 2012; Svensson *et al.*, 2012; Ho *et al.*, 2014).

1.4 Scenario analysis as a potential tool

Participatory approaches can be performed through a range of methods and techniques. Planning policies for sustainability and multiple forest use require new types of systematic and integrating methods of analysing the interdependencies between the various social and ecological values and functions of forests (Hytönen, 1995). As Richnau et al. (2013) summarise, the key challenge is to incorporate multifaceted tangible and intangible landscape values into governance and management processes. During the acknowledgement of sustainable development of the last three decades, the role of scenario analysis for long-term politics and planning has been emphasised as a potential field of studies when trying to balance the economic, ecological, and social values of forests (MEA, 2005; Henrichs *et al.*, 2010; Borch *et al.*, 2013; Westholm, 2015).

The planning tradition in the boreal forest sector has a long tradition of adopting a long-term perspective, since the rotation cycle of forest growth until mature for harvest is 80-120 years. Foresight calculation is a well-entrenched analytical practice in forest management planning and in forest resource assessments of different kinds (Trubins, 2014). The assessment of potential actions begins by asking the relevant actors to identify the possible and/or desirable resource developments and the drivers and barriers for these developments. The goal of scenario analysis is to discover and describe different perspectives of the future in qualitative and/or quantitative ways.

Scenarios can support planning by providing information about potential futures and can facilitate discussion of planning options across stakeholder groups, professional disciplines, and levels of management (Shearer, 2005; Henrichs *et al.*, 2010; Alm *et al.*, 2012).

1.5 Aims and scope

The introduction outlines a need for finding governance solutions that incorporate multiple forest values and participatory aspects in an integrated landscape planning perspective to secure sustainable rural development for future generations. To address this need, this thesis explores how future scenario analysis can support participatory forest resource management and governance by engaging local forest actors in discussions concerning the future of the forested landscape and their community.

The research has been part of the European Union funded research project INTEGRAL in which research design and methods have been developed for implementation and comparative analysis in 20 different case study areas around Europe. The case study area for this thesis is Vilhelmina municipality, situated in interior northern Sweden. The governance challenges include a diversity of both competing and interconnected forest values and actors, traditional and potential future uses of the forest resource, demographical changes, welfare development, as well as policy making processes concerning the natural resources on global, national, and local levels. Thus, the thesis departs from the perspective of how to achieve sustainable development in the rural forested landscape context, which sets the scope for the included papers as well as the theoretical foundation and discussion in the thesis.

The thesis investigates participatory governance aspects by using scenario analysis in a mixed-methods approach that combines both qualitative and quantitative methods, but with a focus on the qualitative methods. The following research questions are investigated in the research papers:

- If and how scenario development can be a constructive tool to facilitate discussions concerning integrated landscape planning among forest actors and contribute to a shift of focus from the interests of individual actors to a common landscape perspective?

- If integrated landscape planning and future studies approaches can potentially facilitate the understanding of institutional complexity of local and national contexts connected to rural development?

- If and how qualitative and quantitative methods can be combined to project and illustrate potential as well as desirable future development on the landscape level?

- What approaches and tools that can be developed to support participatory aspects in integrated landscape planning and management?

Some limitations are relevant to mention at this stage. Although the landscape approach *per se* encourages transdisciplinarity, this thesis belongs in the field of forest science and not in the related fields of political science, cultural geography, or human ecology. Furthermore, the scenario analysis focuses on the local and national contexts rather than global factors. International conventions and legislative directives are assumed to affect, and thereby be incorporated in, national legislation, and thus they are not directly considered. This thesis focuses on the large and diverse number of Non-Industrial Private Forest owners (NIPF) rather than on state and company owners, mainly in order to emphasise the implications of such ownership structure from the integrated landscape planning perspective.

1.6 Outline of the thesis as a guide for the reader

The governance challenges in management, planning and ownership structures connected to the forested landscape are contextualised in the Vilhelmina case study area in which different scenario development techniques are implemented and tested. In contrast to the traditional compilation dissertation that mainly synthesises the PhD work focusing on the papers, this thesis aims to give a wider context to the four research papers, of which three have a methodological focus. The methods used in these studies are not repeated in detail in the thesis, but are thoroughly described in the papers to which the reader will be directed. The papers will not be summarised in a specific chapter, but rather be referred to continuously in the thesis. Figure 1 illustrates how the papers are connected to the research questions.

The thesis briefly describes a range of related topics, concepts, and scientific fields to support the understanding of the case study context and the results of the scenario development as well as to illustrate the transdisciplinary character of rural development, integrated landscape planning, forest governance, and future studies. Therefore, the thesis starts by describing the rural development context and governance challenges of boreal forest communities from a sustainability perspective (chapter 2). Next, Swedish forest policy and governance, planning traditions and ownership rights and

ownership structures are introduced (chapter 3). The landscape approach and its multifunctional character is investigated in chapter 4. Chapter 5 presents the scientific field of future studies and different types of scenarios and techniques. The research design and theoretical background to the used methods are presented in chapter 6, after which the forest values and actors in the case study area of Vilhelmina are described (chapter 7). The methods are presented in parallel with the resulting outcomes of the different scenario development phases, ending with a recapitulation of the participants' evaluations of the scenario development processes (chapter 8). The methods and outcome of the research project are finally discussed in chapter 9 in connection to theory and governance challenges, ending with some concluding remarks and recommendations for future research. In the Epilogue in chapter 10, I close the thesis with a short reflection of the position of being a PhD student in a European research project. Enjoy!

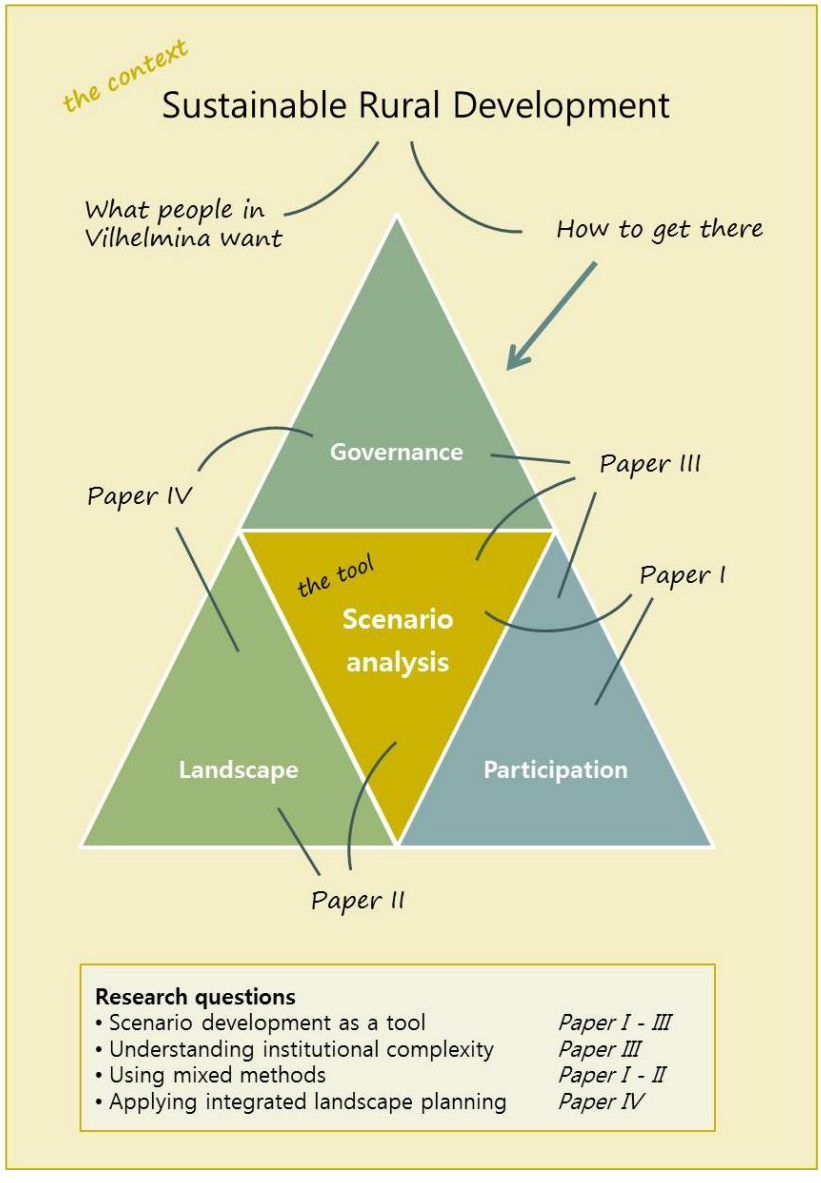

Figure 1. Overview of the connections between the research study context, the theoretical themes, the research papers and the research questions.

2 Rural development in boreal forest communities

Throughout my thesis work, rural development has been a reoccurring theme. Based on the various established definitions of rural, rurality, and development, I view rural development as a process of co-production between man and nature, influenced by both endogenous and exogenous factors, preferably involving a high level of local participation (Elands & Wiersum, 2001). Thus, key issues include to what extent local communities can define their own needs, how these needs can be met, and how the local natural resources can be used to their benefit. In the case of communities in northern interior boreal Sweden, forests are a key natural resource and forestry is a basic industry. However, as a basic industry for the country at large, local forest resources serve national needs, so the decisions made about these resources are significantly influenced by exogenous factors e.g. national and international wood and energy markets and national and international policies regarding e.g. biodiversity and climate change. Other mega-trends, such as urbanisation and an ageing population, bring additional challenges regarding the governance of rural landscapes. In the following sections, I develop these issues using literature and previous research.

2.1 Conceptualising rurality

There is no absolute or undisputed definition of what is rural or the kindred concept rurality, since the diversity of rural conditions, globally and even within Sweden, cannot meaningfully be covered by one all-embracing definition (Eckerberg & Wide, 2001; Elands & Wiersum, 2001; Westholm, 2008). What is rural often depends on who asks and what a research study wants to investigate. Westholm (2008) argues that a fixed definition would be an undesirable straight jacket hindering flexibility and openness, since most people have their own relation to rural areas and their own view of what rural

means. Because these different concepts of what rurality means inform one another, my approach will be open to its various meanings with the aim to enhance the understanding of these terms and to contextualise the conditions and challenges for Vilhelmina (as a preparation for chapter 7 and 8).

As a rural area includes its physical landscape as well as its infrastructure, institutions, and social relations, rural areas should also be viewed from the perspective of how human activity interacts with the landscape and nature (Elands & Wiersum, 2001; Westholm, 2008; Westholm & Waldenström, 2008). Rurality can be defined by how its socio-cultural structures differ from urban socio-structures. Although this rural-urban continuum is often used, it can be viewed from a larger scale, with the urban on one end (high human impact on the landscape) and the untouched wilderness on the other end (no human impact). The rural landscape can then be placed as intermediate. Traditionally, rural areas were characterised by the presence of a specific set of agricultural and other processes involving natural resource production (Elands & Wiersum, 2001). Rurality can also be a personally perceived experience, where individuals attach different meanings, norms, and values to the concept and therefore producing different social representations of rurality (Halfacree, 1993), which in turn are expressed and disseminated through different discourses[1] (Elands & Wiersum, 2001). The sense of both individual and collective identity reflects local culture and heritage, including both connections to the physical environment and relations with family, friends, and other residents (Hannon & Curtin, 2009). Individuals and groups create a sense of community and their competencies and local environment give them the possibility to use local resources in sustainable flows, to unite new and old knowledge, and to focus on quality of life.

Population numbers, scarcity, and distance to conurbations also characterise rurality. Statistics Sweden defines a densely populated area as having more than 200 inhabitants with less than 200 metres between houses; everything else is defined as sparsely populated. According to the County Administrative Board, a sparsely populated area has less than 20,000 inhabitants and less than five inhabitants per square km, with long distances to larger population centres, employment, and services.

Forsberg (1996) argues that both rurality and urbanity are becoming more alike in the social and economic sense, being reciprocally dependent on each other. By this, she means that rural areas have problems not because of not being well-developed, but because of being removed from the urban. Rural

[1] Discourses can be defined as the terms through which people understand, explain and articulate their social and physical environment (Elands & Wiersum, 2001). A discourse may be described as a power relation between people expressed in social interaction and language (Lisberg Jensen, 2002).

development can therefore be understood as rural areas that need development and these are seen as inferior to urban areas, the norm. Forsberg further argues that this view is more motivated to analyse conditions of different groups of people rather than from a geographical regional perspective, as it is not certain that the living conditions are equal for all people in a rural village. The rurality in a region can have more in common with the urban conglomerates in the same region than with rural areas in other regions. This is certainly the case when comparing rural areas in northern and southern Sweden. There is also a risk of objectifying rural areas, tending to study them from an urban perspective.

2.2 Defining development from a rural sustainability perspective

Development can be defined as a constant change, either towards a certain direction, or as a change that expands and increases complexity (Lundberg & Karlsson, 2002; Myrdal, 2008). In modern western society, development is closely related to modernisation and improvement. Rural development can be seen as an adaptation process aimed to secure and improve the local community (Myrdal, 2008), or as the process for reaching a desired state (Elands & Wiersum, 2001).

Development can be connected to large common use or take its departure from local self-reliance to meet local needs with local resources (Lundberg & Karlsson, 2002). The large scale development, characterised by the current industrial world view on development, highly values globalized production and trade, rationality, efficiency, science, and technology. The world's needs should be met with as low resource input as possible; that is, the world's needs should be met by extracting as much as possible from existing resources. On the other end of the development scale, the strategy of local self-reliance focuses on the local socio-cultural context of daily life and place, where people either dispose the local resources to meet their own needs or adapt their needs to the available resources (ibid). The former development processes have a top-down character whereas the latter have a bottom-up character, either being exogenous as a result of impacts from outside the rural area, such as economic market forces and international policy measures, or being endogenous based on local initiatives and participatory planning (Elands & Wiersum, 2001). The key issue then, according to Lundberg and Karlsson (2002), is to what extent people in a local community have possibility to define their needs, how these should be met, and whether the local resources are accessible. Therefore, it is reasonable to conceive rural development as being influenced by a combination of both endogenous and exogenous factors.

Sustainable rural development can be defined as a long-term, stable development of the economic, social, cultural, and ecological aspects of a community that ensure the community's long-term existence. An economically sustainable rural development should make sure that rural areas do not consume more resources than are created or renewed. Social rural sustainability considers quality of life, accessible societal services, employment possibilities, social cohesion,[2] and democracy. Cultural aspects are closely related to the identity of the specific area. Social processes of networks are crucial to rural development (Vergunst & Shucksmith, 2009). Ecologically, a sustainable rural use and conservation of natural resources incorporates economic adjustment and ethics (Eckerberg & Wide, 2001). Hereafter, the concept of rural development will include these sustainability aspects as I regard them to be essential and unnegotiable when discussing the future of the rural boreal landscapes.

2.3 The role of forests in rural development and local competence of action

Before the 19th century, the interior parts of northern Sweden included what seemed to be endless areas of untouched forests available for everyone to use. The first rural settlements here were located in and near the river valleys where agriculture was possible (Johansson, 1994). The limited arable land was complemented with forest-related activities: cattle grazing, haymaking, slash-and-burn cultivation, hunting, and tar and charcoal production. The people and their livelihoods were conditioned by their ability to make use of the local natural resources for subsistence, basically as small-scale farmers. Forest resources dictated the development of local society, as production and consumption were assembled in the same area. For those who were willing and able to work hard, the natural resources seemed endless and accessible, regardless of ownership (Johansson, 1994). Since 1860, when the forest industry began to exert an influence on the area, wage labour and contracting in logging operations during winter became a significant source of income for farmers, making a mutual dependency between the small-scale forest holdings and agriculture (Törnqvist, 1995). The demand for loggers also implied an in-migration to remote rural areas, a demographic trend that increased the population substantially. This development brought about a change in material conditions as well as in mentality. Traditional patriarchal household-based relations and ideals were challenged by modern ideas and practices influenced by the forest-industrial paradigm, where modern man explores and changes the

[2] Social cohesion is the sense of community and empowerment (Chavez-Tafur & Zagt, 2014).

use of natural resources through planning, calculation, and rational decision-making (Johansson, 1994). In Sweden, forestry was seen as a modernising force that could provide a better life and a better society for its citizens (Johansson, 1994; Kardell, 2004).

During the 20th century, the national politics influenced demographical patterns of expansion and decline in these areas (Törnqvist, 1995). For instance, the depression, unemployment rate, and lack of food resources in the 1930s contributed to maintaining rural populations as these people could remain self-subsistent using the available agricultural and forest resources. During World War II, forests were mainly used as an energy resource, as timber could not be exported. After the war, the demand on construction timber increased rapidly, resulting in a large demand on the work force, which was also needed in the forest industry. During this period, the working force was the limiting factor in the still manual harvest work. Successively, when the mechanisation and the urbanisation decreased the need for labour and detached previous employees in the rural forest sector, a considerable part of the population in the northern inland areas left the forestry industry (Lisberg Jensen, 2002). In addition, the requirements on profitability and up-scaled production capacity challenged the subsistence and livelihood possibilities for small-scale farms. During the post-war era and until the 1980s, a majority of the small farms were run down in favour of industrial work. The regulation of land acquisition was stimulated through efficiency and rationalisation. The forest farmers therefore needed to break free from the forest-industrial paradigm and rely on self-employment, returning to a work pattern resembling the pre-1850s. During the 1970s, following the green wave, this correlated well with the ideal to reconnect with the rural values of origin, identity, tradition, small-scaleness, and self-subsistence (Törnqvist, 1995). Settlement and employment outside of the forest estate threatened the agricultural sector and the survival of the rural areas. In general, however, the northern Sweden (*Norrland*) experienced a rapid outmigration during the second half of the 20th century, resulting in uninhabited, remote, and economically and socially depressed areas (Thellbro, 2006; Holmgren, 2015). Today, the forestry and agricultural sectors have separate business operations and ownership structures (Törnqvist, 1995).

Over time, the role of forestry in rural development has continuously been changing, and this is still the situation. The forest – as part of many other natural resources such as reindeer husbandry, tourism, mining, hydro power, agriculture, fisheries, and various enterprises – contributes to the survival of rural areas. In rural development in Sweden, the diverse sectors and multiple actors representing these sectors have created a governance system that is

fragmented as well as a traditionally co-operative. Modern society needs to access and use the forest resources (e.g., timber, recreation, biodiversity, and carbon sequestration); these pressures come from outside these rural communities as exogenous factors. Timber resources, for example, are influenced by global market fluctuations and commercialisation, including by the present emphasis on bio-economy and commercialisation rather than on local development of resources.

As will be further examined in chapter 3 and 7, there are multiple conflicts about what forest values are and how they should be used both between and within national and local levels and actor groups. However, most conflicts take place outside the local community's sphere of influence, where national interests and regulations with incoherent goals or unsolved debates on rights and influence are discussed without consulting local communities and without considering these communities' abilities to handle these larger national and even international concerns. More research is needed to understand what issues can be solved locally and how surrounding governance systems interact with the local level (Beland Lindahl, 2008).

Therefore, Lundberg and Karlsson (2002) promote the need for local competence of action (*handlingskompetens*) to determine the perceived value of the natural resource. If people are aware of the factors that influence their living conditions and the community development, if they are able to mobilise and create action around common local concerns and if they are able to foster solidarity, trust, and cohesiveness, then the local competence of action can contribute to achieving local goals. This approach also depends on relations to the surrounding world, in economic and political ways, as well as on traditions and sociocultural heritage. Here, it is important that the actors with decision-making power accept local goals and ambitions, legitimising the local competence of action (ibid), as participatory management arrangements are increasingly proposed in order to promote economic and social development and/or reduce conflicts (Willebrand *et al.,* 2006). The study in Paper III, connecting local goals with the national policy-making level, illustrates how this claim for legitimacy is essential in participatory processes concerning local development.

There has been a shift in activity in the rural areas, where the production of goods and fibres are less dominant, combined with other kinds of activities connecting rural areas with urban areas. Although the production of the rural forest landscape has always been multifunctional (Johansson, 2002), increasingly activities including tourism, locally produced food, environmental values, animal care, and preservation activities are being developed next to traditional resource use in agriculture and forestry (Myrdal, 2008; Árnason et

al., 2009). By changing how production in the rural areas is viewed, it is easier to view them in relation to the needs of society and identify the close interrelation between the public and the private. Many of the produced values are initiated privately, for example, renting cottages, organising outdoor activities, supporting creativity through art and handicraft, as well as establishing new small-scale enterprises. The use of natural resources is arranged by institutional frames, norms, traditions, organisation structures, and activities. The development of the different sectors in natural resource management affects local and societal life.

2.4 Governance challenges in rural northern Sweden

Swedish regional politics have previously focused on regional equalisation and a balanced financial growth in the whole country according to the idea "let the whole country live" ("*hela Sverige ska leva*"), where all regions should have an equal part of welfare and growth (Westholm, 1999; Lundberg & Karlsson, 2002). During the second half of the 20th century, the State has strived to maintain the distributed population pattern to protect and develop all parts of the country through, for example, municipal tax equality and regional subsidies (Westholm & Waldenström, 2008). Today, however, the employment paradigm argues that the movement of wage earners is primary; this means rural areas will need to provide work opportunities or its inhabitants will have to move.

There is a general experience, also captured in my interviews, that the population in Norrland has long been a marginalised group in Sweden. The inhabitants of the northern inland regions of Sweden own a minority of the local natural resources; the use of these resources today generates a small number of employment opportunities and the income, and revenues from its exploitation rarely stay in the local community (Karlsson, 2008; Tidholm, 2012). There is a continuous debate in Sweden on how best to encourage rural economic development as many people believe the high tax pressure on rural areas is inequitable. That is, tax revenues on natural resources are not reinvested in the rural areas where they are reclaimed, but instead these revenues go to urban areas where companies have their head offices. Tidholm (2012) notes that the redistributive politics no longer work as intended, and employment opportunities decrease even though production and revenue increases. The local community should accept and bear the costs of industrial exploitation and be providers of raw natural resources, but without receiving compensation, and respect "intrusions" in the living environment and loss of alternative industrial sectors. For instance, Norrland produces 40% of the

energy required nationally (i.e., energy not consumed locally) and 80% of European ore production, although the population depends on subsidies for maintenance of services and welfare (Tidholm, 2012).

2.4.1 Discourses on forestry in rural development

In connection to the rural forest history, some discourses of the forest sector in Sweden are relevant to the present situation. Discourses can be defined as the terms through which people understand, explain, and articulate their social and physical environment (Elands & Wiersum, 2001). In daily life, discourses, traditions, and rules influence thinking, speaking, and acting (Arts *et al.,* 2013). People engage in their own specific discourse, which influences the view that people have on the role of forestry in rural development (Elands & Wiersum, 2001). Therefore, discourses should be understood within a context to make visible the present ideas and world views that are often taken for granted in daily conversations.

Based on a literature review, Elands and Wiersum (2001) identified five discourses where the role of forestry in rural development is perceived differently. The agri-ruralist discourse concerns the demand from society on farmers to deliver multifunctional agriculture serving a range of values where the role of the farmers as stewards for food production and landscape amenity preservation is strengthened. The hedonist discourse focuses on "quality of life" and how aesthetic, cultural, and natural values can be reinforced as central to rurality. The utilitarian discourse emphasises the role of rural areas as primarily economically oriented production areas for innovative modern markets, supplying food specialities, recreation, housing, etc. The nature conservation discourse concerns the maintenance of ecological integrity, wilderness, and biodiversity as fundamental elements of the rural area.

These four discourses can be applied to the forestry context of northern Sweden. Elands and Wiersum (2001) also distinguish between remote areas and areas adjacent to urban agglomeration regarding the perception of the role of forestry through these four. The fifth community sustainability discourse focuses on remote rural areas and describes the general situation in the small community of Vilhelmina: "remote places [are] characterised by low population densities, low incomes and stagnating basic services" (Elands & Wiersum, 2001:12). These areas struggle to keep their social and economic infrastructure up-to-date, requiring an influx of tax money. Here forestry can be regarded as a means to increase community identity and social capital. In northern Sweden, this discourse can be connected to the view that rural areas provide much of Sweden's economic wealth without receiving much in return from urban areas, where the wealth of natural resources is turned into

economic power (Tidholm, 2012). During the 1970s, many state authorities and departments were moved to small cities to stimulate rural growth and decentralisation in a spirit of letting the whole country flourish. This paradigm has slowly been changed since, especially in northern Sweden, urbanisation and forest industry concentration have resulted in decreased employment and depopulation. Consequently, the resources for maintaining equal welfare services in those rural areas have diminished. Instead of protecting people's choice of and place attachment to their living area, people are expected to seek work where there are jobs. Although the "rural discourse" in interior northern Sweden promotes the possibilities of broadband infrastructure in distance employment and entrepreneurship, the postal services are disappearing, disabling, e.g., e-commerce irrespective of internet speeds. As a result, the local competence of action has decreased.

2.4.2 The challenge of demography and promising trends

Demographic processes include dynamic shifts of mortality, fertility, and migration, influencing not only population size and growth but also age structure, household size, and population distribution (Hummel *et al.*, 2013). The demographic situation affects social welfare systems, economic development, employment, and consumption in a spatial-temporal dynamic. When analysing demographic challenges, it is essential to consider motives, knowledge, and the attitudes behind why people choose to live in a certain place (ibid).

Remote rural areas, especially in the northern interior of Sweden, are facing severe demographical challenges: a declining and ageing population, in parallel with a change in the economy from relying on extraction and export of natural resources to becoming more and more dependent on the public sector (Lundmark, 2006). The low population numbers make it difficult to sustain commercial and public services, high costs for investing in infrastructure and services, and high tax levels (Almered Olsson *et al.*, 2004; Westholm & Waldenström, 2008). When the working-age population decreases as the birth rate decreases, skewed-age distribution in the remaining population results, a situation that requires more healthcare and eldercare employees (Karlsson, 2007). Young people leave rural areas for urban areas to pursue education and employment opportunities. The combination of these conditions results in a misallocated distribution in age, class, and gender. The situation is more severe for the rural areas with greater distances to the regions with larger labour markets. In fact, this sparsity results in special preconditions for all human activity (Westholm, 2008). Migration patterns are divergent for different groups in society depending on cultural, gender, or ethnic differences

(Westholm & Waldenström, 2008). The male dominant discourses regarding recreational activities connected to hunting and fishing strongly influence men to stay in the rural areas where they were born, but this discourse has less appeal for women (Johansson, 1994).

The migration patterns are not solely negative. Today, more and more people share their time between urban and rural environments. The changes in labour markets, mobility, double residency, cultural influences, gender roles, health preferences, and education open opportunities for living in rural areas (Westholm, 2008). In general, people who move to the countryside want to control their lives, striving for self-dependency through a combination of working life and leisure. These people prefer to be close to nature and to see this life style as a way to attain peace and wellness. The internet is changing rural precondition profoundly as one's actual location does not always dictate what kind of work is available and human interaction can take place irrespective of geographical distances (Westholm, 2008).

In contrast to people in urban and industrialised societies, Westholm (1996) asks whether rural areas may be more closely connected to traditional forms of self-organisation, as people in rural areas may have kept their multifunctional approach of living and sustaining in a resilient and adaptive form as they maintain their habit of self-dependency and do-it-yourself solution-oriented activity. Historically, efficient use of rural resources was only possible through collective cooperation. Traditionally, farming, fishing, and hunting have been organised in a way that calls for individual responsibility as well as collective resource use. Westholm (2008) identifies future possibilities in continued cross-sectoral partnerships, networks, and collaboration projects as political means, using the uniqueness of the rural area to create social processes and synergies to strengthen financial growth.

3 Forest governance in different contexts

This chapter aims to contextualise the forest governance situation in Sweden from a rural development perspective to provide an understanding for the latter description of the local conditions of the Vilhelmina case study area (chapter 7) and the basis for the conducted scenario development (chapter 8). Here governance is seen from a context-specific view, where certain structures, actors, policy goals, and tools are implemented in the rural areas of interior northern Sweden (Beland Lindahl, *et al.,* 2015). I start by defining forest governance and its vertical and horizontal structures, followed by a brief tour through Swedish forest history, describing the views on forest resources, private forest ownership, and the development of planning perspectives and policy goals. The call for sustainable forest management and its impact on forest policy will be described. The implementation of Swedish forest planning and management paradigms will be discussed, as well as challenges of governing multiple values with regards to ownership and user rights. The forest ownership structure, prevailing forest discourses and how forest ownership behaviour may influence forest management will also be reflected.

3.1 Defining governance

Governance in general refers to "the traditions, institutions and processes that determine how power is exercised, how citizens are given a voice, and how decisions are made on issues of public concern" (Graham *et al.,* 2003). The forest sector is increasingly facing governance challenges since a multiple set of actors advocate their claims of forest resources and values of an economic, ecological, social, and cultural character. Private forest owners, forest managers, authorities, non-governmental organisations, citizens, and external enterprises have different perspectives on the use of natural resources on the local, national, and global levels (Appelstrand, 2012). The ongoing and potential conflicts between different forest stakeholders need to be handled

through new governance procedures, changing from former political and hierarchical structures of government to softer, more flexible processes where multiple interests are co-ordinated: "from government to governance" (Appelstrand, 2012; Böhling & Arzberger, 2014; Secco *et al.,* 2014). Historically, formal state institutions (governments) used coercive power to execute legislation, executive and judicial activities, as hierarchical forms of command and control steering, enforcement, detailed regulation, and economic incentives (Torfing, 2006; Appelstrand, 2012). The State was believed to have the specialised knowledge and tools needed for the primary responsibility for the well-being of the population. Today, however, this responsibility is shared with other actors, while the status of the State as the sovereign centre of politics decreases. State institutions have therefore moved from constitutional and legal strength to contextual and entrepreneurial strength (Pierre & Peters, 2000; Torfing, 2006). The borders between civil society, the public, and the private have been dissolved (Appelstrand, 2007). This type of governance can be defined as a negotiated interaction and responsibility involving multiple actors and institutions across sectors in decision-making and goal-definition processes characterised by transparency, accountability, and equity that expands the capacity of public policy (Torfing, 2006; Hedlund & Montin, 2009; Böhling & Arzberger, 2014). Furthermore, it aims at decentralising power, introducing and diffusing market-based instruments, and using participatory approaches (Secco *et al.,* 2014). This does not mean that the State's role is reduced or loses importance, but rather that it changes from direct authoritative legal steering to the role of traditional command and control (Appelstrand, 2012). One could view the State as an institutional structure with informal and formal principles, norms, rules, and decision-making procedures that influence different actors and is influenced by different actors in return. This configuration allows for a diversity of actors to create their own agendas and objectives that may not always be coherent (Sundström, 2005; Hysing, 2009). The culture of those in authority often determines the nature of governance processes; when the decision-makers' culture and citizens' culture differ, conflicts tend to arise (Innes *et al.,* 2005). Therefore, governance should be regarded as a context-specific combination of ways to view the world, where policy goals and tools are implemented in specific places and times (Beland Lindahl, *et al.,* 2015).

3.1.1 Vertical and horizontal governance structures

Governance structures can be illustrated in vertical and horizontal directions. The horizontal level illustrates links between different interests, actors, sectors and institutions, whereas the vertical scale shows the link from international

through national, regional, and local levels (Figure 2) (Brown, 2009; Secco *et al.*, 2014). The governance system therefore needs to consider all these levels – handling both vertical EU scales and the horizontal sector planning tradition. Local level forest agencies may play a key role as a link in facilitating collaborative processes on forest resource management: horizontally by facilitating cooperation between different land owners and stakeholders and vertically by translating international and national objectives and demands for the local forest ecosystem (Tippett *et al.*, 2007; Secco *et al.*, 2014). There is a need to explore how governance networks can bring public and private actors together: "[actors who are] *mutually dependent* on each other's resources and capacities, but who *operate independently* in the sense that they cannot be commanded to think or act in a certain way by the other actors in the network" (Torfing, 2007:5 author's emphasis). The integration of vertical and horizontal structures in governance and planning ultimately aims to improve adaptive and sustainable natural resource management through a dynamic process characterised by interaction, negotiation, and coordination of norms and rules, as well as linking multiple spatial, temporal, and administrative scales (Sayer & Collins, 2012; Arts *et al.*, 2013; Secco *et al.*, 2014). In addition, national preferences can be challenged through conventions promulgated by the EU and other international governing bodies (Hysing, 2009).

Since 1988, the Swedish system of public administration works to formalise sectoral responsibility, where regulatory authorities function as independent organisations. Accordingly, sectors in forestry, agriculture, and energy are all responsible for implementing, e.g., environmental policy according to their authority mandate and power (Beland Lindahl *et al.*, 2015). There is, however, a risk that decisions taken on one level may have unintended effects on other levels (Secco *et al.*, 2014). All these forest actors share the responsibility for policy implementation, supported by the use of soft legal instruments by the authorities in form of knowledge transfer through education, dialogue, and consultation (Appelstrand, 2012; Beland Lindahl *et al.*, 2015). In line with the soft steering governance, the Swedish public administration has therefore been characterised with a culture of pragmatism, consensus, and a willingness to make compromises (Boström, 2002; Schlyter & Stjernquist, 2010). This approach has created a tradition of interaction and cooperation of well-organised interest groups with few hierarchies thereby combining democracy and corporatism (Appelstrand, 2012). Increasingly, more decisions are made on the horizontal and operational levels where the forest sector conducts policy making in connection to the creation of national objectives. In addition, voluntary agreements between public and private sectors and market-based instruments are important policy measures (Beland Lindahl *et al.*, 2015).

There are four main groups of actors that are actively concerned with the Swedish forest governance system: NIPF owners; forest industry; environmental non-governmental organisations; and public authorities, which can be considered as a rather narrow range of actors having formal rights or duties (Beland Lindahl *et al.*, 2015). In addition, the Swedish Forest and Wood Trade Union and the Swedish Sami Federation are highly influential in specific issues (Hysing & Olsson, 2008). A broader range of actors, however, are invited to contribute to the consultation process, where the extent of their involvement depends on the scope, context, and initiative of the issues under consideration (Beland Lindahl *et al.*, 2015). When planning is made in cooperation with multiple actors, it is important to ensure appropriate representation, since political and power relations determine who is, and who is not, given voice and influence (ibid). Particularly little is known about how to best link horizontal governance such as collaborative processes to vertical governance structures typical of traditional decision-making (Rogers & Weber, 2010).

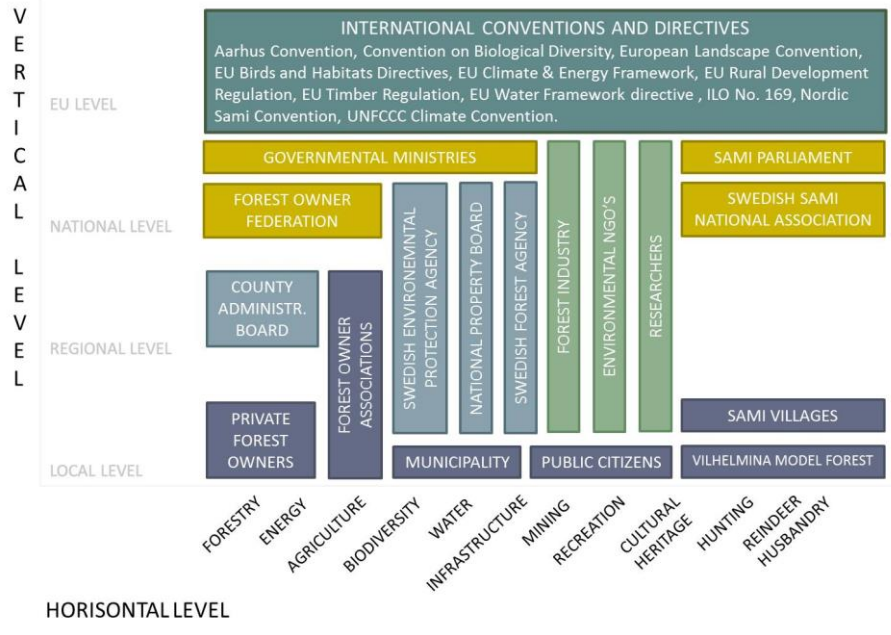

Figure 2. Overview of horizontal and vertical governance structures of sectors and actors related to the forested landscape. The colours indicate vertical level.

3.2 Swedish forest policy – from government to governance

In pre-industrial northern Sweden, forest resources were mainly used for household purposes, so the State did not initially bother to define exact user rights. Forests were considered common resources, and competition over forest land was minor and local, as forestry, farming, and reindeer herding co-existed (Nylund & Ingemarsson, 2007; Holmgren, 2015). Throughout the 19th century, however, the State decided to take more advantage of natural resources, among them the timber resources. The forests were perceived as endless resources and harvests were conducted without considering sustainable regrowth. To organise the forestry sector and to ensure that the forests were more well-kept, the State decided to distribute crown forest land to individual farmers as part of wider liberalisation and "delimitation" processes [*avvittringen*] (Törnqvist, 1995). The State needed to encourage people to settle in the rather inaccessible remote areas in the interior north, reasoning that people tend to take care of a resource that they own and sense responsibility for. This action resulted in a two-fold gain: securing the subsistence of farm families, who were entitled and motivated to ensure silviculture through ownership, and providing the industry with timber and the State with tax revenues (Stenman, 1983; Törnqvist, 1995). Hence, the State could influence the owners of forest land to use and manage forest resources in ways that increased timber growth to be used in industrial production, while simultaneously ensuring long-term resource sustainability and subsistence of farmers.

3.2.1 The Forestry Act of 1903

At the end of the 19th century, the forest logging industry grew to be the largest export sector in Sweden, exceeding the iron industry (Almered Olsson *et al.*, 2004). Large parts of the boreal forest landscape, with multi-layered and age diverse forests, were harvested and replaced with single-layered and thinned forests where the trees had smaller diameters per the ideas of forest "farming".

The first legislation for sustained yield on private land[3], the Forestry Act, was introduced in 1903 as a response to how the forests had become severely impacted from hard harvests and ineffective regeneration. The regeneration of tree plants was a challenge in the harsh climate of northern interior Sweden, so selective harvesting was developed as an alternative in some areas, and legislative demands for securing regeneration and allowing forest ditching were introduced. The forests were managed according to the even aged stand

[3] Sustained yield can be defined as ''the yield that a forest can produce continuously at a given intensity of management, without impairment of the productivity of the land'' (International Union of Forest Research Organizations).

management system – consisting of final felling followed by planting or natural regeneration – aiming to secure a long-term supply of cheap wood material for industries. This kind of sustained yield forestry focuses on an efficient use of the wood resources as a commodity, relying on stable ecosystem productivity and controlled natural disturbances (Elbakidze *et al.*, 2013).

Although small-scale private farmers had become forest owners, lumber companies bought estates and harvest rights for dimension felling from the farmers. These purchases occurred through corporate law infringements, dubious affairs, fraud, and exploitation of peasant land owners. In the early 1900s, it was debated whether the forest companies or the farmers would manage the forests better, resulting in a regulation that prohibited companies to buy forest farm land in 1906. The small scale forest owners could then start exploiting the now valuable timber resource and employ modern silviculture practices (Törnqvist, 1995; Nylund & Ingemarsson, 2007).

In 1933, the use of forests as pasture and graze land for cattle was prohibited, as the milk production demanded more efficient production of grazing resources and forestry became more separated from agriculture (Östlund & Zachrisson, 2000).

3.2.2 Forest policy in the post-war era

After World War II, the transfer from wood fuel to fossil fuels reinforced the focus on clear cutting silviculture, making timber production the major management goal. Agricultural and forest farming should be conducted in the most rational way to support growth of societal economy and to improve the living standard for the population. At the same time agricultural should not inhibit employment that could be used in other sectors with larger growth potential; the Land Acquisition Act in 1948 aimed at securing agricultural land for farmers, while simultaneously the Forestry Act demanded profitability of the forest to stimulate even more revenue.

Between 1950 and 1975, the export industry grew significantly as the State and the private sector promoted Swedish timber exports, with tripling export figures over this period (Almered Olsson *et al.*, 2004). The oil crisis stimulated policy efforts for increased production and growth, e.g., through the introduction of pesticides and ditching.

In addition to regulations on regrowth practices and the harvesting of immature stands, the new Forestry Act (1979) included detailed regulation regarding thinning, clear cutting area sizes, fertilisation, and ditching (Törnqvist, 1995). The forests were regarded as an important resource for national economy and as such were governed according to state objectives. At

the same time, the policy instruments were rather soft and educative (freedom with certain restrictions), in close collaboration with the private forest sectors (Sundström, 2005; Hysing, 2009). The Swedish Forestry Model that was developed during this period (1950-1980) aimed at using forest revenues to improve welfare standards, developing public sectors, investing in industry, and raising real wages. During this period, the manual work of humans and horses and the use of floating timber down rivers were replaced by mechanisation and establishment of dense networks of forest roads and truck transportation. These improvements in production and improvements in science-based forest management increased forest revenues.

3.2.3 From criticism of the Swedish Forestry Model to Sustainable Forest Management

During this intense clear cutting silviculture period, there was an increased interest in outdoor recreation and environmental values. At this time, there was a large debate about the introduction of the Lodgepole Pine (*Pinus contorta*) and its impacts on the forest ecosystem, which resulted in a nature consideration paragraph in the Forestry Act of 1979. During the 1960s, 1970s, and 1980s, the forestry industry's single focus on high productivity and intense exploitation with the clearcutting was criticised. In addition, many stakeholders began to scrutinise other natural resource management practices: cultivation of pasture lands; the cultivation of deciduous forests, broadleaf, and mountainous forests; machine-caused environmental damage including air pollution; the use of chemical pesticides; and the drainage of wetlands pollution (Almered Olsson *et al.*, 2004; Kardell, 2004; Enander, 2007). As the growth rate and standing volume of the boreal forest has increased, the ecological consequences of reduced biodiversity (many red-listed animal and plant species) changed habitat structures and destroyed some cultural values (Östlund & Zachrisson, 2000). As a result, only a small proportion of forest land undisturbed by humans remains today as protected land.

In the early 1990s, this criticism resulted in a structural change of forest policy and a deregulated forest sector and initiated the call for sustainable forest management that respected the International Convention of Biological Diversity, which was signed by more than 150 states at the UN Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992. In the Forestry Act of 1993, the production goal was equalised with the environmental objective that the forests should be managed in such a way that valuable yield can be provided while simultaneously preserving biodiversity (Bush, 2010; Brukas & Sallnäs, 2012). According to a governmental bill (prop 1992/93:226), the production goal states that forests and forest areas shall be

used efficiently and responsibly, aiming for sustainability as well as positive revenue. This goal is done through the regulation of regeneration after final felling and of the length of rotation periods. The environmental objective states that the natural given production capacity of forest land and its biological and genetic diversity should be preserved. This type of forest management preserves natural habitats and ecosystems that support strong populations of indigenous flora and fauna and protects endangered species and ecosystems. The Forestry Act also intends to protect cultural values as well as aesthetical and social values and emphasises biodiversity values to encourage the establishment of key biotopes and nature reserves through voluntary agreements. However, the wording in the actual paragraph and the structure of the forest policy objectives gives the social and cultural values a less prominent position (Beland Lindahl *et al.*, 2015). Also, it is not stated how goal achievement should be evaluated (Lundström, 2013).

Today, sustainable forest management (SFM) aims at securing ecologically sound, economically viable, and socially acceptable forest ecosystems for present and future generations (MCPFE, 1995; Hahn & Knoke, 2010; Arts *et al.*, 2013). SFM thus includes maintaining the health, integrity, and biodiversity of forest ecosystems in addition to long-term profitability, a healthy environment for local communities, and the cultural identity of forest landscapes (MCPFE, 1995). Combining these elements is challenging; for example, the enhancement of recreational values may not be totally compatible with economically sustainable forestry (Bettinger *et al.*, 2009). To handle conflicts in multiple spatial scales requires adaptive management and governance (Hahn & Knoke, 2010; Sandström *et al.*, 2011). SFM has become institutionalised as a norm in various instruments of the international forest regime – both public (non-legally binding instrument on all types of forests) and private (FSC) as well as both binding (Convention on Biological Diversity) and non-binding (Rio forest principles; national forest programs; SFM criteria and indicators) instruments (Arts & Babili, 2013). In addition, SFM now forms the basis of most forest policy and management around the world (FAO, 2010).

A vision that was formulated by the former Ministry for Rural Affairs in 2011, "The Forest Kingdom", includes goals for how the Swedish forest sector can combine increased timber production with environmental considerations, increase the use of biomass and renewable materials, work with climate change adaptation, and find new ways to refine and innovate forest raw material. The Forest Kingdom can be seen as a strategy the State uses to encourage multiple forest values, acknowledging the diverse attitudes and democratic values of the diverse actors (Holmgren & Arora-Jonsson, 2015).

The call for sustainable forest management in Sweden has also resulted in the development of several market-driven policy instruments of certification systems, providing guidelines and criteria for responsible management: Forest Stewardship Council (FSC) system and Programme for the Endorsement of Forest Certification (PEFC). The major forestry companies are certified and more than 60 percent of the forest areas are as well; in fact, Sweden was the first country to get a national FSC standard (1998). The initiative came from the WWF. The Swedish standard was developed through negotiations between the private forest actors with the shared goal of reaching a verifiable sustainable forestry. The environmental organisations aimed at more direct influence in forest management, and the industry needed to reach legitimacy for their production on the international timber market (Rametsteiner & Simula, 2003). FSC goes further than the Forestry Act requirements regarding logging in old growth forests and consultation procedures between reindeer husbandry and the forest industry (Johansson, 2013). From a governance perspective, the certification schemes have created a powerful policy; however, the certification schemes require significant state support and this support affects the timber market. Certified companies are not allowed to buy wood from forests with valuable natural key biotopes even though the wood may come from biotopes that are not formally protected. Therefore, non-certified actors may have a difficult time finding customers.

The Swedish Forestry Model, where use and protection are equally important, is described by its proponents as world leading[4], but the model is also contested. The international obligations to protect old growth forests, biodiversity, and enhance sustainable development have not been realised according to international evaluations, and the freedom of the Swedish Forestry Model is criticised for its avoidance of greater societal responsibilities.

However, the State has actually relied on the market driven forest certification schemes to ensure nature conservation goals rather than taken action through forest policy measures (Hysing, 2009; Johansson, 2013). The State, corporatists and the NIPF owners are highly integrated in the forestry sector, leaving the borders between policy-making and certification schemes fluid. The possibilities for non-conventional forestry actors to participate in decision making, including local and environmental groups, is restricted (Forsberg, 2012). The criticism indicates that while the State has become less visible in steering, there are unclear expectations of what the freedom with responsibility actually implies (Holmgren, 2015).

[4] Including the Ministry of Rural Affairs and the Swedish University of Agricultural Sciences (Swedish University of Agricultural Sciences, 2012; Affairs, 2011) in Holmgren 2015.

A recent example of the criticism towards the sustainability achievements of natural resource management in Sweden considers the national Environmental Quality Objectives (EQO) (SEPA, 2016b). In 1999, the Swedish government launched a number of goals, which today are 16 quantified goals to be met by 2020. The EQO "Sustainable Forests" considers how the biological production of forest land as well as cultural heritage and recreational assets can be protected. However, the recent evaluation concludes that only one of the sixteen EQOs will be reached in 2020 ("A protective ozone layer"); the others are not achievable within the remaining period (SEPA, 2016a).

3.3 Implementation of forest policy

The Forestry Act of 1993 resulted in a shift from a more government-oriented to a more governance-oriented policy, deregulating and decentralising the forestry sector (Appelstrand, 2012). The implementation of the forest management objectives has been characterised by soft legal instruments and voluntarism through a strong sectoral responsibility and a freedom with responsibility for forest owners (Appelstrand, 2007; Hysing, 2009; Beland Lindahl *et al.*, 2015). This deregulation resulted in several changes regarding policy means. The forest management fee and the subsidies for pre-thinning, forest road construction, and other management activities were all discarded. The Swedish Forestry Model allows forest owners to freely make their own silvicultural decisions, but they are also required to consider environmental and societal needs (Brukas *et al.*, 2013). All land owners must inform the Swedish Forest Agency, of their plans to harvest timber in final fellings; if the plans are unsatisfactory, the agency can prevent the felling or insist on modifications in case the felling plans do not meet societal aims (Brukas & Sallnäs, 2012).

It may seem clear that the maximum sustained wood yield has run its course as the sole management paradigm, as all elements of sustainable development are increasingly gaining equal interest and as stakeholders outside the forest sector are critical about how intense forest management has impacted other forest landscape values (Elbakidze *et al.*, 2013). Nevertheless, Sweden has maintained intensive, at least by European standards, annual timber harvests, equating on average a gross increment ratio of 70% both before and after the policy shifts of the early 1990s (SFA, 2011). The perception of forestry as mainly an economic contributor in employment and raw materials in rural areas has prevailed. This perception can be viewed as a production discourse; a green discourse, on the other hand, values pristine nature, biodiversity, and social needs over economic considerations (Lisberg Jensen,

2002). Ambjörnsson et al. (2016), studying changes in discourses connected to the Swedish forestry sector and the debate on multifunctionality of rural landscapes, concluded that the production discourse as well as the green discourse are still very much alive, despite arguments that forest management is increasingly emphasising multiple-use (Sandström *et al.,* 2011).

The public awareness following the introduction of certification schemes, green forest management plans, national EQOs, and international conventions on e.g. habitat and water management, have changed the forest discourse agenda. However, representatives for nature conservation argue that the current consideration to ecological values being too weak (Gustafsson & Perhans, 2010; Forsberg, 2012). The risk of ecological fragmentation is emphasised, as a result of the lack of coordination and overview of areas relevant for nature conservation in the whole landscape, which hinders communication between forest owners and responsible authorities. Management methods combining nature protection and silviculture, e.g. through careful selection cutting, are suggested, in order to find a continuous and sustainable balance between conflicting values.

3.3.1 The Swedish Forestry Agency and national stakeholder forums

The Swedish Forest Agency (SFA), the main government agency for forests, carries the responsibility to ensure that Swedish forest policy is implemented and realised in practice (Beland Lindahl *et al.*, 2015), acting as the coordinator. The SFA independently interprets and upholds the law, improves capacity-building within the forest sector, conducts forest inventories, and distributes information to stakeholders and the general public (KSLA, 2015). SFA also manages policy implementation processes, ensuring the reduction of forest damage, reforestation, and improved compliance with forest management practices.

The role of SFA has changed over time, from being more controlling, inventorying, and distributing of subsidies, to today being an informative, consulting, and supportive authority, coordinating participatory activities with forest-related organisations. The soft law instruments that are used to implement the Forestry Act objectives are communication, information, and support (Sundström, 2005). The Forest Agency and the County Administrative Boards seldom use “hard law” instruments, such as fines, to steer the forest sector (Beland Lindahl *et al.,* 2015). Other agencies that influence the forest sector are the Swedish Environmental Protection Agency, the Swedish National Heritage Board, the Swedish Agency for Marine and Water Management, and the county administrative boards.

Swedish forest policy has a long tradition of consensus-oriented deliberations between stakeholders. For example, stakeholders can comment on drafts of governmental bills in writing or by expressing their opinions at participatory meetings. One example of a multiple actor forum is the Forest Sector Advisory Boards, which consists of public authorities and different interest groups (Sundström, 2005; SFA, 2016b). Today, there is one national board, three regional advisory boards, and a few boards concerning specific issues such as reindeer husbandry and forest statistics. The boards were founded in 2002, and mainly discuss over-all forest and environmental issues in meetings four times a year. The SFA is the initiator and administrator. In addition, during the last several years, the government has investigated the forms for establishing a National Forest Programme (NFP) as a forum or mediator to advocate SFM in a participatory, holistic, cross-sectorial, transparent and iterative process in forest policy development, implementation, monitoring and evaluation (Larsson *et al.*, 2014). The role, effectiveness and optimal organisation of several NFPs in Europe have been discussed, and research has shown that NFPs have not always succeeded to promote deliberation, reconcile conflicts or generate legitimate strategies (Primmer & Kyllönen, 2006; Winkel & Sotirov, 2011; Johansson, 2016). Johansson (2016) evaluated the establishment phase of the Swedish NFP, and found discrepancies in how actors formulated the purpose and their expectations of the NFP differently in connection to their own agenda. Drawing from experience of previous processes, e.g. on forest sector goals and the FSC certification, these struggled with unclear mandates, goals and forms of accountability. Johansson (2016) therefore emphasise that the NFP must incorporate decision-making procedures that provide a clear mandate and secure long-term participation of key stakeholders. In order to off-set power asymmetries, it is important to secure that all actors have equal opportunities to express their concerns in a balanced and transparent manner. The success also lies in how deliberative ideals and expectations of the stakeholder groups and sectors are managed, in order to create a collaborative process with the ambition to improve previous governance models.

On the local level, there are few examples of forums where stakeholders meet to discuss land use issues and management of multiple forest values continuously.

3.4 Forest ownership, management behaviour and conflicting values

3.4.1 Property rights

In Sweden, there are at least three kinds of land tenure regimes that influence the use of forest resources, and thus rural development: private land tenure, usufructuary rights of the reindeer herders, and the right of public access. Private ownership is based on possession rights, whereas the other two forms are based on user rights. Ostrom and Schlager (1996) define rights to allow individuals to take action regarding a certain "thing" in relation to other individuals:

> "The duty that an individual owes another defines the actions the individual may, must, or must not take in relation to another and that other's property. [. . .] Individuals who hold rights to management have the authority to determine how, when, and where harvesting from a resource may occur, and whether and how the structure of a resource may be changed. Having rights of exclusion give authority to define the qualifications that individuals must meet in order to access a resource. The alienation right means that individual sells or leases the rights of management, exclusion, or both." (Ostrom and Schlager 1996:130, 132)

Ostrom and Schlager (1996) categorised property rights in a scale from access; withdrawal; management and exclusion to alienation rights. The access and withdrawal of resources are the most basic rights, allowing to enter a property and to extract resources. The management right allow to organize usage patterns, including when, how and where the appropriation of a resource can take place. The management right also enables the right-holder to make decisions regarding improvements of the resource. The exclusion right implies the power to decide who can have access rights, while the alienation right considers the right to sell or lease management rights and/or exclusion rights. These rights can be held by either individuals or collectives. The last three rights give the property right holder the authority to make decisions about future rights (Wennberg DiGasper, 2008:36).

Private property is protected against expropriation by the State according to the Swedish Constitution, unless it is not needed for public good, in which case the property owner is compensated (Wennberg DiGasper, 2008).

The forest ownership rights are regarded as a strong institution in Sweden, deeply rooted in history, identity, and local practice (Ambjörnsson *et al.*, 2016). The forest is a family asset due to a well-functioning and respected cadastral system (KSLA, 2015). The ownership rights awake a sense of responsibility; if you know that you will gain revenue from work, you are willing to make sacrifices to reach your goal. Regarding land ownership, the revenue goes to the owner, which in turn gives the owner a large freedom to influence the natural environment and rural development (Karlsson, 2008).

3.4.2 Governance of conflicting values

The different values of the forested landscape are advocated by different actors and interests, and are interlinked in different ways as regards users and right holders. I will highlight some challenging owner-user relations.

The public interest in social forest qualities started to increase in the 1960s and 1970s in Sweden, in times of dramatic transformations of the natural landscape – due not least to mechanized forestry practices and urbanisation wave – which stimulated the public demand for attractive and accessible recreational forests (Olsson, 2014; Sténs *et al.*, 2016).

The recreational forest values are regulated in the Swedish Right of Public Access (*Allemansrätten*): "the limited right each and every one has to use the property of others, land and water, primarily by traveling over it, at least by foot, and to stay there for a short time" (Sténs & Sandström, 2013:57). The responsibilities can be summarised with the catchphrase "[Use but] don't disturb, don't destroy" (Bengtsson, 2004). The Right of Public Access is linked to both recreation and the use of some non-timber forest products (NTFPs), e.g. entrance to private property and berry and mushroom picking, regardless of land ownership (Bengtsson, 2004; Sténs & Sandström, 2013). The regulation has historical roots, partly deriving from the early Middle Ages, but widely spread as a concept in mid of the 20th century (Sténs & Sandström, 2013). By not being a law in itself, but restricted indirectly in e.g. the Real Property Law (1970:994) and the Criminal Code (1962:700) protecting land owners, and the Environmental Code (1998:808) which prohibits environmentally harmful activities, the concept is experienced as imprecise and contested, contributing to conflicts between those who defend ownership rights and those who defend public access (Bengtsson, 2004; Sténs & Sandström, 2013). Over the years, there has been a national debate on binding solutions to control the berry resource versus retaining open access to protect smallholders and citizens. The importance of Rights of Public Access holds a strong position in the public opinion as important to protect, and important for outdoor recreational activities; much more than importance of nature reserves or national parks.

However, while this right is valued as an important part of the Swedish culture, the Federation of Swedish Farmers (LRF) argues for a change in legislation that prevents commercial activities within the Right of Public Access (Ambjörnsson *et al.*, 2016). There is no consensus on how the Rights of Public Access should be governed, as different actors have divergent ideas on property rights and regulations and potential certification schemes for wild berry harvesting.

Private forest owners are not obliged to adapt their forest management for recreational purposes. The lack of possibilities to influence how visual and recreational values are impacted during clear-cutting practices by local citizens is criticised (Zaremba, 2012). There is a discussion around developing the social forest values processed in the Swedish Forestry Act (SVL §30) on other land areas than those close to conurbation. In 2008, the Forestry Act was amended to also include the social values of the forest. Recently, the Swedish government has introduced strategies advocating for financial compensation to private forest owners who are willing to adjust their management practices to recreational needs (SOU, 2013:43; Olsson, 2014); a suggestion that was generally supported by my interview participants.

The vagueness in legislation regarding social values is similar to the considerations for reindeer husbandry as an entrepreneurial sector of forest land. The Sami people are affected of private, common and state property rights as well as the open access rights, in varying ways (Wennberg DiGasper, 2008). The entire region of Norrland is a reindeer husbandry area and includes about a third of all productive forest land. The reindeer grazing rules are decided by the Sami community in order to avoid overgrazing and degradation of tundra land. The mountain areas are to a large extent owned by the National Property Board (state authority) and the boreal forest land by NIPF and company owners, on which the Sami have user rights including reindeer grazing, hunting and fishing since immemorial time (Widmark, 2009).

The concentration of forest production as the major land use largely displaced and challenged the subsistence of the reindeer herders, who have been living as an indigenous people in northern Sweden for 8000 years. Even though reindeer husbandry and cultural heritage interests are taken into account in the Forestry Acts of the 1980s and 1990s, conflicts are still unresolved and have risen between the forestry industry, landowners, and reindeer herders (Enander, 2007; Beland Lindahl, 2008; Widmark, 2009). For example, conflicts over the use of reindeer winter pasture land outside designated mountain territories have been "resolved" by the vague formulation "prescription from time immemorial", allowing grazing on all of the land where the Sami people had traditionally carried out their activities (Thellbro,

2006; Widmark, 2009). This emphasis, albeit vague in wording, on Sami cultural values and reindeer husbandry has not received the same interest in society as green ideas (Sandström & Lindkvist, 2009).

To solve conflicts over land use and allow the forest industry and reindeer husbandry to co-exist on the same land, consultations were initiated in legislation in 1982 (Kardell, 2004), and extended through the FSC certification system during the last decade. In addition, the Swedish Forest Agency was given the mission to develop Reindeer Husbandry Plans as a communication and information tool in consultation processes between the forestry industry and reindeer husbandry (Sandström, 2015).

Forest owners are obliged to consult the reindeer herding communities when a clear cutting unit larger than 20 hectares (10 hectares in mountainous forests) is planned on reindeer grazing lands, for fellings when constructing forest roads and when fellings are planned in areas rich of tree-lichens or areas used for moving reindeers. The FSC introduced consultations on winter grazing lands with the same rules as those applied to the year-round areas (Widmark, 2009). However, the institutional arrangement cannot be considered to work properly as disputes still occur (Widmark *et al.,* 2011), primarily because issues concerning property rights are not solved (Sandström & Lindkvist, 2009). Natural grazing areas are not sufficiently protected in legislation (Widmark, 2009).

The last example considers hunting, which is of interest to several actors. The forest owners, with full alienation right, often hunt themselves; otherwise sell hunting licenses to others. Hunters and hunting tourism entrepreneurs, who lease hunting rights, are characterized as authorised users as they need to consider specified withdrawal rights and formal rules of hunting quota, hunting period, license requirements etc., as well as the fact that they cannot make management decisions, nor possess exclusion or alienation power (Wennberg DiGasper, 2008). The State, the public and specific stakeholders in nature conservation, has an interest in wild life management by different reasons: to secure a sustainable species quota; for maintaining ecological dynamics of biodiversity and balance in predator pyramids; and to limit the risks of traffic accidents where wild life is involved. The forest owners are in addition concerned with herbivore grazing pressures on their plantations.

3.4.3 Ownership structure and management behaviour

In Sweden, the productive forest land[5] covers 23,2 million hectares of the total land area of 40,7 million hectares. It is owned by individual private owners (50%), private-sector companies (25%), state-owned companies (14%),

[5] Produces at least one cubic meter wood per hectare and year.

the state (3%), other public owners (2%), and other private owners (6%) (SFA, 2014). This ownership structure with a large part of NIPF owners reflects the privatisation process of forest land as the result of 1906 legislation that prohibited companies from purchasing forest land from private family owners (Nylund & Ingemarson, 2007). The average holding of the individual private owners is approximately 50 ha, but this varies greatly in the country as larger estates are more typical further north. According to regulations by the Real Property Agency (*Lantmäteriet*), a forest estate must produce at least 250 m^3 per year, a condition meant to regulate estate sizes and prevent estate divisions. This tradition is rooted in the state view on forest ownership as a business enterprise, where the estate must be large enough to be economically sustainable.

There are many factors that influence how forest owners decide to manage their forest estates. The size and productivity of the forest land, and the owner's age, gender, place of residence, education, and attitudes influence behaviour (Törnqvist, 1995; Lidestav & Ekström, 2000; Hysing & Olsson, 2008; Duncker *et al.,* 2012; Eggers *et al.,* 2014). People might have a personal relation to the land, historical and cultural, as well as knowledge and skills applicable on the local environment. Their various attitudes, means, and financial motivations result in different management objectives (Lönnstedt, 1997; Uliczka *et al.,* 2004; Wiersum *et al.,* 2005; Ingemarson *et al.,* 2006; Kindstrand *et al.,* 2008; Hengeveld *et al.,* 2015). Some owners may, however, not be trained, informed, or aware of how forest-related activities and decisions affect the territory and resources at stake. Others may lack the time, resources, self-confidence, and the organisation to articulate and express their concerns (Borrini-Feyerabend, 2004; Eriksson, 2012). Around half of all family forest enterprises are part of forestry cooperatives, such as forest owner associations, which offer forest management and advisory services and represent private owners in policy consultations.

Forest management behaviour is also connected to the increasing phenomenon of non-residential forest ownership[6], and the fact that many forest owners today share their ownership with relatives (Lidestav & Nordfjell, 2005). On the one hand, people in Vilhelmina argue that local resident forest owners tend to be more engaged and active in their forest management and the future of the rural area as they have a personal connection to the place where they live. On the other hand, both resident and non-resident owners are increasingly engaging forest consultants and advisors to help them formulate their forest management goals, which tend to be rather streamlined and

[6] The issue of resident/non-resident ownership was also discussed in the desired vision process (section 8.2) and in the scenario development process (see Appendix).

coordinated based on the traditional silviculture (specifically monoculture) practices. In addition, there are many examples of highly engaged non-residential owners who have strong emotional connections to their inherited family estate. These owners may have more interest in other forest values than primarily timber production. These diverse views on the importance of residency can be explained by how the owners "consume" their property. As the resident owners in interior northern Sweden make a living of their estate, they equate what they invest in "their" forest to an investment in their living environment, lifestyle, and place. The family estate exists in the context of inheritance; what is invested will be passed on to the next generation rather than as a revenue when sold as real estate, as if the property were located in an urban area and only seen as an investment. In this sense, for the resident owner consumption and production are merged. Non-resident forest owners, on the other hand, use the estate as an instrument and the income it generates from management activities for consumption elsewhere – buying cars, apartments etc. – rather than investing in the estate, as they may have no place attachment (Holmgren, 2006). These different views of forest resource management can be related to the described discourses and social representations of rurality: rural residents have a more "practical" perception of the landscape resources and urban citizens regard the forests as a relaxing contrast to hectic urban life (Elands & Wiersum, 2001). Törnqvist (1995) describes how the forest estate can have different meanings: the physical space of ownership, an economic resource, and production factor, a working place, a way of living, a childhood environment, and a link connecting generations.

Many studies have investigated and defined non-industrial private forest owner typologies based on management objectives, attitudes, and decision-making styles (Karppinen, 1998; Boon *et al.*, 2004; Wiersum *et al.*, 2005; Ingemarson et al., 2006; Dhubháin *et al.*, 2007; Favada *et al.*, 2009; Nordlund & Westin, 2010). Eggers et al. (2014) identified a connection between forest management activity levels and the size of forest holdings in connection to different forest owner categories. In Paper II of this thesis, we modelled different categories of forest owner behaviour and how the owner's management choices might vary, depending on three qualitative scenarios (developed in Paper I).

3.5 Forest planning as a means for policy implementation

Forest planning can be defined as a discipline through which forest policy is expressed and multi-objective forest management activities are discussed (Farcy, 2004; Brukas & Sallnäs, 2012; Cullotta *et al.*, 2015). The planning

process supports land owners and managers to determine and express management objectives, what steps that need to be taken to reach them, and the relationship between planned activities (Bettinger *et al.,* 2009; Stojanovska *et al.,* 2014). As Kangas et al. (2000) argue, all forest planning is made under uncertainty; there are no absolutely optimal recommendations. One needs to calculate with a "realistic uncertainty", but more important than this is to find optimum solutions to "learn about the decision situation, future production possibilities and trade-offs, and the effects of different assumptions and factors on the optimal forest plan. The aim of forest planning is not to show 'right' decisions, but to give solid decision support and deep and versatile insight into the planning problem" (Kangas *et al.,* 2000:408).

Because future conditions depend on organisational, political, social, economic, ecological, and institutional capacities, stakeholders should use risk management strategies to adapt to changing conditions to maximise their opportunities (Hahn & Knoke, 2010; Stojanovska *et al.,* 2014). In addition, past and current experiences and knowledge and motivation of the owners and managers influence planning incentives (Ingemarson *et al.,* 2006).

3.5.1 The Forest Management Plan

The Forest Management Plan (FMP) is a technical comprehensive document that describes different silvicultural management options in a scope and detail that depends on the natural conditions of the estate as well as the size and ownership form of the estate (Brukas & Sallnäs, 2012). The planning horizon usually covers 10 to 20 years. Technical aspects of planning such as inventory methods, data management, and scheduling of activities have been in focus in planning, with an increased interest in optimising plans in order to find a sound balance between multiple benefits and/or preferences, e.g., through multi-criteria decisions analysis (Brukas & Sallnäs 2012; Nordström, 2010).

Following the freedom with responsibility-paradigm, forest management objectives largely rely on the voluntary actions, management goals, and behaviour of the forest owners (Ingemarson *et al.,* 2006), as the mandatory requirement for having a FMP disappeared with the deregulation of the forest sector. As a policy instrument, the FMP has several roles in Sweden. As a regulative instrument, the FMP operationalises legislation such as compulsory forest management requirements. As an economic instrument, the FMP is a prerequisite for obtaining subsidies, certification premiums, or tax deductions. As an informational instrument, the FMP generates information about forest resources for public authorities. Finally, the FMP encourages forest owners to pursue forest management practices that are perceived as desirable. (Brukas &

Sallnäs, 2012:606). In this way, the FMP balances policy objectives with the forest owner's needs and interests.

Although the FMP is a voluntary instrument, the certification schemes have promoted the mandatory use of a Green Forest Management Plan (GFMP) in case the forest owners want their estate to be certified. A GFMP is basically a standard FMP that is supplemented with classified management goals for the forested area of an estate. The goals are divided into four classes of a production-conservation gradient, ranging from wood production (with some general nature conservation considerations) to "setting aside" solely for nature conservation (Brukas & Sallnäs, 2012).

The forest management has become more and more professionalised, connected to the increasing trend of non-residential forest ownership and subsistence from sources other than forest holdings (Karlsson, 2008). Usually, the forest owners hire entrepreneurs to conduct their forest management activities, such as managing larger plantations, scarification, thinnings, and final fellings (Lidestav & Nordfjell, 2005). This strategy is also used by most forest companies that do not themselves operate the machinery necessary for such activities. About two-thirds of the Swedish private forest owners carry out self-employed work on their holdings (Lindroos *et al.*, 2005), focusing on minor forestry operations such as planting and cleaning.

Increasingly, forest owners also use services to order FMPs, often through the forest owner associations. The professional forest planners act as both experts and advisors. Their education is to a certain degree rather uniform; often the planners give advice according to the Swedish Forestry Model and the traditional monoculture approach to silviculture, but they also form their strategies based on their individual perceptions, interests, and skills. The effects of this phenomenon on a landscape level are discussed below and in Paper IV. Irrespective of whether their routines are homogenous or heterogeneous, the planners have a comprehensive and functional knowledge that provides a link between forest policy and forest owners (Brukas & Sallnäs, 2012). In addition, forestry advisors, contractors, and timber buyers also influence how forest owners make management decisions, however being less attended to in research studies (Holmgren, 2015).

3.5.2 The connection between NIPF owners and forest companies

Even though this thesis focuses on NIPF owners, it is relevant to say something about the forest companies from a landscape perspective; after all they own 40% of the productive forest land in Sweden. The large, diverse, and heterogeneous structure of the NIPF owners could be expected to result in diverse and heterogeneous forest management objectives, and subsequently

landscape character (Hengeveld *et al.*, 2015; Holmgren, 2015). However, according to the Swedish Forestry Model and tradition, the NIPF owners have been closely integrated with the industrial sector and the global market. The State has advocated for an economically sustainable forestry sector with maintained competitive position as a major objective, which subsequently has influenced the forestry conditions and forest policy. The small-scale private forestry has been commercially incorporated with industrial forestry business logic and as a common forestry sector, not least through the forest ownership associations (Alarcón Ferrari, 2015; Törnqvist, 1995). The corporatist structures have implied mutual dependence between the State (through the Swedish Forest Agency), the forest owners and the companies (Holmgren, 2015). This relationship has largely been facilitated by a common perception of knowledge, scientific methods and expertise, as well as a shared language, in the rather homogenous assembly of actors in the forest sector (Holmgren, 2015; Törnqvist, 1995), indicating a streamlined forest management tradition.

The freedom with responsibility-paradigm has become a fundamental officially articulated principle representing the interests of both forest owners and companies (Alarcón Ferrari, 2015). However, the introduction of the paradigm also entailed soft law, less detail-regulated, and hence less clarified, state governance, by mainly using "sermons" rather than "sticks" to implement forest policy objectives (Brukas & Sallnäs, 2013). The concrete governance is performed through the willingness (*frivilligheten*) of the forest owners (Appelstrand, 2007). The forest owners are expected to consider and take responsibility for multiple values and interests in the sake of society; at the same time as acknowledging their own management objectives and the market conditions. They are supposed to make profit and dispense with the same by enhancing nature protection or recreation values at the same time. The absence of policy measures and the double message that lies within the freedom-with-responsibility-paradigm makes the situation for the forest owner confusing and complex. There is a tendency that forest owners withdraw from taking responsibility and as a result forest management has become less diverse and governance less heterogeneous and transparent; consequences that were unexpected and not desired (Holmgren, 2015).

Forest management planning is implemented in a standardised manner by both NIPF owners and forest companies, with the main difference that the company ownership is continuously changed through the sale of shares and emissions, as well as differing scale and planning time horizons. The forest management objectives as expressed in the FMP and in the planning of the forest companies are however rather similar, since the established system of estate and cutting classifications (*huggningsklasser*) are used by all and

conveys a logic that is acknowledged by forest owners in general (Alarcón Ferrari, 2015). By using the same system, it is therefore assumed that the NIPF owners share and legitimise the objectives of the State and the companies to maintain a competitive Swedish forestry sector; this has at least for long been the case. This consensus view has facilitated knowledge production, norms and transmission within the sector in a cost efficient way (Törnkvist, 1995). Relating to the insight of my interview participants, it is clear that they understand these premises, the market demand for profitability, at the same time as they increasingly acknowledge the need for considerations to multiple values and functions of the forested landscape.

What appears challenging for integrated landscape planning is however not to involve representatives of the rather few, large forest companies, but to include the spread of independent and, to a large extent, uncoordinated NIPF individuals. Naturally, it is more challenging to coordinate thousands of small-scale owners, than representatives for a couple of forest companies, in the same landscape. In addition, a difference between company owners and NIPF owners of high relevance for rural development and social cohesion is the local connection between the (resident) NIPF owner and his/her land and living environment, in contrast to the costumers and owners of the forest company. The NIPF owners are to a larger extent locally legitimised for taking sustainable considerations for future generations than the companies, whose main objective is sustained revenue.

From an integrated landscape planning perspective, there are at present no existing forums where forest owners discuss the management of the larger forest landscape, exceeding estate borders – neither within the NIPF owner group, nor between NIPF owners and companies. As will be shown in the following chapter, all values, sectors, and actors contribute to create connectivity in the landscape as important pieces of the whole system.

4 Integrated landscape planning

The challenges of the Swedish sectorial governance system and of the heterogeneous forest ownership structure, combined with the need for cross-sectorial planning and management that addresses the sustainable use of multiple forest values, call for the need of a landscape approach – the subject of this chapter.

In Sweden, forest planning by NIPF owners usually addresses planning at the stand and estate level. The forest companies may be said to conduct landscape planning, as their estates are larger and often spatially connected. The high number of forest estates with a diverse set of owners and management objectives could be assumed to result in a heterogeneous landscape character (Hengeveld *et al.*, 2015). However, as previously discussed in chapter 3, the forest management consultation procedures are rather streamlined in Sweden, advocating the Swedish Forestry Model with a focus on wood production and even-aged silviculture in combination with nature conservation. Forest management plans are generally not communicated between neighbouring landowners (Angelstam *et al.*, 2015)

I will start by sharing different aspects of what the landscape concept may include that I find compelling, comprehensive, and easy to grasp. This overview is followed by arguments for how the landscape approach could improve forest planning because of its multifunctional, cross-sectorial, transdisciplinary, and sustainability oriented character.

4.1 Understanding landscape concepts

Researchers, planners, policy makers, practitioners, and other people often have different perceptions of what is meant by the term landscape. There are many definitions of landscape concepts, since the landscape way of thinking has emerged within a variety of initiatives and scientific disciplines without

any interaction in between them really. For example, ecologists analyse patterns of species' habitat on land-water scales, historical geography studies long-term changes to map and understand the development of spatial patterns and functions, the psychological, humanistic and semiotic approaches are interested in the perception, behaviour, well-being, and existential meaning of landscape concepts, whereas landscape architecture focuses on visual and physical surroundings in spatial planning (Antrop, 2006; MacFarlane, 2007; Selman, 2012). Historically, art and cultures have shaped the perception of landscape as a visual entity, object, and environment of rural idylls in paintings, gardens, and poems (Wylie, 2007). The different understandings of landscape have developed and advanced in response to each other (Butler, 2014). Ultimately, the landscape approach aims to understand and recognise the interconnections between various land uses and users by integrating them in a joint management process (Helming & Wiggering, 2003).

Several attempts have been made to categorise landscape concepts and perceptions. Jones and Stenseke (2011) describe landscapes as *morphology* relating to physical surroundings where a distinction is made between natural and cultural forms of the landscape, studied from natural science and humanities or social science perspectives respectively. Landscapes as *scenery* refer to visual aspects of an area, including experiences, emotions, arts, and social constructions. The earliest use of the term "landscape" considers the juridical aspect; landscape as *polity* of historical administrative-territorial units that were shaped through customs and laws. In Sweden, we also have the old and formal administrative term *landskap*, which still relates to regional identity.

According to the European Landscape Convention (ELC), landscape is ''an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'' (Council of Europe, 2000, chap. 1, art. 1). In this way, landscape is conceived as more than an area; it also expresses the perceptions of an area that people share, value, and use. The ELC defines the landscape as an object composed of both natural and cultural factors (Sarlöv Herlin, 2007; Butler, 2014). That is, the landscape is seen to be shaped by tangible and intangible social and cultural practices (Olwig, 2007).

Butler (2014) specifies landscape categories related to *form*, *relationships* and *practice*. The physical influences − such as geology, topography, and hydrology − are aspects of form. Ecological influences concern present species and habitats in the landscape − i.e., both form and relationships. The study of human influences and cultural development of the area describes both form and practice. Finally, the sense of place and the uniqueness of a certain landscape consider form, relationships and practice.

Lastly, like Angelstam et al. (2013), I find it helpful to interpret and organise landscape concepts into four themes: biophysical, anthropogenic, intangible, and social-ecological (Table 1). The fourth integrates the other three in a transdisciplinary manor. The authors emphasise the importance of context to explain the variety of different concepts.

Table 1. *Typology of four landscape concepts and their interpretations as sub-groups, adopted from Angelstam et al (2013:131).*

Landscape concept	**Type of interpretation**
Biophysical interpretations Landscape as purely natural phenomenon	Territorial complex composed of of natural components (rocks, soils, vegetation, etc.) Area organised in a system by biophysical patterns and processes Area preserved in its pristine natural image (Wilderness and naturalness)
Anthropogenic interpretations Landscape as nature with human artifacts	Spatial system composed of nautral and anthropogenic elements Space with specific interactions between human culture and nautral environment An area phsycially perceived as spatial integrity
Intangible interpretations Landscape as cognitive representation of a space, socio-economic interpretations and landscape as socially organised space	Visual image of an area Mental image of a space Landscape as composition of places bearing moral and ethical values Landscape as an area specific with its economical and social functions Landscape as place for humans, arena where their behaviour is taking place Landscape as esthetically organised space, an area giving esthetic satsifaction
Coupled social-ecological interpretation Landscape as totality including both material natural and cultural dimensions, and spritual phenomena	Total system including both tangible and intangible elements

Understanding these different definitions and perceptions of the landscape is important in order to manage intended or unintended changes in structures and functions (Termorshuizen & Opdam, 2009; Clementsen & Schibbye, 2016). If people define the concept differently, they risk misunderstanding and

miscommunicating with each other (Esselin, 2014). To achieve a common approach, perhaps through collaborative planning, people need to speak the same language when trying to understand each other's perspectives and perceptions.

4.1.1 Multifunctionality

According to Selman (2012), landscape has gradually been accepted as an integrative concept, delivering sustainable and multifunctional services, both on a regional and a local scale. The landscape can be regarded as a multifunctional entity. Ultimately, integrated landscape planning is about multifunctionality, and this planning must include multiple demands and landscape functions simultaneously over space and time (Helming & Wiggering, 2003). In other words, effective landscape management considers different land uses for the same landscape unit (Brandt & Vejre, 2004). Some landscape functions may be spatially and temporally segregated, whereas other co-exist at the same location at the same time, being synergetic or conflicting (Bolliger *et al.,* 2010). In a time horizon, the interaction between existing and potential uses and users is explored with consideration to site-specific and contextual factors (Gallent *et al.,* 2004; MacFarlane, 2007).

The multifunctional view of landscape incorporates both natural and cultural aspects − i.e., as spatial human-ecological systems − that delivers a wide range of functions that are or can be valued by humans because of economic, sociocultural, and ecological reasons (de Groot, 2006; Termorshuizen & Opdam, 2009). All terrestrial and aquatic biophysical components of the landscape are included as well as interaction by people and institutions (Svensson *et al.,* 2012). Multifunctional landscapes are considered to be more resilient to change and adaptable to future shocks even when interconnections between natural and social systems are disrupted (Selman, 2012). It is important to understand the dynamics of how multifunctionality is affected and how different landscape users act and react. With such knowledge, it is possible to develop visions, evaluate possibilities, and define priorities (Pinto-Correia *et al.,* 2006).

Increasingly, the multiple values in a landscape are described in terms of ecosystem services (ES), which refer to interactions between human well-being and different values and functions in an ecosystem, by providing benefits directly or indirectly (de Groot *et al.,* 2010; MEA, 2005; Potschin *et al.,* 2016). The ES concept can be a common discussion base for stakeholder groups in order to facilitate the understanding of how management decisions influence different services and users. In paper II, we used a selection of ES as output data in the quantitative scenario models for the forest landscape in Vilhelmina.

4.2 Human relations to and perceptions of the landscape

As I also experienced when interviewing people in Vilhelmina, Johansson (2002) found that people's daily lives are influenced by their close relationship with the forested landscape, a relationship constantly created and recreated through their experiences and actions. It is indeed difficult to separate the physical and the emotional relationship to the landscape. The landscape is not only impacted by both certain natural conditions but also by anthropocentric actions in time and space, depending on varying forms of resource utility, economic strategies, knowledge, norms, and attitudes. People relate to and perceive landscape values differently, depending on their age, economic positions, gender, and life conditions (Johansson, 2002). Wylie (2003) also describes how the landscape can be defined as a way of seeing, although Wylie argues that it is not only *what* we see but also *how* we see, an activity informed by world views, cultural discourses, attitudes, ideologies, and expectations. Hence landscape is a social construction: the visible and perceived product of the interaction between a society and its environment at a given time in history (Guisepelli & Fleury, 2008).

Smith et al. (2011) studied the relationship between place meanings and natural resource management in rural areas where the natural resource base was central to people's surroundings and economy. They considered seven aspects of place: individual identity, family identity, self-efficacy, self-expression, community identity, economy, and ecological integrity. They concluded that management objectives may reinforce people's sense of place, feelings of community, and local pride. The engagement through different forms of participation and social interaction with the common landscape is therefore linked to social capital (Selman, 2012). In this sense, the social reconnection with the landscape can motivate people to enhance sustainability and resilience values (ibid).

Based on these insights, the ELC argues that the people whose daily practices and perceptions shape the social and physical landscape (i.e., not primarily experts) should be the ones responsible for planning and developing the landscape (Jones *et al.*, 2007; Olwig, 2007). However, the convention does not outline how this public involvement should be undertaken (Butler, 2014). It is seen that such operational procedures need to fit within the existing legal and policy framework of the signatory nation, being adaptable to particular types of landscapes at local level. A few European countries have defined landscape in the Planning and Building legislation, to develop a comprehensive landscape policy (Clementsen & Schibbye, 2016). Sweden ratified the ELC in 2010, but its legislative implementation is still being debated. Its general aims can be said

to be included in the Environmental Act, although opponents argue that a jurisdictional protection for landscape values is missing in Swedish legislation (Esselin, 2014).

4.3 Arguments for cross-sectorial landscape planning

Since the natural and cultural values are integrated in a landscape, making plans in separate sectors seems inappropriate (Berkes *et al.,* 2002; Kleinschmit *et al.,* 2012; Angelstam *et al.,* 2013*).* Traditionally, natural and cultural values have been looked upon as separate sectors in rural planning, partly because they have mainly been studied by different disciplines without any common platform of training or methodology (Fry, 2001; Esselin, 2014). The sectors were historically confined by economic activity, professional communities, geographic boundaries, and government structures (Holmgren, 2013). In Sweden, the roles of and responsibilities of different authorities are sometimes unclear, often overlapping. Inevitably, multiple sector demands on land use often result in conflicts, which are not facilitated by the fact that different sectors define the landscape concept differently and the missing holistic overview on national and regional levels (Esselin, 2014). These conflicts call for an efficient regional negotiation process that represent multiple sectors, governance levels, and participants with diverse interests and knowledge backgrounds (Helming & Wiggering, 2003).

4.4 How to achieve integrated landscape planning

In summary, the main benefits of using a landscape approach are it's spatially explicitness on the local scale, its potential integration across disciplinary boundaries, and its suitability for collaborative decision-making (Helming & Wiggering, 2003; Termorshuizen & Opdam, 2009). When multiple actors unite to collectively explore and develop understanding for and knowledge of the dynamic of social-ecological systems, democracy values, trade-offs, and conflict solutions are enhanced (Esselin, 2014; Jørgensen *et al.,* 2016). Finding solutions requires collaborative decision making, adequate representation of interests that need to be addressed in the landscape, and institutions that go beyond sectoral interests (Chavez-Taur & Zagt, 2014). Increasingly, transdisciplinary approaches are being advocated, involving academic researchers from different disciplines and non-academic participants, such as policy makers, agencies, and interests groups to jointly work together (Tress *et al.,* 2006). Albert and Vargas-Moreno (2011) argue that this should "not be

perceived as a partial byproduct of landscape studies, but rather a desirable and necessary condition to achieve and pursue the continuous negotiations between socio-economic and political interests and the long-term benefits of sustained provisions of ecosystem goods and services at the landscape scale" (2011:6). The level of transdisciplinarity has become a key indicator of rigorous sustainability planning (Ahern, 2006).

To perform, adapt, and implement this approach is however challenging (Pinto-Correia et al., 2006). Multifunctionality has to be planned in order to happen, by acknowledging site-specific and contextual factors (Helming & Wiggering, 2003; MacFarlane, 2007). Models and working routines for constructive collaboration must be developed to achieve common understanding and interaction between authorities, sectors, and competences in research, planning, and decision making. Forestry has to integrate with the whole landscape as a new context for forest policy (Ambrose-Oji *et al.,* 2011). Measures and incentives must be available and exercised on the local scale. Moreover, implementing multifunctionality requires constructive, feasible tools and proven participatory methods that allow people to express their opinions, construct their own understanding, and communicate this understanding with others (Stenseke & Jones, 2011).

In paper IV, we suggest three tools for implementing integrated landscape planning: the broker, the arena, and the tool. We suggest the need for a landscape broker to facilitate collaboration processes between stakeholders, preferably through the Model Forest arena. We also see potential in developing the FMP into a multifunctional landscape planning tool, that can enhance the collaborative dimension by leverage different perspectives and problem representations among the involved stakeholders.

5 Future studies

This chapter aims at providing a theoretical introduction and description of the field of future studies and scenario analysis, framing the methodological context for the studies of this thesis. I will describe how the discipline has evolved, the purpose of scenario development in a policy context, and how it has been used in various studies. In addition, I will also provide an overview of several types of scenarios from both a qualitative and quantitative perspective, which are often combined in a mixed-methods approach (described more in chapter 6) as well as with the possibilities and constraints of participatory scenario analysis processes.

5.1 Introduction to the field of future studies

The activity of studying the future has engaged humans throughout history in various forms. Modern systematic future research evolved during the aftermath of World War II and through the progress of industrialisation (Rounsevell & Metzger, 2010; Westholm, 2015). Since then, diverse methodologies and methods have been applied and developed within military planning (Kahn & Wiener, 1967) as well as in public policy and business, aiming to improve prediction tools. The environmental debates during the 1960s and 1970s emphasised that the future of the natural world's sustainability can and must be consciously influenced through democratic processes. During the 1990s, the focus on future studies shifted towards preparation for unexpected developments and the management of risks and uncertainty as well as trade-off analysis, for example, regarding future energy use and climate change (Henrichs *et al.*, 2010; Westholm, 2015).

Several terms can be used to describe the study of future activities, for example, foresight, future studies, strategic planning approaches, visioning, forecasting, scenario modelling, and trend analysis (Pelli, 2008). Here, I will focus on the academic tradition and the field of *future studies*, a concept

developed by French and Norwegian academic communities in the mid-1960s. The concept originated as a critical response to the forecasting field developed in the US after World War II (Dannemand Andersen & Rasmussen, 2014).

5.2 Scenario analysis

Scenario analysis can be seen as a structured, systematic method for exploring how the future might unfold (O'Brien, 2004; Shearer, 2005; Börjeson *et al.*, 2006). The aim is to anticipate possible consequences of how long-term developments either prevent, prepare, or benefit from future changes (Henrichs *et al.*, 2010). By reflecting on possible implications of alternative decisions in a certain context, awareness for uncertainties and complexities can be raised (ibid). Usually, creative methods are used to activate the imagination and reflection beyond the existing state and the conventional ways of understanding an issue (Shearer, 2005; Höjer *et al.*, 2012), an activity that distances oneself sufficiently from the present (Andreescu *et al.*, 2013). Scenario development can help people think about realistic future conditions that may vary from present circumstances. Such an open mindedness abandons scepticism and accepts the possibility that a scenario could happen – this acceptance can be called "suspending disbelief" (Frittaion *et al.*, 2011).

The scenarios build on a synthesis of how a system is structured and what constitutes major drivers of change. The driving factors can be of social, technological, economic, environmental, and political (so-called STEEP categories) or they can be direct or indirect factors or they can reflect the possibilities of control through endogenous (in one's control) or exogenous factors (out of one's control) (Walz *et al.*, 2007; Henrichs *et al.*, 2010). Scenarios are flexible products that can incorporate a rich set of complex information from a variety of disciplines (Kok *et al.*, 2007). Scenarios can help describe socio-ecological change in a way that can be understood by stakeholders from a variety of backgrounds (Celino & Concilio, 2010; Reed *et al.*, 2013).

Unlike forecasts, which aim to identify the most likely pathway, scenarios create several unvalued options on futures regardless of how likely they will occur (Pillkahn, 2008; Henrichs *et al.*, 2010). The objective is not to illustrate the most realistic situation or discover a pre-existing future, but to explore multiple plausible future situations rather than one outcome (Cuhls, 2003; Biggs *et al.*, 2007; Westholm, 2015). Scenario development helps stakeholders identify where they undervalue or underestimate uncertainties, deny evidence that does not support their view, over-estimate the quality of their judgements,

and over-estimate the probability of desirable events (Shoemaker, 1993; Wollenberg *et al.,* 2000).

As an analytical and interactive process, scenario analysis can help stimulating discussion and creative thinking, challenging prevailing world-views, providing better policy or decision support, stimulating engagement in the process of change (Henrichs *et al.,* 2010). Most scenarios are developed to aid stakeholders to develop effective policies (Wollenberg *et al.,* 2000), but scenario analysis can also support scientific exploration and research or serve as a collaborative education exercise to encourage learning (Henrichs *et al.,* 2010). The scenarios can study changing patterns of societal behaviour and human values, cultures, interests, and power structures. When applied to planning processes, scenarios provide a way to analyse policy implications. Such an analysis encourages discussions about ongoing restructuring and its consequences, resulting in more appropriate, flexible, and robust policies (Cuhls, 2003; Shearer, 2005; Alcamo, 2008; Celino & Concilio, 2010).

5.3 Qualitative and quantitative scenario methods

Future studies cover a broad range of methods and techniques involving varying degrees of expertise, creativity, and interaction (De Smedt, 2013). The choice of methods depends on the context of the scenario and the goal of the process. Often, scenarios are constructed using both qualitative and quantitative models and information on present and past conditions (Shearer, 2005; Biggs *et al.,* 2007; Van Berkel *et al.,* 2011; Amer *et al.,* 2013). In general, qualitative methods can be narrative descriptions such as phrases, stories, and images, whereas quantitative methods are numerical estimates often represented in tables, graphs, maps, and output of simulation modelling tools (Henrichs *et al.,* 2010). Qualitative scenarios are often more flexible to work with, as they do not depend on data availability or computing limitations (Kok & van Delden, 2009). In turn, models can enrich qualitative scenarios by showing trends and dynamics in another way than a storyline may provide. Qualitative and quantitative methods can interact and strengthen each other when used together: the model can adjust to the storyline or the storyline can adjust to the model to improve consistency of the two types of information (Amer *et al.,* 2013).

Usually, the optimal set of scenarios includes three to five scenarios that differ from each other in a relevant and accessible way. This approach ensures effective decision-making and strategic planning (O'Brien, 2004; Pillkahn, 2008; Henrichs *et al.*, 2010). These are defined within spatial (from global to local) and temporal boundaries in a certain biophysical, socio-economic, and

political context. The time horizon of 30 years is considered appropriate in land use planning (van Notten *et al.*, 2003; Henrichs *et al.*, 2010).

Paper I describes in detail the procedure of scenario development that we conducted within the INTEGRAL project. But there are several other ways to create scenarios. Scenario construction processes are thoroughly described by Shoemaker (1993), O'Brien (2004), Kok *et al.* (2007), Evans *et al.* (2008), and Henrichs *et al.* (2010).

Henrichs et al. (2010) describe four main steps in the scenario development process: (1) identifying a focal issue or main concern; (2) identifying main drivers and uncertainties; (3) developing storylines and, optionally, quantifying assumptions; and (4) analysing the implications of the scenarios. This last evaluation step is essential when scenarios are used in decision-making processes (Wollenberg *et al.*, 2000; O'Brien, 2004). A number of studies describe useful criteria for evaluating scenarios (e.g. Wollenberg *et al.*, 2000; Xiang & Clarke, 2003; O'Brien, 2004; Henrichs *et al.*, 2010; Reed *et al.*, 2013). Some of these criteria address how to assess the relevance of a scenario, some address credibility issues (the quality of the scenario and the methods used), and some address legitimacy (exclusivity and biasness of a scenario). Furthermore, it is important that scenarios are consistent, coherent, and plausible for them to be useful in planning and decision-making (Henrichs *et al.*, 2010). Consistency means that the scenarios share the main assumptions, driving forces, and trends (i.e., scenarios are addressing the same issues in the same manner and therefore are generalizable); however, the scenarios may play out differently depending on scenario implications. Coherency assures that the scenarios match and follow the same scenario logics across scales. Plausibility concerns how reasonable a certain development is.

Scenario analysis has been used in a range of processes connected to natural resource management, environmental assessment, and ecosystem service management (MEA, 2005; Henrichs *et al.*, 2010; Westholm, 2015). More specifically, several scenario analysis studies have examined rural development and multifunctional land use management in forest and mountain regions in Europe (Walz *et al.*, 2007; Soliva *et al.*, 2008; Volkery *et al.*, 2008; Carvalho-Ribeiro *et al.*, 2010; Morris *et al.*, 2011; Palomo *et al.*, 2011; Van Berkel *et al.*, 2011; Reed *et al.*, 2013). These studies combine different types of scenarios, integrating both qualitative and quantitative methods as well as both scientific and local stakeholder knowledge.

5.4 Types of scenarios

There are different types of scenarios: *explorative* scenarios, examining "what could happen"; *normative* scenarios, examining "what ideally should happen"; and *predictive* scenarios, examining "what is likely to happen" under certain circumstances (Börjeson *et al.*, 2006). The studies in this thesis use explorative and normative scenarios that combine both qualitative and quantitative methods (see Paper I, II, and III).

Explorative scenarios investigate how the future might develop under different assumptions and what consequences and changes alternative developments might bring when key factors interact in different ways (Börjeson *et al.*, 2006; Biggs *et al.*, 2007). Hence, explorative scenarios study possible outcomes, aiming to help people prepare for change or learn how their system works and might respond to changes, a useful type of thinking in strategic planning (Börjeson *et al.*, 2006).

Normative scenarios focus on investigating desirable futures and how specific goals can be reached (Nassauer & Corry, 2004; Shearer, 2005; Börjeson *et al.*, 2006; Rounsevell & Metzger, 2010). Exploring the desired future helps participants change focus and gives them distance from current conflicts and concerns (Carlsson-Kanyama *et al.*, 2008; Andreescu *et al.*, 2013; Saritas *et al.*, 2013; Hansen *et al.*, 2016).

Therefore, exploring desirability and feasibility of alternative futures includes policy choices in the analysis (Robinson, 2003). A desired future end-point or a set of goals is formulated for a time between 25 and 50 years in the future. By working backwards from that end-point, the feasibility and consequences of reaching the goal can be examined and drivers of change and potential policy measures can be suggested (Robinson, 2003; Höjer *et al.*, 2012). However, even though a desired scenario is constructed in consensus, it only becomes normative if it is put forth as a goal for action (and sometimes also as a path to that goal) (Andreescu *et al.*, 2013).

When describing normative future scenarios, it is relevant to mention backcasting. Developed by John Robinson in the 1970s, backcasting examines future options and policy choices, focusing on how desirable futures can be attained (Robinson, 2003). Backcasting scenarios start with a prescribed vision of the future and then work backwards to visualise how this future could emerge. This method is suitable when investigating what actions could lead to a specific end state (Alcamo, 2008). Forecasting and backcasting can preferably be combined in workshop situations (Kok *et al.*, 2011; Berkel & Verburg, 2012; Palacios-Agundez *et al.*, 2013), using explorative possible scenarios as starting points for discussions of desired futures.

5.4.1 Critical Utopian Action Research

Another kind of normative scenario construction, which was used in the study in Paper III, corresponding with the third phase of the research project, is Critical Utopian Action Research and Future Creative Workshops. Paper III gives a thorough description and evaluation of the research design and performance as well as a theoretical background. Here, I will highlight some main aspects of the CUAR methodology.

CUAR critiques existing conditions and creates utopian views about a desired future (Aagaard Nielsen & Nielsen, 2006). This methodology is highly inspired by the future creating workshops, initially developed by Jungk and Müllert (1984, 1987). The use of "Future Creating Workshops" develops desirable (normative) futures and identifies concrete ways for implementation by visualizing, brainstorming, and creativity-focused methods (Cuhls, 2003).

Generally, CUAR methodology aims to assist to critique present social and cultural orders to uncover new possibilities". The participants, usually citizens in a community, try to define how they would like to live in relation to a context, all being equal and taking part in the discussion in an open room without hierarchies or preconditions (Hansen, 2014, personal communication). Here, utopian ideas are thought of as a way to avoid making projections of existing conditions (Tofteng & Husted, 2011). The focus is on future images of people's aspirations, dreams, and visions, departing from criticism and experiences of subjective life contexts.

In this way, CUAR aims to get away from situations where the researchers create situations that only make sense because of the researchers' project or needs (Aagaard Nielsen & Nielsen, 2006). Within CUAR, it is the workshop participants and their collective knowledge and creativity that produce the ideas and future concepts (Drewes Nielsen *et al.*, 2004). Drewes-Nielsen et al. (2004) describes how workshops overcome the limitations of "desktop research" by addressing practical concerns. In addition, many participatory processes, in a heuristic fashion, ask people to express their opinions about pre-formed solutions instead of helping them develop their own ideas (Tippett *et al.*, 2007).

A shared future vision and commitment of action can help participants redefine problems and establish new policy networks. Visioning processes not only legitimize political action, but also help shape the stakeholders' perceptions of the urgency a scenario addresses (De Smedt, 2013). The dialogue processes can create trust, move borderlines between consensus and conflict, and increase the sense of commonly shared goals, which can make a

good platform for overcoming present conflicts and change the direction of action (Drewes Nielsen *et al.*, 2004).

In concrete terms, the "Future Creating Workshops" produce desirable visions through three phases. First, in the Critique Phase (CP), the participants are invited to critique the present situation. This phase is followed by the Utopian Phase (UP) where the desirable future for different aspects of the landscape is discussed. Finally, in the Realisation Phase (RP), the visions are made more concrete by discussing actions that are achievable, the desired future (Friedman, 2001; Drewes Nielsen, 2006) (Drewes Nielsen 2006, Friedman 2001). CP aims to let the participants vent their frustration, and then move away from that and focus on the future. The critique can also inspire ideas of what to change. The design of the UP helps the participants see beyond barriers, current possibilities, power relations, and law restrictions. After the brainstorming, a theme can be chosen to focus and deliberate on further during the rest of the day, or smaller groups can discuss one theme each. The theme is discussed constructively as a utopia until the RP starts, when implementation ideas are raised. RP formulates concrete actions needed to implement the utopia: Who will do what and when to reach the desired goal?

A general problem with the CUAR methodology is its ability to create system level change – the actual decision-making level, encompassing bureaucracies and politicians (Hansen, 2014, personal communication). Even if members of the system level are included in the process, they are seldom able to get acknowledgement for the resulting visions and actions when bringing them back to their own organisations. The ideas for change that are brought from the participatory exercises are often seen as alien and illegitimate as the preceding discussions often do not make sense to non-participants, a situation we experienced in our national workshop (see Paper III).

5.5 Participatory involvement in scenario analysis

There is a vast amount of literature concerning how participatory strategies can improve policy-making, decision-making, and planning processes in governance of natural resources in order to reach higher degrees of social sustainability (Buchy & Hoverman, 2000; Currie-Alder, 2003). Future studies often include stakeholders as key elements. This section will describe the benefits and challenges of participation, specifically as part of scenario analysis processes.

Naturally, people use, value, and shape the environment they live in, so they should be involved in scenario analysis as they are the ones who are affected, and eventually will implement ideas, work with conflict solving, or make

decisions (Patel *et al.*, 2007). Hansen et al. (2016) argue that participation can ensure better inclusion and integration of the existing values, experiences, and various types of knowledge in society. Local expert knowledge and experiences improve the quality of the information used for adaptation and decision-making, increasing its credibility and legitimacy (Appelstrand, 2002; Saritas *et al.*, 2013). In regional development research, scenario analysis has often been linked with participatory approaches as local actors usually have considerable knowledge and can thus provide information about how the region works (Patel *et al.*, 2007; Walz *et al.*, 2007), while also providing planners access to local knowledge that enables them to produce better plans (Reed *et al.*, 2013).

Scenarios can serve as a tool to establish and facilitate communication between people who do not understand each other, to comprehend the roots of conflicts, and to find creative shared solutions (Masini & Vasquez, 2000; Borch *et al.*, 2013). Scenarios stimulate a continuous conversation and deliberative engagement (Cuhls, 2003; Celino & Concilio, 2010). Through such sharing of knowledge and perspectives, scenarios can help participants visualise conflicts between goals and interests (Höjer *et al.*, 2012; Saritas *et al.*, 2013). Furthermore, scenarios can bridge gaps between scientific communities and governments, businesses, interest groups, or citizens, consequently improving relevance, usefulness, salience, credibility, and legitimacy of the scenarios, creating mutual understanding and learning, facilitating collaboration, consensus-building, and problem-solving (Mostert, 2003; Tippett *et al.*, 2007; Reed, 2008; Volkery *et al.*, 2008; Saritas *et al.*, 2013). The sharing and joint interpretation of information and perspectives not only builds trust and increase acceptance of planning decisions (Luz, 2000), but also develops the participant's sense of responsibility for implementation and ownership of the process (Keough & Blahna, 2006; Reed, 2008; Malinga *et al.*, 2013; Saritas *et al.*, 2013). The process is therefore as important as the end product and should be monitored and evaluated carefully to secure the objectives of social sustainability (Buchy & Hoverman, 2000; Cuhls, 2003; O'Brien, 2004).

5.5.1 Involving actors or stakeholders

Scenarios are especially suitable tools to use when many stakeholders with different backgrounds are involved as scenarios often do not require the participants to have advanced technical skills and they have a flexible format that can incorporate a variety of transdisciplinary input into the process (Bradfield *et al.*, 2005; Andreescu *et al.*, 2013).

Ideally, all relevant actors should be continually engaged in conversation, reflection, and action (Forester, 1999; Appelstrand, 2002; Henrichs *et al.*, 2010; Andreescu *et al.*, 2013). Carlsson-Kanyama *et al.* (2008) emphasise the importance of engaging participants with varied backgrounds, expertise, and values. The combination of different knowledge types from various disciplines is likely to result in more robust scenarios and deeper and more nuanced reflections (Nassauer & Corry, 2004; Reed, 2008; Khadka *et al.*, 2013). It is important to develop open-mindedness towards co-production of new knowledge (Masini & Vasquez, 2000; Wollenberg *et al.*, 2000; Biggs *et al.*, 2007) and combine both scientific and non-scientific knowledge with stakeholder values and preferences (Welp *et al.*, 2006; Reed *et al.*, 2013; Saritas *et al.*, 2013). Local knowledge can validate and deepen researchers' understanding of a system (Walz *et al.*, 2007). In turn, support from research and scientific exploration can help local communities better understand the interaction and linkages between key driving forces (Henrichs *et al.*, 2010). In Paper I, we conclude that the scenario development process can be used to combine both scientific and stakeholder knowledge.

The central issue is how to decide who participates in the process (Primmer & Kyllönen, 2006). It is necessary to secure the representation of relevant stakeholders in the process. Often, these processes involve participants by using stakeholder analysis (Boon, 2000; Bryson, 2004; Hermans & Thissen, 2009) with roots in strategic management (Freeman, 1984). Stakeholders may be individuals, informal groups, or well-established organisations, actors who own the problem or challenge and have a stake in the future (Primmer & Kyllönen, 2006; De Smedt, 2013). In comparison to the public or citizens, stakeholder participation refers more to organised groups (Mostert, 2003). Other actor analysis methods are social network analysis (Scott, 2000), cognitive mapping, and conflict analysis. The choice of actor analysis method requires understanding the method's different theoretical perspectives, characteristics, and potential use (Hermans & Thissen, 2009). Actor analysis should be transparent and accessible, so its accuracy can be assessed by a large group of people (ibid). Actor analysis investigates networks (stable patterns of social relations), perceptions (world-view, frames of reference), values (internal motivations of actors, norms, interests, and purposes), and resources, enabling actors to influence the world and other actors – i.e., things they can control.

When planning for a participatory scenario development process, it is important to consider the available time and resources, the degree of involvement, and the relevant participatory methods (Henrichs *et al.*, 2010; Reed *et al.*, 2013). It is important to clarify exactly how the input from the

participants will be incorporated in the process and whether the scenarios are can help identify or assess decision options (Wollenberg *et al.,* 2000). The comprehension of roles and responsibilities of scientists and participants must be secured before the process starts and continuously evaluated during its course (Volkery *et al.,* 2008; Khadka *et al.,* 2013; Mårald *et al.*, 2015). Also, it is important to have a plan for how the initiated visioning work can be incorporated and linked to planning processes in reality (ibid), establishing commitment among stakeholders and increasing the democratic processes (Borch *et al.,* 2013).

The scenario planning for a given landscape should include and respect different stakeholder groups; however, stakeholders do not need to participate in the whole scenario planning process (Wollenberg *et al.,* 2000) and the level of engagement varies considerably (Reed *et al.,* 2013). Not all participatory processes need to involve all stakeholder groups in the same venue at the same time; more thoughtful responses and constructive results may be obtained by granting equal access to each stakeholder group separately, organised by interests or geographical areas. Normally, stakeholders are involved in the first and the final stages of scenario development, concerning problem formulation, in the evaluation and selection of scenarios and when using the final outcome in decision-making and planning (Kok & van Delden, 2009; Reed *et al.*, 2013).

Volkery et al. (2008) describe different kinds of actor involvement. One can use a stakeholder panel that develops qualitative storylines based on discussions about driving factors. Alternatively, experts can form modelling groups in which qualitative information is translated into a quantitative model input for analysis. Stakeholders and experts can also join together in a common iterative process, combining qualitative storyline scenarios with quantitative simulations.

5.5.2 Constraints with participatory processes

Participatory processes are no guarantee for successful solutions; they are complex processes with their own limitations (Weiss *et al.,* 2002). An inclusive approach supports democracy, arguing that all who will be affected should have an equal chance to participate (Primmer & Kyllönen, 2006). But in practice, the greater the number and diversity of involved actors, the greater the challenge it is to achieve effective outcomes (Sandström, 2009). Involving participants demands large resources in time and funding to allow participants to get to know each other and develop mutual understanding and trust (Appelstrand, 2002; Shearer, 2005; Rickards *et al.*, 2014).

Another challenge is that stakeholders, who represent particular interest groups, may favour lobbying by strong private interests (Jones, 2016). Power

relations between actors with a strong voice and influence and groups who lack resources and networks determine the outcome and preconditions of participation (Beland Lindahl *et al.,* 2015).

Many natural resource management projects offer little transparency as to the constitution of stakeholders. When participation is defined from a governance perspective, it often becomes a matter of ensuring that the most influential stakeholders are somehow taken into account. In choice of actor analysis method, practical usability concerns often trump concerns related to analytic quality, which might in turn be costly. Therefore, stakeholder analysis is often used as it is rather easy to map stakeholders using common sense. However, this approach also brings analytical constraints such as difficulties revealing hidden agendas, hidden motivations, and informal power structures (Hermans & Thissen, 2009). Hansen et al. (2016) argue that stakeholder participation have reaches paradigm status when "it is difficult to legitimise a policy or plan today without dutiful adherence to the stakeholder model of governance" (2016:124). However, they see a risk of failure as such involvement does not fully include the multiple values, experiences, and knowledge of citizens' everyday lives, which a citizen-oriented approach would. Not all people are represented by those who are stakeholders, so processes based on stakeholder participation only reproduce the same problem of interest polarisation and privatisation of common issues, problems that are supposed to be overcome by public engagement and democracy (ibid). It is crucial to include those who normally are excluded or disempowered so they can openly challenge power inequalities that otherwise may be over-looked (Forester, 1999; Boon, 2000; Borrini-Feyerabend, 2004).

Furthermore, conflicts may evolve as different stakeholders may have incompatible aims and agendas (Cheng & Mattor, 2006; Jones, 2016), "defend[ing] their corner" (Kangas *et al.,* 2010) or "keep[ing] their cards in their own favour" (Stojanovska et al., 2014). Compromises may lead to sub-optimal solutions in which individual expectations are not fulfilled (Sipila & Tyrvainen, 2005; Jones, 2016). Appelstrand (2002) argues that the achievement of unanimity in a participatory process does not necessarily have to be the optimal solution, but rather should find a balanced agreement that is at least acceptable to the parties concerned.

Cheng and Mattor (2006) identified several perceptions that may constrain the participatory process: the perceived costs of participating may outweigh the perceived benefits; the perception of fairness, which highly influences the trust in the process; the perception of one's own capacity and effectiveness to participate and influence decisions; and the perception of other participant's goals, motivations, and behaviours. To achieve a co-constructive process

therefore demands a readiness for deliberation and active participation by stakeholders and institutions (Hansen *et al.,* 2016).

Another common problem in participatory processes is the risk of "consultation fatigue", which occurs when stakeholders are often asked to (voluntarily) take part in processes that are not always run well or when they perceive that their involvement will provide them little reward or capacity to influence outcomes (Wondolleck & Yaffee, 2000; Appelstrand, 2002; Tippett *et al.,* 2007; Reed, 2008).

A weakness with participatory scenario thinking is that people tend to have difficulty imagining the future as more than an extension of the present (Shearer, 2005), being too conservative rather than imaginative (Rickards *et al.*, 2014). Another possible constraint in visioning work to consider is that people's values and preferences change over time, adding additional complexity to future use of the common vision (Celio *et al.,* 2015). On the other hand, ongoing and potential conflicts can be resolved or avoided pro-actively in both short-term and long-term issues, which increases efficiency and saves time (Appelstrand, 2002).

6 Research design

"Method is like a glove which needs the human hand to give it shape and meaning".
(Kushner, 2002:252)

Three of the papers in this thesis (I-III) have a methodological focus, examining how various techniques of scenario analysis can be used to support participatory forest planning. The research design was developed in the European research project INTEGRAL, which will be introduced in this chapter, followed by an introduction to the mixed-methods approach, which has been central. Thereupon, I will lift some arguments for the value of researching case studies from a bottom-up perspective. In connection to that, I will briefly introduce the participatory methodology of Action Research, which was used in Paper III. I will also argue for the importance of combining scientific and practitioner knowledge. The chapter will end with an overview of the research design for all papers and the thesis, and a description of the method of the interview study, which built the basis for the scenario development and was used as empirical material in Paper IV. The scenario development methods and the resulting scenarios are presented in chapter 8.

6.1 INTEGRAL – a European research project

This research has been conducted as part of the European Union funded project INTEGRAL. The project, ongoing between 2011 and 2015, aimed at developing new policy and planning strategies towards a sustainable and integrative forest management of European forest landscapes. In total, 20 case study areas within ten different European countries were involved, representing diverse ecological, socio-economic, political, and cultural circumstances: Sweden, Lithuania, Germany, Slovakia, Bulgaria, Italy, France, Portugal, The

Netherlands, and Ireland (Figure 3). In Sweden, two case study areas were selected: Vilhelmina municipality in northern Sweden and the Helgeå river catchment area in southern Sweden. The project delivered cross-case comparative analyses and EU level syntheses and studies by conducting research based on interdisciplinary and transdisciplinary methods of, for example, qualitative foresight studies, forest modelling, and footprint analysis.

The INTEGRAL project aimed to identify and investigate policy and management responses that could help anticipate and prepare for the uncertain and complex future challenges of integrating sustainable forest management with societal demands (Sotirov *et al.,* 2015). By involving ten countries, the project aimed to illustrate the consequences that forest policy decisions on an EU level may have in these different diverse and heterogeneous local landscapes around Europe.

INTEGRAL was carried out in three interconnected research phases and on two levels. The first phase focused on mapping key socio-ecological drivers and barriers influencing the local forested landscape. The second phase included explorative development and participatory evaluation of future scenarios of forest management. The third phase aimed at creating a desirable scenario and identifying policy measures and forest management strategies that could help achieve the desired, and avoid undesired, provisions of forest ecosystem services in the future.

The methodology on which this thesis is mainly based was developed by the research team at INTEGRAL. The experiences and implications following from this are presented in the Discussion chapter as well as in the Epilogue.

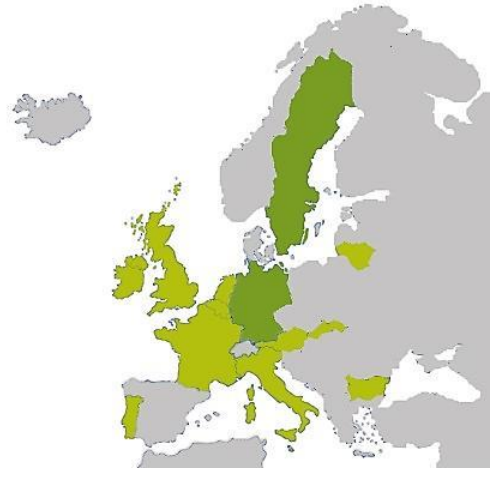

Figure 4. The particpating countries in the INTEGRAL project.

6.2 Mixed-methods approach

The research in INTEGRAL and the work in this thesis are based on a mixed methods approach. When using a mixed methods approach, the researcher combines many approaches to collecting, analysing, and integrating both quantitative and qualitative data to provide the best understanding of a research problem (Creswell, 2009; Hesse-Biber, 2010). A wide range of methods can be used, such as participant observation, interviews, surveys, GIS, remote sensing, statistics, and computation (Cheong *et al.,* 2012). Unlike the use of one method for modelling and analysis, the combination of multiple methods can help researchers compare, triangulate, and generate a more comprehensive picture of an issue (ibid).

Quantitative information is amenable to testing the reliability and validity of statistical analyses and standardised tests, whereas qualitative data adds an in-depth understanding of research results and allows the researcher to explore divergences or subgroups within the data. Working with both methods allows researchers to cross-check their research results (Hesse-Biber, 2010). The procedure can be sequential, exploring a phenomenon or concept on an individual level with a qualitative method, which is then followed by a quantitative method to generalise results to, e.g., a population, providing both a detailed view and a generalisation of the findings. Similarly, using a quantitative method as an initial test of theories and concepts can be followed by a qualitative method to explore a few cases or individuals in detail.

The final results present both qualitative and quantitative information. Data are nested concurrently together to provide a comprehensive analysis and capture the complex human–environment interactions and support integrative multidisciplinary research efforts across varying spatial and temporal scales (Creswell, 2009). This mixed-methods approach shares similarities with the practice-based approach, where researchers actively produce and interpret quantitative and qualitative findings (Arts *et al.,* 2013). There are also connections with grounded theory. Grounded theory is an interactive and open-ended approach where researchers are regarded as part of what they study, not separate from what they study (Charmaz, 2006).

Scenario development studies often use mixed methods, integrating qualitative and quantitative information to develop process-based knowledge of land use dynamics to be used in modelling and scenarios (Cuhls, 2003; Cheong *et al.,* 2012). The interpretation of qualitative information often requires a holistic and nuanced understanding of the human systems. Cheong et al. (2012) argue that it is important to understand that the qualitative parts are not expected to adequately represent human processes, so storylines are effective ways to represent and integrate human perceptions into a model

application, without reducing the elaborated qualitative data to a quantified model input. Creating a strong overlap between stories (focusing on social and institutional change) and diagnostic models (describing biophysical and economic change) is a key challenge in scenario development. Furthermore, scenario methods can include involvement of actors in discussion of the socio-economic context, linking this information to quantitative data and models, providing quantitative, spatially explicit information on current and future patterns of land use (ibid).

6.3 Case study approach

No practice is similar to another, but is situated in particular contexts (Rönnerman, 2004). To involve participants in scenario creation, where they are asked to share their view on possible and desirable futures of their local landscape, does in itself entail context-dependency in contrast to generalisation oriented research. The task inevitably implies a bottom-up approach and a study of a specific case *per se*. This section will not give an overview of what case study research could include, but will argue for the application of case study based research and action-oriented research that was used in this project. I deliberate on the value of local and practitioner's knowledge and on the value of researching case studies from a bottom-up perspective, as an empowerment and confirmative validation of social science.

There is a contested tension between the personal daily life understandings of the world versus the scientific understanding; the latter is supposed to be more correct and universal based on replicable laws and theories of identified patterns (Vygotskij & Öberg Lindsten, 2001). The knowledge of local practitioners does not have the same status as the knowledge produced through rigorous protocols and production of evidence in the scientific community (Luginbühl, 2008). There is an unspoken hypothesis that the academic theoretical knowledge is necessarily good and important for practitioners to know, but this may not always be the case. Such assumptions often neglect practical knowledge (Berlin, 2004). Science is largely characterised by being grounded in results that are systematically collected where claims need to be supported to be considered reliable in a positivistic tradition. It is from this interpretation that methods for collecting and analysing material have been developed, and theories have been used to view and understand actions from a certain perspective. "Ideal" research is often described with terms such as impartiality, distance-keeping, and critical reflection, with established rules and methods for investigation and data collection (Berlin, 2004). Daily life knowledge largely relies on one's own experiences, traditions, and reasoning.

The conflict between scientific knowledge and daily life knowledge concerns legitimacy and power. Science knowledge often has interpretative power that practical knowledge lacks. But perhaps a new type of knowledge can be developed between these, where different perspectives can challenge and enrich one another (Rönnerman, 2004). To eliminate the borders between academia and practice and to create equality, there must be a common language with which dialogue is expressed. Another alternative is to accept the differences and learn to handle them (Berlin, 2004).

Flyvbjerg (2001) describes a phronetic perspective of social science where the research aims to bring up problems that matter to the local and national communities, and in that respect contributes to society's capacity for value-rational deliberation and action, rather than to develop predictive theory. Social science may "contribute to society's practical rationality in elucidating where we are, where we want to go, and what is desirable according to diverse sets of values and interests" (Flyvbjerg, 2001:166). In this sense, the role of social science and the use of case studies can be empowered, especially if ensuring that the research results are communicated to fellow citizens.

Using a case study approach is highly relevant when aiming to study daily life practices and specific contexts in concrete examples. Diverse knowledge integration can be organised in multiple ways in the broad spectrum of types of case study research. The choice of methods is however key in order to develop a valid understanding of the case (Scholz & Tietje, 2002).

In INTEGRAL, Vilhelmina municipality was chosen as a representative case for northern interior Sweden, and the case study area of Helgeå River Catchment in southern Sweden. This combination aimed to illustrate how the conditions in forest management and planning vary in Sweden. In addition to the case study approach, we decided to apply an action-oriented approach in the third phase of the research project that considered the desirable scenario development (see section 5.4.1)[7]. Action Research (AR) is an approach that aims to stimulate cooperation between researchers and practitioners (Rönnerman, 2004). The research, which often departs from practitioner-initiated problem formulations, owes much to critical theory, especially as it was understood by Jürgen Habermas (1971, originally 1968). Action research is fundamentally an approach to handle complex problems from a bottom-up perspective where the main purpose is to initiate social processes aimed at obtaining a normative goal through the collaborative production of knowledge (Friedman, 2001). Collaboration, emancipation, and empowerment of people are important key words, ultimately aimed towards more democratic societies (Huttunen & Heikkinen, 1998). The researcher's role is to stimulate dialogue,

[7] This choice of methodology was as a complement to the suggested method in INTEGRAL.

to assist in studies, and to develop practices with suggestions for solutions for enhancing possibilities for change (Berlin, 2004). Hence, action research is concerned with the practical realities of implementation where different kinds of collaboration, joint learning, and common competence development are essential. AR combines practical problem solving as well as theoretical development, where the competences of both the researcher and the practitioner are incorporated. The research process aims at giving the participants a holistic understanding of a problem that the action is supposed to solve. The view of what the problem is can differ among the participants, so the problem needs to be discussed and consensus reached about the definition or conditions of the problem (Berlin, 2004). It is essential that the process is continuously followed and analysed as this reflection allows the actors to evolve and shape the process themselves (Brown, 2009). To encourage this reflection on daily practices, researchers frame open-ended questions that will lead to a discussion about how to improve a particular situation.

Validity is confirmed when evaluating whether methods are capable of measuring, representing and illustrating the case according to the intention of the case study, hence if the used methods truly reflect the case. Case analyses are however not strictly objective, as the outcomes depend on the researcher's case understanding and competence with methods. Both case study research and AR-created knowledge have been criticised for being too practical and not having any larger validity outside a specific context (Zeichner & Noffke, 2001), based on the view that knowledge should be objective and free from valuation or opinions. Folkesson (2004) cites several researchers (Dadd, 1995; Stake, 1995; Zeichner & Noffke, 2001) who argue that it is not reasonable to evaluate AR according to traditional academic research criteria; rather a new validity measure is needed. The word trustworthiness, rather than validity, better captures what the practitioners know about the knowledge their research has created (Zeichner & Noffke, 2001).

Dadd (1995) suggests that action research is evaluated regarding its knowledge generation, the quality of the results, how the research has impacted the practice and learning of the researcher, and/or the situation and the quality of the collaboration in the research. Alternatively, the usefulness (its practical application or validity) of the research is determined by the way receivers of the knowledge apply the results to their own context.

Flyvbjerg (2001) lifts five arguments of how the nature of the case study as a research method has been misunderstood, oversimplified and misleading. Even though the case study is an examination of a single in-depth example, it can still provide reliability. Flyvbjerg (2001:66-67) therefore argues that general theoretical knowledge should be regarded equally valuable as concrete,

practical, and context-dependent knowledge. Cases do not have to be generalizable to receive scientific status. The case study can be useful both in generating and testing hypotheses and building theory. The case study is not biased in the sense that it tends to confirm the researcher's preconceived notions. And lastly, it is possible to develop general propositions and theories based on specific cases.

It seems natural to apply case study oriented research and an Action Research approach when studying their characteristics and potential benefits as described above, and when the task is to conduct participatory planning in a context-dependent forest landscape. When people are able to gather around common local concerns, their local competence of action is supported (Lundberg & Karlsson, 2002). Action Research aims to help people to reach realisation of their ideas and implementation of their local knowledge, which both motivate participation and the use of a case-centred focus.

6.4 Research design overview

Following a mixed-methods approach, I base my research on different qualitative and quantitative methods. The studies have been conducted in different phases with various methodological "themes". In Figure 4, an overview of the different phases and methods is presented, indicating what phases the papers are based on.

In the first phase, an interview study was conducted with forest owners and stakeholders in Vilhelmina municipality. The information gathered here was used to build the ground for an understanding of which drivers and barriers influence decision-making (and the decisions that influence present and future effects) and land use character of the forested landscape. The interviews served to map *what* is produced in the landscape, *by* whom, and *for* whom. The factors were the initial building blocks for conducting the first set of scenario development. During this second phase, we held a participatory workshop in Vilhelmina to discuss and rank factors, which were then used to develop possible (explorative) qualitative scenarios by the researcher team. By using the qualitative information in computational scenario development software, a range of plausible and consistent scenarios were developed, from which we chose three and compiled narrative storylines for these. In the third phase, we once again organised participatory workshops, but this time they were focus group meetings using the CUAR method. These workshops aimed at creating a normative (desirable) future scenario, including goals and policy suggestions to reach them, which were then compiled into a narrative storyline and illustrated with photo montages. Both the explorative and normative scenarios were

subject to quantitative modelling of forest ecosystem changes and ecosystem services provision, building on a qualitative part of forest ownership behaviour and various forest management programs, also based on information from the interview study. Papers I-III discuss the method performance of the scenario development phases. The result of the normative scenario is however presented in the thesis only. Paper IV uses the interview study as empirical material for discussing governance challenges in using a landscape perspective in forest planning. This paper evolved as a synthesis of the experiences that I have gained throughout the research regarding the identified need to develop the collaborative and sustainability aspects of the forest planning practice.

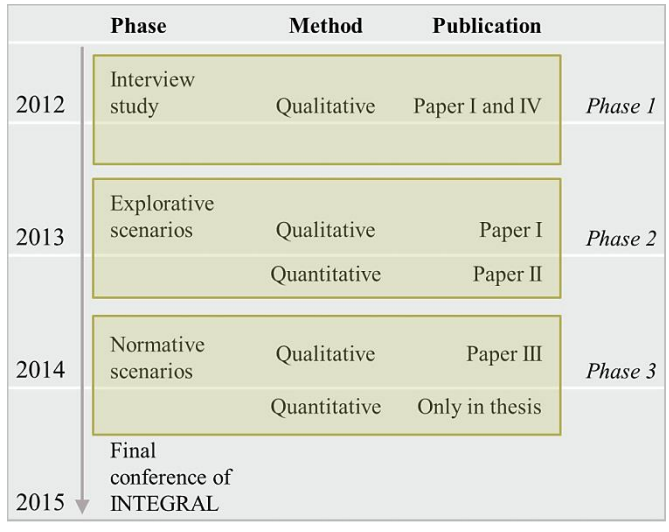

Figure 4. Overview of research phases, methods and resulting publications along a time line of the INTEGRAl-project.

6.5 Interview study

The interview study initially served to contextualise the case study and provide background knowledge for the construction of the scenarios. The interviews aimed to gather data on the key political, socio-economic, ecological, and technical factors (barriers and drivers) that influence forest management.

A joint interview questionnaire was used in all 20 case study areas in INTEGRAL, developed for forest owners and forest stakeholders. These groups were asked separate sets of questions. The interviews were semi-structured and narrative in character, generally following Kvale's approach (1996).

In total, 17 forest owners and 15 stakeholders were interviewed, representing both men and women, resident and non-resident owners, and different ages. Among the NIPF owners, the size of their estate holdings varied: <50 ha (3); 100-1000 ha (9) and 1000-8000 ha (6 persons). Forest owners were contacted with the help of the local Swedish Forest Agency office. Stakeholders were contacted from the Vilhelmina Model Forest network, which assembles local stakeholder representatives in the area including local and county agencies, forest industries and associations, scientists, local politicians, and several other local forest-related organisations (Table 2). The gender distribution is presented in Table 3. Viable participants were contacted individually; in the case of organisations, the head of the office was contacted.

Table 2. *Representation of interests among interviewees. Several participants represented more than one interest, so the sum of the different groups exceeds the total number of participants.*

Represented stakeholder interests	**Interviews**
National organisation	1
Regional authority	1
Local authority (municipality)	2
Forest authority	1
Forest owner organisation or individual private owners	22*
Forest industry (company)	1
Forest entrepreneur - timber and NTFP based	3
Non-governmental organisation (nature conservation, game management, geology)	4
Specific user group	
Outdoor recreation, hunting & fishing, mushroom & berry picking	32
Sami people	1
Education & research	1
Total number of interview participants	**32**

Table 3. *Number and gender of interviewed forest owners, managers, and stakeholders*.

	Total	**Male**	**Female**
Stakeholders	15	10	5
Forest owners	15	12	3*
Forest managers	2	2	

*Two married couples participated: one wife contributed actively and one contributed more passively.

All prospective interviewees were invited to participate in an interview via mail, telephone call, or e-mail. They were provided with a comprehensive information sheet in Swedish describing the INTEGRAL project and explaining the type of information the research would consider. Before the interviews, people who agreed to participate in the interviews were provided with the interview questions. Most interviews were conducted in person at a mutually agreeable time and location. One interview was conducted over phone.

The forest owners were asked about their forest estate and ownership history, their present and expected future management goals, ecosystem services produced, and their opinion on forest management activities, the Swedish forest management tradition, forest legislation, actors in the forest landscape, local conflicts, cooperation, and networking. The quantitative portion consisted of an exercise where the forest owners ranked a preliminary list of factors that would be the most relevant or important for them in their forest management decisions. The average duration of the interviews was approximately 90 minutes, ranging between 70 and 120 minutes.

The stakeholders were asked about their understanding of how and why forest owners and managers manage their forests. The interviews also covered questions on collaboration and networks between different actors, local conflicts, power relations over natural resources, policy and traditional influences on the forested landscape, and ecosystem services production. Because several of the stakeholders were also forest owners, some additional questions were asked about their forest goals and management activities. The average duration of the interviews was approximately 80 minutes, ranging between 60 to 120 minutes. All the interviews were recorded (the interviewees provided permission) and transcribed with a focus on content rather than being verbatim transcriptions.

The analysis of the interviews was supported by focused coding to make the most analytical sense when sorting, synthesising, and categorising the data (Charmaz, 2006). Preconceived codes were not used; codes were created from what the data suggested.

7 Case study description – Vilhelmina municipality

It is time to introduce the case study area of this thesis, which serves as the example in the scenario development and analysis. Situated in the mountainous and boreal forest of interior northern Sweden, Vilhelmina is largely characterised as an area of even-aged forestry, protection-worthy biotopes and the cultural heritage of the pastoral Sami people and their reindeer herding traditions (Willebrand *et al.,* 2006). Based on the contextual descriptions of rural development challenges in northern Sweden and the forest governance history discussed in chapter 2 and 3, this chapter will begin by describing how these aspects are realised in Vilhelmina municipality. Next, the chapter describes the multiple forest values and major actors in the landscape. Information that was collected during the interviews regarding the forest values are integrated in the descriptions, including reflections over some major forest related conflicts in the area.

7.1 The forested landscape of Vilhelmina municipality

The Vilhelmina municipality was chosen to be the case study area for several reasons. Being a rural forested landscape, the area represents the transitional forest conditions and socio-economic settings in northern Sweden, from boreal to alpine land. In 2004, the Vilhelmina Model Forest network was established, providing an arena for interaction between practitioners, researchers and politicians in various kinds of projects connected to the forested landscape, a circumstance that has also motivated several research projects.

Historically, the municipalities of interior northern Sweden have been characterised as "rural resource communities"[8] (Reed, 2003) where natural resources[9] such as timber production, hydro power and mining have significantly contributed to the national economy and welfare system during the past century, resulting in a high living standard for the Swedish population (Sörlin, 1988; Lisberg Jensen, 2002; Almered Olsson *et al.*, 2004). These sparsely populated municipalities cover a large geographical area and lack sufficient infrastructure even though people have been living close to the natural resources of boreal forests situated near these great river valleys for a long time (Thellbro, 2006).

In contrast to the "days of glory", when the municipality was more populated and flourishing in the most intense forestry phases, currently these municipalities are characterised by significant migration of younger people moving from the rural areas to urban areas. This demographic trend means the remaining elder population will face a constrained healthcare and service supply due to shortages in employment in the welfare sector and strained tax resources. Small businesses and farms are a crucial part of the local economy of the boreal municipalities, enabling people to make a living where they want to live (Taylor *et al.*, 2004). Since these communities are situated long distances from regional centres with varied education, training and employment possibilities, the situation can be described as a dead end. On the other hand, the transformation from industry-based communities to knowledge- and information-based societies provides opportunities for employments (Westholm, 1996). For rural communities within commuting distance to urban areas, the situation is much brighter, since many people enjoy living close to nature but still within distance to an urban working life (Almered Olsson *et al.*, 2004). Because there are more mobility opportunities, many people no longer need to live close to a work site (Nordström & Mårtensson, 2001). In general, however, the wish to live in the countryside is not only based on employment factors, but also on the closeness to nature, space, quietude, family traditions, and local culture (Nordström & Mårtensson, 2001; Thellbro, 2006). Enjoying recreational forest values provide both additional income and leisure opportunities (Westholm, 1996).

Vilhelmina municipality covers 870 000 ha, of which 530 000 ha are coniferous-dominated productive forest land (Figure 5). The most common tree species are Norway spruce (*Picea abies*), Scots pine (*Pinus sylvestris*), aspen

[8] A term that describes the human-nature dependency in a society residing in a relatively small geographic area, where "people rely on the extraction and/or processing of natural resources for their livelihoods" (Thellbro, 2006:14).

[9] The natural resources concept is exemplarily described by Thellbro (2006).

(*Populus tremula*) and birch (*Betula pubescens* and *Betula pendula*). The western part of the area contains an increasing amount of old, natural forest and significant parts of the foothill forest still exhibit natural or close to natural conditions, hosting the majority of the nature reserves and other protected areas (180 000 ha) (Svensson *et al.*, 2012). That is, 40% of the area is subject to forest production, 21% is protected land (mostly non-productive forests), and 38% is mountainous, water, mire, agricultural, or housing areas.

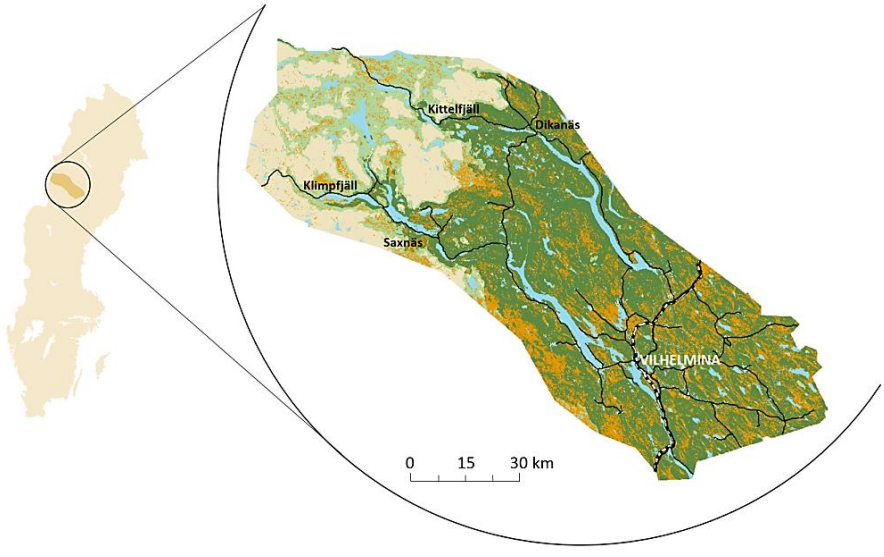

Figure 5. The location of the Vilhelmina municipality in Sweden, indicating the largest villages, roads and railway and the distribution of land cover classes: Dark green – forest; yellow – open land (mires and agriculture land); blue – water; light green – mountain birch tree-line forest; white – high alpine without woody vegetation. Map made by Camilla Thellbro.

In Vilhelmina, the winter season is long (from October until April) and is characterised by significant snow fall and frozen ground and the summer season is short and intense (from June to August) and daylight extends for almost 24 hours, as Vilhelmina is situated at 64º latitude (the Arctic circle is 66º). Climate change will increase precipitation, expanding the wet lands and increasing nitrogen leakage, prolong the growing season, delay the snow season, increase autumn temperatures, decrease winter temperatures, shorten and delay periods of frozen ground, and increase storm intensity (Hooper, 2013). These factors could lead to migration, the introduction of new species and provenances of weeds and trees, changes in biodiversity, and increases in

"forest damage" due to pests and pathogens (fungi and insects). The demands on adapted forest management activities and harvest transport will change. The forest production capacity is expected to increase, and the mountainous areas are expected to be more vegetated, resulting in shorter rotation periods and the need to adapt machine technology to avoid soil and tree damage (SOU 2007:60; Jansson *et al.*, 2015).

7.2 Forest values

The Vilhelmina landscape provides a range of natural resources, functions, and interests, sometimes strongly linked to private ownership rights and sometimes regarded as common pool resources of public interest. The mapping of forest values can be organised in many ways. Here, the values are described in a range from consumptive to non-consumptive values.

Wood-based products

Wood production focuses on industrial round wood, sawn wood and pulp wood as the largest product groups, with a potential market for biofuel wood. Wood production is the main use of the productive forest land, (40 % of the municipality area).

In Vilhelmina, a medium-sized sawmill for spruce timber (capacity 110 000 m^3) operated by SCA was the major industrial actor and largest private employer until the summer of 2013, when it was shut down due to market competition. In 2012, approximately 200 people were employed in the forest sector (Svensson *et al.*, 2012). Today, timber is sold and transported to mills owned by private companies or the forest owner associations along the coast or in Jämtland county. Several of the interviewed forest owners have their own small-scale saw mill to prepare construction wood for private use.

The global and European economy and market competition strongly influence the forest product market. To a large extent, forest owners coordinate their harvest activities with price fluctuations (Kangas *et al*., 2000). In general, the interviewed persons would preferably see an increased capacity for local refinement of raw wood material. Due to high transport costs, few entrepreneurs and investors are willing to invest in enterprises that require moving products such long distances. A change in fuel taxes and legislation for truck fuels might have a large impact on the local market for wood products and the economic profitability of forestry. Trains were used to transport timber in earlier decades, but this option is no longer available.

Reindeer husbandry

Since the saw mill shut down, Vilhelmina's largest private enterprise has been reindeer husbandry. About 100 of the indigenous Sami people are organised in two reindeer herding communities, Vilhelmina North and Vilhelmina South Reindeer Herding Communities. The reindeer husbandry jurisdiction (i.e., the Sami people's rights to use land for reindeer grazing, hunting, and fishing concerning all state, private, and company land) is grounded by the Swedish Constitutional Act, as an exclusive usufructuary right restricted to reindeer herding Sami people only (Kardell, 2004; Widmark, 2009). During the summer, the reindeer stay in the mountain areas (year-round areas). During the winter, the entire northern Swedish boreal area, where the tree and ground growing lichens are the main food source for reindeer, is used as grazing land. During the migration period between summer and winter grazing areas, forests with tree lichens are the limiting factor and when grazing opportunities are insufficient, conventional fodder feeding is required (Sandström & Widmark, 2007; Sandström *et al.*, 2016b).

Many timber activities severely affect lichen growth and reindeer migration, including even-aged forestry, felling of old forests, construction of roads, forest fires, herbicides, nitrogen fertilization, the introduction of *Pinus contorta*, and soil preparation (Kardell 2004, Widmark 2009). Although migrating reindeer can destroy trees, their search for food positively impacts forest health by preparing the soil via scarification for new plants to grow. In addition, reindeer meat production improves the region's economy (Kardell, 2004).

Sweden has not ratified the ILO Convention No. 169 for indigenous people. One reason for this is the requirement to clearly delineate land rights of Sami people and to identify the borders of this land (SOU, 2006:81). Another reason is that a majority of land owners, representatives from municipalities, and state agencies argue that practical solutions can be made at the local level through consultations with the Sami people (SOU, 1999:25). The Sami Parliament advocates for the ratification of ILO Convention No. 169 and the finalisation and adoption of the Nordic Sami Convention to be reviewed in all laws and policies, as well as legislating the Sami-negotiated absolute right to Free, Prior, and Informed Consent regarding any exploitation of natural resources in traditional Sami territory (Sametinget, 2015, 2016).

Hunting and fishing

Hunting, in particular moose, forest birds, and small game, is important from economic, social and cultural aspects (Willebrand, 2009). The wildlife serves

both consumptive harvest needs and recreational tourism; however, these pressures come with ecological risks.

In Sweden, landowners hold the exclusive right to hunt on their property. Forest owners can sell hunting licenses, which is the case for 50 percent (Sandström & Lindkvist, 2009), hence most hunters in rural parts of Northern Sweden lease land to hunt. A large moose population, preferred by the hunters, has implications for forestry, especially as moose can significantly impact pine plantations through their grazing (Sandström *et al.*, 2013). The goal to minimize damage while maximising the yield of the moose population is even an internal conflict for the hunting forest owner.

In Sweden, fishing requires a license that is connected to specific lakes or water sheds. A land owner of a water course is not required to buy a fishing license. In Vilhelmina, there are disputes around whether commercial fishing enterprises should require specific rights to fish and whether there should be a balance of fishing tourism and the access to fish supply.

Wildlife management includes game stewardship, wildlife conservation, and pest control. SEPA has the final responsibilities regarding hunting licenses for large predators, inventory results, and the regional level work of the CABs.

Nature-based tourism

Overall, there is a positive attitude for developing local enterprises within the nature-based tourism sector, such as wildlife experiences, hunting, outdoor recreation, and cultural heritage visits. The ability to communicate and market natural resources could provide many employment opportunities. Tourism can potentially be and already is a way to diversify local economies in rural areas (Willebrand, 2009). There are plans to expand the airport runway so larger airplanes transporting tourists can land.

Vilhelmina is experiencing increased interest in hunting tourism from both southern Sweden and Europe. Most of these hunters want to pursue moose, forest birds, and small game. The most common arguments against hunting tourism are the exclusion of local hunters, higher leasing fees, and overharvest (ibid). Some people would like to see a requirement for foreign hunters to be accompanied by a Swedish guide, which would secure a safe, sustainable, and considerate activity and provide enterprise opportunities. The limited access to accommodations, criticism of tourism entrepreneurs who may compromise Rights of Public Access, and the limitation of hunting quotas are some constraints for developing nature-based tourism. The revenues from nature-based tourism are most visible in the hotel, shopping, and restaurant sectors, rather than as revenues for the land owners.

NTFPs, berries and mushroom picking

Berry and mushroom picking are popular outdoor recreation activities. These berries include blueberry (*Vaccinium myrtillus*), lingonberry (*Vitis idaea*), and cloudberry (*Rubus chamaemorus*). Both residents and tourists search for mushrooms such as the yellow chanterelle (*Chantarellus cibarius*) and the funnel chanterelle (*Craterellus tubaeformis*).

The berry industry is growing. Many of the workers in this industry are from Asian countries (5000-8000 workers in Sweden according to Wingborg, 2011). This organised business of wild berries and other NTFPs have triggered a debate about the commercial exploitation of public access to forest land (Sténs & Sandström, 2013). The land owners do not receive any revenues from these commercial businesses, since the rights to harvest these products are universal according to the Rights of Public Access regardless land owner (see more regarding this conflict in section 3.4.2). In addition to the use of berries in food products like jams and syrups, Nordic berries and wild flowers are increasingly being used in medicines, dietary supplements, and cosmetic products, creating a new economic interest in the berry industry (Sténs & Sandström, 2013).

Wind power

Wind power is an important part of renewable energy; it has a relatively small environmental impact as it requires a relatively small amount of land and produces no pollutants other than the carbon required to produce the infrastructure and the actual wind mills. The development of wind power production is closely connected to energy prices and profitability. The municipal council has created a wind power management plan together with the neighbouring municipalities of Åsele and Dorotea to find suitable areas for wind mills, on both municipal and private land. The goal is to establish 50 wind mill stations in Vilhelmina municipality before 2020 (www.vilhelmina.se).

Forest owner opinions on wind mill issues differ, from being seen as a competing interest interfering with nature and aesthetic values in the landscape, to being seen as a benefit because of its small carbon footprint, the improvement of road networks, and potential local revenue similar to timber production. However, wind power is only seen as a complement to the energy supply. According to some of the interviewees, when large amounts of energy in the Vilhelmina are needed (i.e., during winter), there is often no wind or significant ice problems. However, the municipal wind mill plan claims the winter season is the windiest. Some interviewees objected to power generated

by windmills because they believed this energy would be transported to southern Sweden, where most of the energy is consumed. Small-scale village wind mills were suggested as sustainable solutions by some interviewees.

Water protection management and hydro power

The Ångermanälven River flows through two river valleys in Vilhelmina municipality, originating in the Kultsjödalen Valley and connecting to the city of Vilhelmina in the Vojmsjödalen Valley. A number of lakes are formed along the rivers, which also function as water reservoirs for hydro-electrical power stations (Svensson *et al.*, 2012). The socio-economic importance of water resources is increasingly recognised. The hydro power extension during the 1900s contributed largely to the industrial development in Sweden (Almered Olsson *et al.*, 2004). Hydro power as renewable energy source is seen as environmentally preferable to fossil fuels or nuclear power (Renöfält *et al.*, 2010). However, when regulating dams in Sweden, little consideration was given to their ecological effects. Hydro power threatens freshwater ecosystems by reducing flow velocity and the number of rapids in water courses, changes that disturb deltas, wetlands, flora, and fauna dynamics and habitats.

In 2008, there was a local referendum concerning plans on exploiting hydro power in Vojmån river, nearby the city of Vilhelmina, where citizens voted negatively to the exploitation plans.

Mining

Another discussion in Vilhelmina municipality has been the re-opening of the former copper mill in the very west mountainous part of the municipality, Stekenjokk, which was open between 1976 and 1988. The Stekenjokk area is a national interest (riksintresse) for both mining and reindeer husbandry. The County Administrative Board and Bergsstaten rejected the re-opening proposition in favour for reindeer husbandry.

National park

A relatively new debate is taking place around establishing a National Park in the Blaik mountain area, which covers the border between Vilhelmina and Åsele municipalities. Proponents argue that the marketing value of the strong brand that a National Park labelling brings, with state financed management resources and potential tourism benefits will increase tourist visits. Some of the interviewees are however worried about potential impacts on the Rights of Public Access, especially regarding limitations on hunting, fishing and snowmobile use.

Nature conservation, biodiversity, and key biotopes

The boreal forest and Fennoscandian mountain range is the home to diverse flora and fauna. The long tradition of and focus on timber production values in forestry have influenced nature conservation and biodiversity values. Habitat loss and fragmented forests, as the result of economic factors, forest policy, and technological development, are two main critical obstacles for achieving the environmental quality objective concerning biodiversity (Sandström & Lindkvist, 2010; SEPA 2016b). For example, extensive logging activities have significantly decreased old growth forests in Sweden (Sandström & Lindkvist, 2009).

The need for nature conservation and biodiversity protection is acknowledged by most of the interviewees, although they also recognise how important timber production has been for welfare development. Some of these interviewees believe that they should be economically compensated for implementing strategies that conserve nature, especially when the certification agreement does not allow harvests on key biotope areas. The government had such a compensation system in place, but the money was exhausted earlier than anticipated.

One major conflict between advocates for forestry and advocates for nature conservation revolves around Njakafjäll, a mountainous forest area west of Vilhelmina. This issue has been thoroughly described by Lisberg Jensen (2002). Starting in 1984, the Swedish nature conservation organisations debated whether the ecological values of the old primeval spruce forests should be protected in a nature reserve. The Upper Vilhelmina Forest Common owning the land wanted to establish a forest road for clear cutting activities. The Forest Common met strong opposition by the national environmental movement, soon supported by scientific arguments as well as many international environmental activists. In 1997, Greenpeace became involved in the debate to the blockade activities, gaining large attention in the media. The debate came to a financial solution in 1998; the Forest Common was offered an exchange of the Njakafjäll forest for other estates around Åsele. Upon the exchange in 2001, the Njakafjäll area became a nature reserve. This conflict was the largest of its kind in the Swedish forestry debate, illustrating oppositional ideas about forests and forestry practices in north-western Sweden, putting basic ideas of local development and sustainable economic yield and security up against the environmental movement defending the conservation of nature (Jensen, 2002). Today, the management of the nature reserve is also discussed as the County Administrative Board has lacked the

resources, for example, to maintain bridges along snowmobile trails, to repair wind damage, and to keep the reserves accessible for visitors.

Recreational values

There is a wide range of recreational activities that take place in the Vilhelmina forests such as picking berries and mushrooms, hunting, fishing, wildlife experiences, hiking, swimming, skiing, mountain biking, canoeing, rafting, and snowmobile driving. In addition, mountainous municipalities are subject to a large market for secondary and leisure housing. Social forest values are important contributors to human health and quality of life, recreation, knowledge, social relations, inspiration, identity-making, and cultural heritage, all values climbing higher on the forest policy agenda (Birkne *et al.,* 2013; SOU 2006:81). Enjoying the scenery and wide views in the mountainous areas or around the water in the landscape stimulates wellness and a personal attachment with nature. However, politicians, stakeholders, and researchers find it difficult to analyse, comprehend and define social and cultural values in forests and in relation to other natural resources (Chan *et al.*, 2012; Sténs *et al.*, 2016).

Sténs et al. (2016) noted that forestry stakeholders frequently identified tourism, recreation, and food production as important social values. In surveys of private forest owners and forest advisors, Norman (2009) found that the most important value was timber production, followed by recreation and biodiversity.

In the village of Dalasjö, a forest company and the municipality exchanged forest land to preserve an area with high recreational values, as an example of a specific acknowledgement of social values.

Sami and national cultural heritage values

The forested landscape holds protected remnants of ancient and newer settlements and land use, such as Sami huts, catch pits, graves, ancient pasture land, summer farms, old roads and paths, stone walls as well as remnants from early industrial production of charcoal and wood (Sandström & Lindkvist, 2009). These historical values are important to human identity and quality of life.

The competition between forestry and cultural heritage is mainly expressed through the large-scale methods in logging and soil preparation in forest areas where remnants are present. More careful and moderate logging and soil preparation methods could enable cultural heritage protection without too major a sacrifice.

7.3 Actors related to the forested landscape

Apart from the actors who have briefly been mentioned in connection to the mapping of values, this section will describe some of the main actors a little deeper: the forest owners, the authorities and the Vilhelmina Model Forest. Because the reindeer herding communities and some NTFP enterprises have been explored in section 3.4.2, they are not discussed here.

Forest owners

The forest ownership structure of Vilhelmina is illustrated in Figure 6. Table 4 presents some data on the 2621 non-industrial private forest owners (SFA, 2016a). The forest companies that own land in the area are SCA, Holmen and Sveaskog. The municipality-owned forest estates are mainly situated in the areas around the city of Vilhelmina and provide recreational areas for its inhabitants.

The forest commons in Sweden are owned in common and managed by shareholders who also own other forest holdings (Holmgren, 2009). These commons were created during the delimitation process (*avvittringen*) (see section 3.2), however, today ownership ranges from private individuals (dominant) to forest companies and public institutions (ibid). The idea is meant to guarantee the joint owners access to revenue from the forest, ensuring that the forest resources remain as economic support to local citizens and the local economy. The Vilhelmina Upper Forest Common was established in 1918. In 2009, it had 393 shareholding properties and 906 shareholders.

The private forest owner associations are membership organisations representing around half of all the NIPF owners in Sweden. Four of these associations are also members of the meta-organisation LRF Skogsägarna (Kronholm, 2015). The forest industries are represented in a similar way by the organisation Skogsindustrierna, where pulp mills, paper mills, saw mills, and heating plants are members.

There are two forest owner associations with local offices in Vilhelmina. They work to secure profitable revenue from the members' forest products (a high and even price level) and to stimulate trade and development of raw wood products. They also provide consultation and advisory services such as developing forest management plans. They represent the private forest owner's economic interests and support the purchases and management of private forest and agricultural estates (Norra Skogsägarna, 2016; Norrskog, 2016).

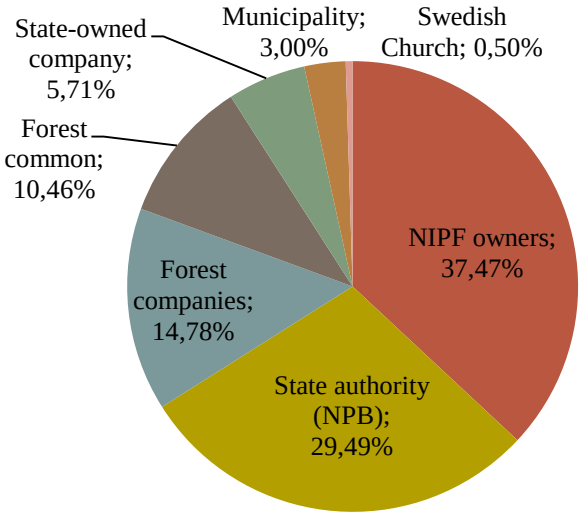

Figure 6. Forest ownership structure in Vilhelmina municipality.

Table 4. *Data on non-industrial private forest owners in Vilhelmina municipality. Because some estates are owned by both men and women, the sum of the female and male owners exceeds the total (SFA, 2016a, processed by Camilla Thellbro).*

	Total	**Female owners**	**Male owners**
Resident owners	1177	445	732
Non-resident owners	1444	615	829
Västerbotten county	*542*	*228*	*314*
Sweden	*843*	*365*	*478*
Abroad	*59*	*22*	*37*
Total	**2621**	**1675**	**2390**

Authorities

In the 1960s, large areas of forest land were reserved for nature conservation and recreation. Acquisition of forest land for conservation or recreation purposes is today conducted through negotiations between the Swedish Forest Agency, forest owners, and the County Administrative Boards (CAB; *Länsstyrelsen*). The CAB administer national parks and reserves, a responsibility monitored and established by the Swedish Environmental Protection Agency (SEPA, *Naturvårdsverket*). The CAB retains regulatory control and approves by-laws that the elected management board of the forest commons must abide by (Holmgren *et al.*, 2010). SEPA owns and manages the

national parks. The National Property Board (NPB, *Statens Fastighetsverk*) is the state authority responsible for protection of cultural heritage sites. The NPB also owns forest land areas that are nature reserves. The Swedish National Heritage Board, The Swedish Forest Agency, and the County Administrative Boards administer the protection of "ancient monuments", "other cultural remains", and the so-called "biological heritage sites" in the Swedish forests. These authorities act as both initiative-taking actors and as monitoring authorities that advise partners and submit comments on political propositions. Both the NPB and Västerbotten CAB have one officer each located in Vilhelmina.

The Vilhelmina Model Forest - a collaborative arena

The Model Forest concept was developed in Canada in 1992, with more than 60 Model Forests around the world today (Bonnell *et al.*, 2012; IMFN, 2015). The initial idea was to create a forum where stakeholders could meet to collaborate, interact and discuss the common forest landscape, which had suffered from many conflicts through the years (Svensson *et al.*, 2004). Thus, it provides an arena for developing, testing, and demonstrating ideas in concrete landscape planning and SFM (Svensson *et al.*, 2012). The Model Forest concept focuses on communicative and collaborative approaches, mixing local, traditional, and scientific knowledge in a transdisciplinary multi-stakeholder and multifunctional manner (Bonnell *et al.*, 2012; Ho *et al.*, 2014).

The Vilhelmina Model Forest (VMF) was established in 2004 as the first Model Forest network in Europe. An important objective was to create networks and to stimulate knowledge exchange between a wide range of actors including local and county authorities, forest industries and associations, scientists, local politicians, and several other local forest-related organisations (see the webpage for full list of representatives, www.modelforest.se). The network building with other MFs on international and national levels has also been significant.

The activity in the VMF depends on the access of funding resources, which has been a struggle, resulting in variation of high or rather passive activity periods. Numerous research projects have used VMF as a case study area, enabling resources for different activities. There is a steering group of 11 local stakeholders, and an interest group assembling a larger group of connected interests and people. There are several thematic groups that address issues such as forest social values and climate change. In addition, there are eight demonstration sites of different nature types and character serving as outdoor classrooms where knowledge and information about forest values and different types of management are presented and discussed.

8 The scenarios – methods and results

This chapter presents the methods and results of the two kinds of scenario development processes, one explorative and one normative. These processes were used in the second and third phase of the research project (Figure 4, chapter 6). The scenarios in both these processes were developed and analysed by combining qualitative and quantitative methods, resulting in narratives and calculations of ecosystem services output of a selected set of forest landscape values. As the Papers I-III describe and evaluate the methods, I only go through them briefly here. In connection to each scenario development phase, I also present the resulting scenarios in qualitative and quantitative output. The chapter ends with a presentation of the participatory evaluations of the workshop and focus group processes, including the comments on the explorative scenarios made by the participants.

8.1 Explorative scenario development

8.1.1 Qualitative scenarios

After the interview study (autumn 2012, see section 6.5) the researcher team analysed and put together a set of social, technological, ecological, economic, and political factors. These factors were discussed during a workshop in Vilhelmina (autumn 2013). The members of the steering committee in Vilhelmina Model Forest and two others participated on this occasion, representing forest owners, a forest company, a forest owner association, the local Forest Agency office, the Vilhelmina Northern Sami village, as well as water management, hunting, tourism and nature conservation interests. The participants were asked to vote for what factors they believed have the greatest influence on decision-making regarding the future use of the forested landscape. The participants also contributed to a technical assessment that weighted the importance of the factors in relation to each other.

After these contributions, the researcher team began to construct scenarios by sketching plausible developments of factors and checking consistency of possible combinations of developments with support from the scenario calculation software Parmenides Eidos™. This process is described in detail in Paper I, which focuses on examining the method and its suitability for combining stakeholder and scientific knowledge. However, Paper I, due to lack of space, does not report the content that was used to build the scenarios. This information is found in tables (see Appendix) that present the different elements and manifestations. A selection of the most influential factors (mainly based on the participants' ranking) was regrouped into twelve *elements*, for which different future developments are described in two to five *manifestations* each. An overview of the elements and manifestations is presented in Table 5 on next page.

Some factors that were mentioned during the workshop were excluded from the analysis mainly of priority reasons. These concerned tax policies in other countries, herbivory, forest owner associations, EU policy (assumed to be implemented in national legislation), political party composition in government, and change of municipality and regional borders. There were also a number of so-called "wild cards" that may have influenced forestry but were excluded from the scenario development for similar reasons: storms, floods, drought caused by climate change, nuclear power catastrophes, innovative models for carbon sequestration or climate change, and nano-technology and 3D-printing.

The following table presents the scenario elements and manifestations, and the following spreads present qualitative scenarios as photo montages (by Charlotta Gard) and as narrative stories.

Table 5. *Overview of elements and manifestations, continuing horizontally on the next page. See Appendix for full description of the table.*

Category	**Social**			**Technological**	**Economic**	
Elements	**S1 Population**	**S2 Ownership structure**	**S3 Public opinion on forest resources**	**T1 Forest technology & mngt. methods**	**E1 Forest commodity market**	**E2 NTFP market**
Alternative manifestations	S1a Urbanisation dominates	S2a Company-owned land increases	S3a High public interaction	T1a Clear-cutting methods dominate	E1a High price for all dimensions & qualities	E2a High demand for social values
	S1b New employment possibilities	S2b State-owned land increases	S3b Low public interaction	T1b Alternative management methods dominate	E1b Low price for all dimensions & qualities	E2b Low demand for social values
	S1c Live and work in several places	S2c Increased private non-local ownership		T1c Several methods are used	E1c High price only for saw-log dimensions & qualities	
	S1d Increase of foreign immigrants	S2d Increased local ownership			E1d Saw-log dimensions and quality does not pay off	
		S2e Forest commons				

Category	Economic		Political			
Elements	**E3 Welfare develop-ment**	**E4 Energy resources**	**P1 Laws & regulations**	**P2 Steering instruments**	**P3 Local planning**	**P4 Indigenous people's rights**
Alternative manifestations	E3a Positive	E4a Biofuel dominates	P1a Soft law	P2a BAU	P3a Top-down	P4a Rights strengthened
	E3b Negative	E4b Renewable fuel sources dominate	P1b Hard law	P2b Increased economic steering towards production	P3b Bottom-up	P4b Rights unchanged
		E4c Fossil fuel dominates	P1c Combination of hard and soft law	P2c Increased economic steering towards environmental protection		
				P2d Increased economic steering towards multiple values		

Illustration: Charlotta Gard ©

Vilhelmina year 2044
Scenario 1: Fade Out

Urbanisation – Natural resource conflicts – Non-resident forest ownership – Even-aged forestry – Carbon sequestration – Northern inland abandonment

Following the strong urbanisation trend of the last decades, a sparse population remains with mostly elder people. The public and political interest in maintaining living rural northern inland areas have diminished. Living in Vilhelmina is less attractive for new inhabitants (including foreign migrants) due to labour and estate market shortages as well as insufficient infrastructure. Vilhelmina collaborates with neighbouring municipalities to maintain welfare services for schools, health care, and elder care. Establishment of small private enterprises is constrained by complex regulations and lack of investment capital. The tourism sector in Vilhelmina is not vibrant, because urban citizens prefer areas closer to their residence and infrastructure and services are poorly maintained. People do not travel long distances due to high fees on carbon dioxide emissions.

Sweden is facing hard competition from wood production in other parts of the world because of the long distance to industries and consumers combined with high fuel transportation costs. High quality timber is produced more profitably in other parts of Europe and China because these areas have high and intensive timber production with short rotation periods of fast growing species. Swedish forest companies now invest in carbon storage in the forest for climate change compensation reasons (keeping a high standing volume) and in alternative renewable energy.

There are a number of conflicts over natural resources in the Vilhelmina area, on both local and national actor levels, concerning, e.g., reindeer husbandry, mining, nature conservation, recreation values, wind power, and hydro power. Politicians on local, national, and EU levels have not been able to agree on a system for comparing forest values on a similar economic scale, leaving forest owners without compensation for taking actions regarding, e.g., social values. The reindeer herders are struggling to maintain the forest areas important for reindeer grazing and migration routes that are mainly threatened by wind power exploitation. Nature conservation has gained increased protection through international agreements, detailed regulations, and specified objectives and goals.

Most non-industrial private forest owners in Vilhelmina are non-residential, who either share their ownership with relatives or invested in forest land without personal connection. The majority hire consultants to plan and conduct forest management activities, so the forests are managed similarly according to even-aged forestry norms. Some owners sell their estate to companies investing in climate compensation.

Illustration: Charlotta Gard ©

Vilhelmina year 2044
Scenario 2: Rural Diversity

Multiple forest values – Entrepreneurship – Small-scale production – Local refinement – Countryside life quality

The Swedish forest sector has experienced a paradigm shift towards multipurpose forest management, grounded in both the general public opinion and in policies for sustainable natural resource management and rural development. People seek to live close to nature enjoying a quality of high life in the rural countryside, often spending their time both in cities and in the mountains. The interest in small-scale farming and self-sufficiency is growing. Hence, the municipality experiences a population increase. Attractive housing prices, infrastructure development, and broadband availability promote the settlement in rural areas. Tax regulation enables tax income from seasonal inhabitants. Vilhelmina is economically, culturally, and socially viable. Small-scale local enterprises connected to natural resources benefit from supportive legislation, and higher education is enabled through Akademi Norr.

Forestry in the region is directed towards provision of multiple ecosystem goods and services, which are locally refined. Forest planning is performed through public participatory processes. There are clear agreements for forest value trade-offs with an increased willingness to pay for recreational values, biodiversity, water quality, and carbon sequestration. The interest in forest products is significant, especially innovative wood products replacing plastic, metals, and concrete materials. Prices are high for all wood dimensions and qualities. Swedish production of hygiene products, textile, cartoons, nano-cellulosa, wood based chemicals, and construction material from wood fibre is consumed locally and nationally. Vilhelmina has sawmills and bioenergy industry.

Despite the active management of forests and a relatively high harvest level, there has been an increase in forest volumes of some 25 percent over the last 30 years. The estate value is equally high for wilderness areas as for production forests. Recreation areas are valued for their tree species diversity and a reduction of stems in the more actively managed forests. The consciousness on climate change effects, resilience mitigation, and risk adaptation is strong in the sector as well as by the more general public. Fossil fuels are replaced by sun, wind, and hydro power. Villages usually share a private wind mill.

Illustration: Charlotta Gard ©

Vilhelmina year 2044
Scenario 3: Reindeer Husbandry

ILO Convention No. 169 ratified and implemented –
Strengthened reindeer husbandry rights – Increased state forest ownership –
Exclusive wildlife tourism

Vilhelmina has maintained a population large enough to sustain social services. People want to live close to nature to a larger extent, and the interest in small-scale farming and self-sufficiency is growing. Infrastructure development and broadband availability enable people to work remotely and commuting to cities some days during the week or month. Small-scale local enterprises connected to natural resources benefit from supportive legislation. Forest tourism, reindeer husbandry enterprises, and small-scale forestry provide employment possibilities. Wildlife tourism and the Blaik Mountains National Park, local food production, cultural heritage sites, and exclusive accommodations attract foreign and national tourists.

Forestry in northern Sweden is characterised by multifunctional ideas, where quality timber production is adapted to reindeer husbandry, carbon sequestration, nature conservation, and recreational values. Large scale even-aged forestry has decreased following public opinion and EU policy demands. Profitable timber production from fast growing species is concentrated to southern Sweden or abroad. Forest land is increasingly state owned to secure multiple value considerations and to avoid conflicts. The awareness of climate change effects, resilience mitigation, and risk adaptation is strong in the sector and by the general public.

Sweden has signed and ratified the ILO Convention No. 169 on indigenous peoples' rights. The strengthened rights for the Sami people have been defined and implemented explicitly for reindeer husbandry, hunting, and fishing rights as regards to forestry. Adaptation to reindeer husbandry needs, mainly in the winter grazing land outside of Vilhelmina municipality, is the most significant change. These changes include reorganising migration routes and passages and calving lands. The Sami communities participate in decision making for land use in regular consultation procedures with all types of land owners and actors. The seasonal residential shifts between coast and mountain land for reindeer herders have been administratively simplified as one can register for the census in several places.

8.1.2 Quantitative scenarios

When the narratives of the qualitative scenarios were produced, the quantitative modelling phase started. We developed a set of potential forest ownership behaviours for each scenario and combined these with a set of forest management regimes, resulting in three quantitative scenarios where the effects on the forest landscape were presented in terms of ecosystem services output. This process and its outcome is the subject of Paper II, but will be summarised here. It is also partly described in the dissertation thesis by Trubins (2014).

The initial step of quantitative scenario development was to prepare the forest data. The description of the forest consisted of roughly 50,000 stands based on a combination of remote sensing data and national forest inventory (NFI) plots. Cadastral information made it possible to allocate all stands to each of the institutional owners (three companies, municipality, church, and commons) and non-industrial private forest (NIPF) owners as a collective. The second activity of forest data preparation was to make projections of almost all potential management options for each of the stands. (This was done by making the projection on the underlying NFI data and then linking the projection to the stand data). The projections were made with the Heureka forest planning system (Wikström *et al.*, 2011).

The development of a quantitative scenario looped through the following steps: (i) defining forest owner behaviour matrix; (ii) selecting the management options for the stands according to the behavioural matrix and additional criteria relating to transaction costs and amenity values; and (iii) computing and presenting the ecosystem services.

The behavioural matrix describes how forest management is conducted in the landscape and thus what outcome a scenario will represent. The matrix is composed along two dimensions: one representing the forest owner types and their share of forest ownership and the other representing the distribution of each forest owner type for each management regime. An example for the NIPF owners of the 'Rural diversity'-scenario is given in Table 6 (complete matrices in Paper II, which also includes the institutional owners).

Table 6. *The distribution of forest area and forest management regimes[10] on NIPF forest owner types for the 'Rural diversity'-scenario (%).*

		Forest management regimes						
Owner type	Area	LoAc	NaCo	InPr	LoRo	CCF	NoMa	Lodg
Economic oriented	30	0	10	80	0	0	10	0
Save for children	15	0	10	0	80	0	10	0
Nature conservation	15	0	70	0	0	15	15	0
Innovator	30	0	10	40	0	40	10	0
Boardwalk	10	0	10	40	40	0	10	0
Passive	0	0	0	0	0	0	0	0

The distribution of owner types is intended to reflect long-term management orientations. Each forest regime represents a recipe for what management options are available. For instance, LoRo (short for long rotations) and the final felling age has to be considerably longer than is allowed by the Forestry Act, and NoMa (short for no management) represents reserves and other set asides. Since the management regimes include several management options, the final choice was guided by a transaction cost based on harvest volume variation and an amenity value based on the age of the stand. The management problem was formulated and solved as a linear programming problem.

We have modelled the ecosystem services of harvested wood, standing volume, dead wood, deciduous area and volume, large coniferous trees, old forest, carbon stock, and the reindeer husbandry. The selection of ecosystem services was based on previous interviews and workshops in Vilhelmina. Expert judgement was then applied to set the quantitative level. Harvested wood should be regarded as a product rather than a service, but we wanted an output for timber production values of the landscape. The levels of dead wood, deciduous trees, and old forest are indicators that correlate with biodiversity and are positively associated with recreational and tourism values. Carbon storage relates to the service of carbon sequestration. The reindeer husbandry service sees forest management as a support for reindeer migration and grazing (enhancing less dense forests and more old forest with tree growing lichen).

[10] LoAc: Low Activity; NaCo: Nature Conservation; InPr: Increased Production; LoRo: Long Rotation; CCF: Continuous Cover Forestry; NoMa: No Management; Lodg: Lodgepole Pine.

Due to modelling constraints, we had to exclude analysis of wild life populations, hunting, and water quality indicators.

The scenarios ‘Fade out’, ‘Rural diversity’, and ‘Reindeer husbandry’ result in three rather distinct trajectories as regards to ecosystem services (a business as usual alternative, BAU, is included as a reference). Three examples are shown in Figure 7 (a complete set is provided in Paper II).

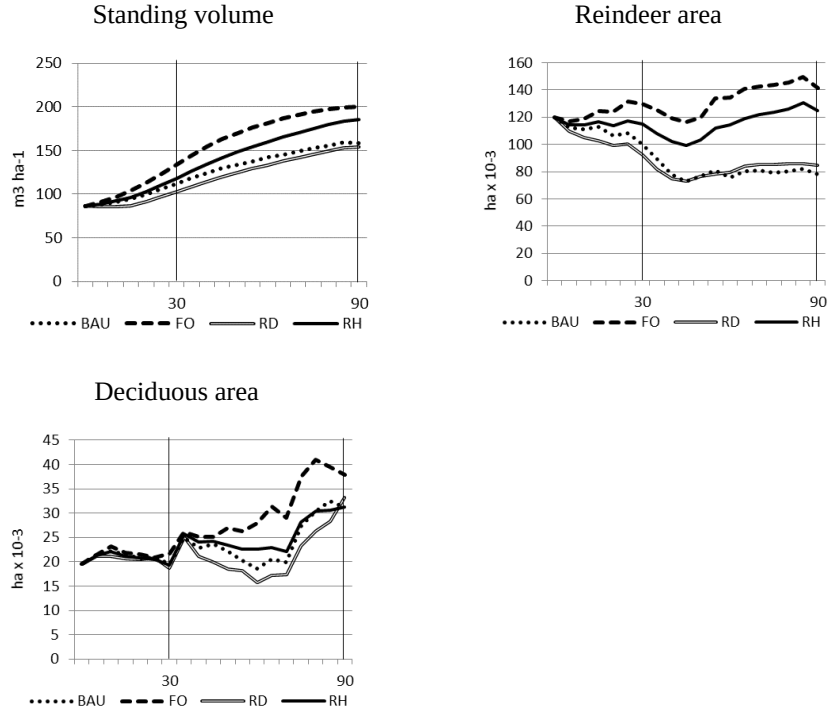

Figure 7. Proxies for some ecosystem services for scenarios Fade out (FO), Rural diversity (RD), Reindeer husbandry (RH), and the reference BAU over the time horizon (years 30 and 90 marked

The harvest activity in the landscape is reflected in the amounts of standing volume where ‘Rural diversity’ represents the most active and ‘Fade out’ the least active. The standing volume also shows that whatever scenario evolves the stocking level will increase; i.e., the harvests of all productive forest are below net increment. The tree layer carries many properties correlated with ecosystem services. This means that items like dead wood, large coniferous trees, volume of deciduous trees, and carbon storage follow the same trends in stocking level, indicating a positive trend in all cases. A less beneficial development can instead be identified in regard to the area suitable for reindeer

herding (defined as forest area older than 100 years) in the 'Rural diversity'-scenario. The area dominated by deciduous trees is also less prone to follow the stocking level. It also shows that it may take time before more substantial changes in the ecosystem take place.

8.1.3 Participant reflections on the scenarios

At the beginning of the focus group meetings in Vilhelmina (autumn 2014), the participants were asked to comment on the content and plausibility of the explorative scenarios.

The first scenario, 'Fade out', was considered to be realistic, plausible, sad, and scary – the "worst case" for the region. All four groups thought that the scenario described the present situation to a large extent, especially concerning the current urbanisation effects on the rural inland. It can be discussed whether this trend could realistically continue for 30 years without peaking and changing before that.

The second scenario, 'Rural diversity', was regarded as a description of a desired future for many of the participants with connections to the way earlier generations made a living from forestry and agriculture with small-scale forest management activities. The suggested paradigm-shift towards multiple forest values and collaborative planning was regarded as crucial aspects in order to reach a changed rural development policy, gaining a positive development of the survival for Vilhelmina as a community with high quality of life and employment possibilities connected to forest values. The plausibility of this scenario was considered both doubtful and hopeful.

The third scenario, 'Reindeer husbandry', was the most questioned regarding credibility because of old and deeply rooted conflicts in historical colonisation traditions and the current national political unwillingness to strengthen the indigenous rights of the Sami people. The plausibility of the scenario may be doubted regarding the extension possibilities for reindeer husbandry and wilderness tourism to result in increased sustentation. However, the largest critique was raised against the document of ILO Convention No. 169, which several participants (and later researchers) described as obsolete in the present work conducted by the Sami parliament regarding indigenous people's rights in Sweden. Instead, the Nordic Sami Convention, the Umeå Declaration 2014, and the Free Prior and Informed Consent are relevant documents to incorporate in the third scenario. Unfortunately, representatives from the reindeer husbandry and Sami people did not contribute with feedback on the scenarios or in the focus groups, although they were invited and contacted repeatedly before and after the workshop.

8.2 Normative scenario

The third phase of the research project aimed at developing a desirable vision (a normative scenario) of the forested landscape for the year 2044 together with local participants in Vilhelmina, followed by a discussion with national stakeholders considering what potential policy measures could be used to reach the local desired vision. The methodology for this phase is thoroughly described and discussed in Paper III and took place during the autumn 2014. Here, the methods of the participatory processes in local focus groups and a national workshop will be described briefly in connection to the results (the latter not being included in Paper III). The results in the form of a qualitative scenario narrative and lists of the locally desired goals and ideas for policy actions will be presented, including the participants' reflections and feedback on the final outcome, when all focus group contributions were compiled. From the national workshop, the outcome of the participants' policy suggestions is summarised. Lastly, the quantitative version of the local desirable vision will be shared, illustrating the future development of a set of ecosystem services, based on an assumed set of forest owner behaviour categories and forest management regimes.

8.2.1 Local focus groups

When my INTEGRAL colleague in the Helgeå case study area, Ida Wallin, and I started to plan the third research phase, we were inspired by Action Research, and more specifically Critical Utopian Action Research (CUAR), with its method for future creation workshops (see section 5.4.1). This approach encourages a participatory meeting where the participants would be inspired and motivated and provides participants a sense of achievement and a desire to develop their ideas even after the researchers have left; motives that we searched for in response to the previous workshop experiences. In addition, the CUAR method is a well-documented method and produces clear results. It also fit into our time limitations. The use of CUAR was supervised by Dr. Hans Peter Hansen[11].

The original task was to conduct a group workshop of 12-20 participants in each case study area. However, in Vilhelmina it was impossible to find one suitable date on which to gather a full group. Therefore, so that each participant would have a higher possibility to take part in the discussion (Kasemir, 2003; Rowe, 2004), we arranged focus group meetings (Krueger & Casey, 2009).

[11] At the time researcher at the Department of Urban and Rural Development, section of Environmental Communication, Swedish University of Agricultural Sciences.

The participants were selected through the previously made stakeholder analysis in earlier research phases, through contact with the Vilhelmina Model Forest network, as well as some snow-ball sampling. A majority of the participants had participated in earlier phases. Unfortunately, we did not manage to engage any representatives from the municipality steering board, from the reindeer herding village (two cancelled on short notice), from the largest forest owner company, or from non-resident forest owners.

Four focus group discussions were arranged with a total of 14 people representing various interests (Table 7), age groups, and professions. Originally, 16 people had signed up for the focus group meetings; however, four of them cancelled on short notice due to illness, work, or mix-up with dates. After the meeting, two people handed in written desired visions that were also incorporated in the final document and in the total number of participants (also included as participants in Table 7).

Table 7. *Representation of stakeholder interests in the local focus groups and in the national workshop. As several participants represented more than one interest, the total number of participants displayed in the table exceeds the actual number of participants, e.g., almost all the participants are forest owners themselves and take part in forest social values.*

Stakeholder types	**Vilhelmina**	**National**
Governmental organisations	1	4
Regional authority	-	2
Local authority (municipality)	3*	-
Forest authority	2	2
Forestry organisations and individual private owners	13	3
Forest industry (companies)	-	1
Forest entrepreneurs – timber or NTFP based	5	-
Non-governmental organisations	9	3
Specific user groups		
Outdoor recreation, hunting & fishing, mushroom & berry picking	14	-
Sami people and reindeer herders	1	1
Education and research	5	-
Actual number of participants	**14**	**15**

***** Three participants are or have recently been part of the municipal council, however not part of the council steering board (higher decision making level).

To stimulate creativity, remove barriers, open the focus for the common issue and to provide an alternative to the traditional indoor meeting room, the

meetings were held outdoors, in the forest (except for one group as the weather was not conducive for outdoor meetings). The aim was to create common grounds in a setting where the participants would feel safe to express themselves and experiment with ideas, with the "sky as the limit".

Each group meeting, which lasted for three hours, had the following agenda: to critique the present situation by referring to three examples of possible scenarios and (largest part of the meeting) to suggest desirable goals for the forest landscape of Vilhelmina as well as to suggest policies that would ensure these goals are accomplished.

The participants walked a short distance in a public recreation forest area, where several posters prompted discussion stops along the pathway. To begin with, the project and the agenda of the meetings were presented. Then the participants were asked to introduce themselves and to reflect on their relationship to the forest. To grasp the time frame of 30 years (which was to be used in the desired endpoint creation), the participants were asked to reflect on what they did 30 years back in time and where they thought they would be in life in 2044. In the next part, each of the three possible scenarios, represented by photo montage illustrations (see section 8.1.1), were discussed one at a time. This part corresponded with the Critique Phase in CUAR (see section 5.4.1), incorporating critique of the present situation as part of this reflection. The main part of the meeting consisted of brainstorming desires and visions about how a desirable future could look (Utopia Phase), and identifying what values are desirable in the forest landscape in Vilhelmina municipality in 2044. The participants were asked to brainstorm freely, with as little interference from the researchers as possible. That is, we did not want us researchers to steer the discussion, e.g., with particular ecosystem services terms. All the

Photo: Julia Carlsson

goals were documented on posters, which included both visions and goals but to a large extent also policy actions (the latter corresponding with the Realisation Phase). At the end of the meeting, the participants were asked to vote for the most important goals. The workshop meeting ended with hotdogs, a bonfire, and a written evaluation. The content of the evaluations is presented in section 8.3. Finally, the participants were informed about the coming research steps and dissemination of results.

The role of the researchers during the workshop meetings was to introduce the tasks, moderate the discussions, and take notes. The visions produced in the four groups were compiled into one vision statement and sent to all participants for comments and review.

8.2.2 Local workshop results – desirable goals and policy suggestions

The local participants suggested a wide range of desirable goals and policy measures. These are thematised and introduced with a short background partly derived from the Critique Phase.

Forest management

Participants criticised the prevailing clear-cutting silviculture system; they wanted silviculture practices to ensure that forests are not only regarded as an investment capital to use in other sectors but also as natural resource to be managed responsibly and sustainably, considering the visual effects of management activities and rural development. Soil preparation areas, clear cuts, and dense young and un-thinned forests are not regarded as visually attractive. In general, the participants preferred small-scale resident or close-to-resident owners, perhaps even regulating ownership through legislation, arguing that these owners are usually more engaged, active, and knowledgeable about sustainable forest management. They were worried about the present trend that non-resident people with large capital buying large forest properties, leading to a few large non-industrial private forest owners. These corporate owners, the participants believed, often view the estate as a source of money through hard clear cuts without reinvesting the profits in the local economy. In addition, the participants believed that new forest owners are mainly interested in hunting rights associated with the estate rather than forest management.

Regarding harvest activities, ecological and aesthetical consequences on a landscape level are negative when several neighbouring forest owners harvest at the same time to use machines efficiently rather than waiting for the best time to harvest, when trees are mature. Also, difficulties in soil rejuvenation impact growth negatively after large-scale harvests. Participants considered the

clear cutting system to be almost a legal requirement, but advocated forestry practices that also used alternative harvesting methods. Participants opposed that the general public are not involved in consultations on large clear-cuts close to their living area.

Desirable goals:

- Respect surrounding land, the local population, other sectors, and the local values associated with mountain environments.
- Encourage sustainable, considerate, and small-scale forest production.
- Plan forest land for multifunctional use respecting all user values equally by integrating multiple user values and management goals, and in some cases organising zones for specific purposes, e.g., old forests, energy forests, and recreation parks.
- Assess risk of forest management practices on climate change and adapt practices to lessen the effects of these practices on climate change.
- Plan clear cuts when natural conditions will ensure the least environmental impact, e.g., during winter as frozen ground decreases damage caused by heavy forest machines.
- Limit size and number of contiguous clear cut areas.
- Use forest machines in an environmentally-friendly way, including the use of several harvest methods and considerations to ergonomics.
- Use energy efficient forest technology and alternative non-fossil fuels.

Policy suggestions:

- Provide a local vision document that describes how all forest values should be managed and provides an overview for consequences of management decisions as they relate to how activities in the landscape and stakeholders impact each other.
- Establish constructive and structured consultation routines.
- Employee landscape coordinators – knowledgeable regional coordinators who watch and combine different interests, external factors, and complexities from a holistic perspective.
- Hire permanent staff for the Vilhelmina Model Forest.
- Allow for more types of management methods and tree species, e.g., fast growing species for energy production.
- Require an obligatory competence certificate and encourage forest owners to be residents in the municipality.
- Control clear cuts through the Forest Agency.

- Require wide buffer zones around estate borders so windblown trees will not fall on neighbouring lands.
- Use models to calculate climate change effects and trade-offs between multiple forest values.

Natural resources

Better knowledge needs to be developed about how natural resource interests conflict. Today, society is stuck in conflicts and long lasting processes that often need to be resolved by the Supreme Administrative Court. Competence and models for successful collaborative decision making processes need to be developed.

Also, EU regulation regarding meat production and slaughter procedures are not adapted to mountain areas in Sweden. The administration is demanding for local small-scale slaughter houses. Distances to slaughterhouses are 400-500 km, so animals are re-reloaded to new trucks to make the transport legal.

Participants argue that the understanding of forest values is grounded during childhood, stressing the need to increase the time children spend in the nature.

Both reindeer herding Sami and non-reindeer herding Sami people have been without rights to land and without legal recognition as an indigenous people. Sweden has not ratified the ILO convention No. 169. One people, the Sami, have had two different regulation frames to follow, as the state has separated Sami people owning reindeers from those who do not. The definitions of the ethnic groups are problematic, resulting in conflicts.

Reindeer husbandry is an important part of the Sami culture, but Sami rights and culture cover much more than reindeer husbandry. In turn, reindeer husbandry must be able to exist as an industry. Although the number of reindeer has not changed much, the forage available for the reindeer has decreased dramatically. This reduction in forage is mainly due to timber production activities limiting the supply of lichens.

Desirable goals:

Biodiversity:

- Increase biodiversity protection and restore nature forests.
- Increase mixed-ages and mixed-tree forests to limit pest attacks, protect against drought, decrease fire risks, improve biodiversity, and address social values. This strategy will also provide a robust buffer against extreme weather situations and climate change.

The landscape:

- Educate people about the inter-connections between the ecosystem services and the landscape.
- Increase agricultural and meadow land.
- Ensure forest landscape is visually attractive.
- Require that forest recreation values are available to the resident population and tourists.
- Establish well-functioning year around tourism sector.
- Fully develop the Kittel mountain area.
- Protect certain areas from snow mobile driving.
- Provide children the opportunity to spend time in nature.

Water:

- Promote high water quality and water management/conservation.
- Educate forest owners about the value of buffer zones.
- Require efficient use of extended watercourses for hydro power.
- Ensure water resources (rivers, lakes, etc.) to be available as recreation areas.

Sami people and reindeer husbandry:

- Ensure Sami's rights to self-determination regarding their economic, social, and cultural development as stated in the Nordic Sami Convention.
- Ensure that the forage supply for reindeer is sufficient and use the reindeer husbandry plans as a basis for well-functioning consultation dialogues between different stakeholders.
- Adapt forestry practices that make it possible for reindeer to easily pass through forest stands.

Policy suggestions:

- Increased possibilities for small-scale animal farming and a local dairy production keep the landscape open (not overgrown). Mobile slaughter facilities or possibility to slaughter many species in the same local slaughterhouse are suggested.
- Hunting tourists are required to have guides.
- Maintain hiking trails in good condition.
- Ensure, strengthen, and encourage the rights of the Sami people so they have unfettered access to their traditional lands as stipulated in the Nordic Sami Convention.
- Allow the Sami parliament to influence decision making concerning Sami rights, culture, natural resources, and land use from the local to the

international level and ensure Free Prior and Informed Consent is always implemented in all issues concerning the Sami people.

Rural development

Northern Sweden is seen as a stock of natural resources to be used for the national interest and welfare development rather than in the interest of regional and local development. Revenues from, e.g., hydro power production in northern rivers are not reinvested locally as originally intended. Sweden has built up regulation supporting a centralised structure, "abandoning" the northern inland rurality. As in Norway, where resident local and regional forest ownership and energy production are supported, participants wanted support for rural development.

Vilhelmina has struggled with decreasing population for decades. Especially, young women are moving away. It is important to support the comfort and well-being of the present inhabitants and not only to focus on attracting newcomers.

The local interest for small-scale self-sustentation on forestry and agriculture is increasing. The possibility to make a living is a precondition for rural life, which can only be realised if you work with another employment or activity that can finance self-sustentation. There is will and interest, but no economic security today, partly due to agriculture and small entrepreneur regulations, rural development politics, strong urbanisation, and centralisation in Sweden during the last decades.

Desirable goals:

Demography:

- Strengthen self-determination possibilities in rural parts of northern Sweden (in contrast to the use of centralization and large scale regulations).
- Establish well-functioning social services and encourage a spirit of cooperative aid and comfort.
- Require the Vilhelmina municipality to develop policies and services that improve and encourage cultural experiences so they enjoy living in Vilhelmina.
- Provide services that will encourage young women to live in Vilhelmina municipality.

Local refinement and sustentation:

- The profitability is high for forest raw material and high quality forest products. New markets and new forest products have been developed. Raw material is refined locally. There are several small-scale local saw mills.
- People can earn a living on local natural resources, small-scale farming, and local refinement. Distance work is combined with self-sufficiency from agriculture and forestry. There are small enterprises providing products and services connected to nature resources, e.g., refinement of wood raw material, local food production, tourism guiding, web-based service enterprises, and local and Sami culture.
- Vilhelmina municipality is self-sufficient with respect to food production.
- Food products from the forest have high quality (no pollution or pest).
- Fishing resources are used by locals and tourists.

Education:

- The population in Vilhelmina has a diversified knowledge and education background.
- There are possibilities for higher education in the interior northern Sweden.
- Distance teaching and digital tools enable high quality in all education levels.

Infrastructure and energy:

- Solar panels provide electricity and warm water for the households during summer.
- The forest common provides household wood fuel used in energy efficient furnaces with low carbon dioxide emissions.
- Households can produce their own electricity in case of being disconnected from the electricity grid during extreme weather events.

Policy suggestions:

- Technological and research developments have resulted in new wood products such as construction material, products from lignin, wood textile, and medicine. These enable a profitable small-scale forest refinement industry.
- High quality Swedish forest products strengthen competitive skills and profitability.
- Laws and regulations are simplified for small-scale entrepreneurs.
- Small-scale entrepreneurs share common administrative coordinators who operate many services: corporate revision, contact with authorities, and paper work.

- Employer-fees are lower the further north in Sweden employers are located. There is an investment fund and development corporation that supports small-scale local entrepreneurs. Local banks focus on the individual and works in the interest of rural development.
- There are natural resource funds dedicated to conservation and sustainability for rural areas.
- Local politics are coordinated in personal elections without political parties.
- Interaction occurs between neighbouring villages, across and within municipality borders.
- Real estate tax is paid locally where the estate is situated, not where the owner lives permanently (if non-resident forest ownership still exists).
- Akademi Norr secures higher education opportunities.
- Research and education are conducted close to the location of the natural resources in question. There is a centre for research and development of the forest landscape in Saxnäs, connected to nature reserves in Marsfjällen and a geo park.
- Infrastructure for common electricity for railways, road networks, and aviation are well developed.
- A fast train runs between Umea and the Norwegian coast.
- Internet access and 3D-technology enable virtual meetings and doctor visits.

8.2.3 The Desired Scenario Narrative

Desired Vision of Vilhelmina year 2044
"Living Countryside, Forests, and Mountains"

In year 2044, the Swedish forestry has experienced a paradigm shift from a domination of even-aged forestry to a diversity of forest management methods that promote many equally-valued interests connected to forests. The shift was initiated by public opinion, political efforts in rural development, and goals on sustainable use of nature resources. Living in the countryside provides a high quality of life. People spend more time in nature regardless of the season, a life style that benefits personal health and wellness and promotes an understanding of nature's values. Forests are seen as pantry, pharmacy, and raw material supplier. Private forest owners are mainly residents of the municipality or live close to their forest estate, with good opportunities for self-employment connected to natural resources. Forestry practices consider multiple interests with a focus on how forest resources can benefit Vilhelmina with local refinement of forest products and services. Legislation and technology shifts have enabled profitable small-scale and diversified forest management. Forest resources are managed through local planning with citizen influence and participation. There are agreements for how different forest values co-exist on a market with an increased willingness to pay for using recreational values, biodiversity, high water quality, and open landscapes. Economic revenues from natural resources are reinvested in the local area. The Nordic Sami Convention and new consultation arenas within certification schemes have strengthened the rights of the Sami people and reindeer herders. There is a wide interest in the Sami culture and tradition. There is a strong awareness regarding climate change effects and needs for risk adaptation in the forest sector and by the public. The technology development has enabled a more efficient energy use based on renewable energy sources. Vilhelmina is a strong viable community with thriving, diversified, and well-educated inhabitants.

Photo: Mikael Damkier ©

8.2.4 Participant reflections on the desired vision

After compiling the goals and policy suggestions from all four focus groups, a document was sent to all participants, including those who were invited but had not been able to participate. Five people of the twelve who participated sent reflections via e-mail, mainly confirming that they recognised their own contributions and acknowledged and supported the vision. Two people who cancelled with short notice made their own vision or commented on the document and these reflections were incorporated in the final document.

For transparency, some main issues of the critique will be highlighted here, which are of interest for the reliability of the vision. The largest concern, questioning the vision, relates to dramatic climate change, which is expected to result in more storms (wind damage in forests) and warm and wet winters (hence shorter or no periods of frozen ground, disabling winter harvesting activities) in Vilhelmina. Global impacts on the economy, on climate refugee migration, and on agricultural land are seen as important issues also for Vilhelmina, natural and demographic changes that demand a better ability for food and energy self-production. One participant wanted to emphasise the Sami and reindeer herding part in the vision, whereas one participant opposed putting certain groups in an exceptional position.

8.2.5 National workshop

The national workshop was held at the Royal Swedish Academy of Agriculture and Forestry in Stockholm as a full-day program, 10 am- 4 pm, in November 2014. The workshop was facilitated by a group of five researchers.

The objective of the national workshop was to gather national policy-makers and forest stakeholders to discuss how the local visions of Vilhelmina and Helgeå case study areas meet the need of ecosystem services production on a national level and to suggest robust policy actions needed to reach the desired endpoint. The workshop used the Chatham House Rules[12].

Thirty potential participants were invited, of which 18 officers signed up to participate. Three persons cancelled on short notice. The following authorities and stakeholder groups were represented:

- County Administrative Board, Dalarna
- County Administrative Board, Västerbotten
- Department of Rural Affairs

[12] When a meeting, or part thereof, is held under the Chatham House Rule, participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed. See more at https://www.chathamhouse.org/.

- Forest company Bergvik Skog (two persons, one cancelled)
- Forest company SCA
- Forest owner economic association Södra
- General secretary, Swedish Forest Agency (cancelled)
- Ministry of Environment and Energy (cancelled)
- Swedish Agency for Marine and Water Management
- Swedish Energy Agency
- Swedish Environmental Protection Agency
- Swedish Forest Agency, officer representing sector- and national environmental objectives
- Swedish Forest Agency, officer from the Vilhelmina district
- Swedish Society for Nature Conservation
- The Federation of Swedish Farmers (LRF), Forestry section
- World Wide Fund for Nature, WWF (two persons)

Unfortunately, the invited politicians and department officers were unable to attend. Representatives from the Sami parliament or reindeer husbandry sector were not invited, since the conflicting interests between reindeer husbandry and forestry are rather specific and was considered an extensive issue that could not be handled adequately within the scope of the workshop day. This argument was also the case regarding energy sectors and the mining industry.

The participants received the local visions from Helgeå and Vilhelmina in advance. During the workshop, the participants were asked to select the five goals (in total from both Helgeå and Vilhelmina visions) that they considered to be the most important or critical goals when creating a national forest strategy. The selected goals were sorted into six themes: Ecological considerations; Profitable forestry; Living countryside and multiple values; Administration; Social values consideration; and Climate. Thereafter, the task was to suggest policy actions in a wide perspective of actions – legislative, economic, informative, dialogic, and cooperative. The suggested policy actions were directly typed into the Office software *Vision* and projected to be visible to the whole assembly.

The workshop ended with some final reflections, presented in section 8.3.3. At the end of the meeting, the participants were informed about the coming steps in the research process. A document of detailed minutes was sent to the participants a couple of weeks after the meeting. At this time, they were also asked to complete a web evaluation questionnaire.

8.2.6 National workshop results

The national workshop aimed to suggest policy actions for reaching the local visions of the forested landscapes. However, the focus quickly turned from direct forest-related issues to rural development, illustrating the complex and challenging connection between forest policy and other policy sectors.

Three themes were chosen for discussion and for policy suggestions. The first theme regarded ecological considerations for water quality specifically. The policy suggestions here concerned the need of cross-sector agreements, the use of comprehensive plans for entire drainage areas (digital and in real time), the increase of knowledge and information on mercury issues, the need for fees for restoring soil and ground damage after forestry activities, and the need for sanctions for failure to fulfil fundamental regulations, which should be as clearly defined as possible.

The second theme considered profitable forestry. The following issues were discussed: fees and taxes for carbon dioxide emissions; subsidies for forest road maintenance; the need of higher valuation of renewable energy and material by the public opinion and society in general; the need of increased knowledge and understanding among consumers for certified wood products as well as the need to balance the profitability of native certified timber production with imported ditto; the establishment of new markets for forest products; the need of larger research grants for development of new forest

Photo: Julia Carlsson

products and innovations; and the implementation of the National Forest Program.

The third theme discussed possibilities for a vital countryside and multi-functionality. The participants argued that strong policy actions are needed to interrupt the urbanisation trend and to sustain rural areas: maintaining social services; increasing opportunities for wood refinement enterprises; using forestry as a base in bio-economy; providing rural residents subsidies; expanding the 4G cellular network in rural areas; supporting employment possibilities and working from a distance; and establishing a better energy grid between urban and rural areas.

Some general governance related issues were also discussed, considering the need of collaborative planning processes, where holistic overviews and transparent trade-offs are kept in cross-sectorial co-governance and co-management of ecosystem services on landscape levels, supported by, e.g., free GIS-tools for all actors. Many questions were raised: Who would have the mandate to operate landscape processes? How should they relate to other processes and tools? How can forest owners and stakeholders be motivated to take part in such a process and expand their influence? In what way is the sectorial planning problematic for reaching a landscape planning perspective? What role should forestry have in a rural landscape? How can sectors interact on local and national levels? The importance of reinvesting revenues from local forest products and natural resources locally as well as of incorporating forest resources in municipal comprehensive plans was stressed.

8.2.7 Quantitative normative scenario

The normative scenario uses exactly the same forest data as the explorative scenarios, i.e., the stand descriptions based on a combination of remote sensing data and NFI plots as the input data to the projections made by the Heureka planning software system. The difference of the normative scenario from the explorative scenarios is that the former tries to find the management that provides functions, services, or benefits that are as close as possible to desired values. The reference point in time was set to 30 years from now. The ecosystem services that were modelled are presented in Table 8. Indicators that correlated in similar ways were excluded, compared to the ES in the explorative scenarios. For instance, large coniferous trees were closely correlated with dead wood and excluded.

Since the desired values refer to a specific point in time, management could be adapted to meet the desired values in a way that would not be very realistic, especially as concerns harvests. To ensure that the results maintained some

degree of realism, harvests were required to be on the same level as in the BAU scenario in the first period and then to change with the same amount over the period until year 25, and from then on to be non-declining.

The other anchorage for the analysis is expressed in a forest owner behaviour matrix. The assumption here was that the less management deviated from current management, the easier it would be to implement policy measures that initiate change. Thus, the task to find a desired path to year 30 would consist of two elements: one to come as close as possible to the desired values and the other to deviate as little as possible from the behavioural matrix (measured in hectares). Each of the ecosystem services and the behavioural matrix elements were normalised. The problem was formulated and solved as a goal programming problem. Tests were made to find weighting of the two elements (behaviour matrix deviation and desired value deviation) so as to find a suitable solution between the extremes.

The results indicate that it is possible to arrive at a management that will satisfy reasonable demands for most ecosystem services. The preponderance of services favoured by increased stocking levels makes the solution more inclined to satisfy those items rather than those favoured by harvest activities. These items are included in the biodiversity and, to some extent, the recreational indices. The target that is most unsatisfied in relative terms is harvested wood.

This may be less beneficial from the point of view that a major concern is the work opportunities in the municipality. However, increasing harvests could harm other values of importance for the tourist industry. This illustrates the need to balance the different ecosystem services before finding proper forms to realise it.

A summary over forest owner types of the different management regimes indicates that not much reallocation is needed between regimes. For comparison, the NIPF owners and their management behaviour, based on the BAU distributions, are presented in Table 9. Larger differences between the current and the desired alternatives matrices are identified for individual forest owner types, but the need for change is still comparatively small. The picture might change if the economic value were introduced as a third element in the equation.

The reallocation of management regimes was comparatively small, amounting to a total of about 40,000 hectares. The largest changes were a reduction of long rotations and low activity management and an increase in a reindeer herding adapted management. To some extent, the result was due to a priority to establish forests that improve reindeer migration (i.e., thinned

forests) rather than forests that provide forage during spring migration (i.e., old and denser forests).

Table 8. *Current values of ecosystem service indicators and the desired level in relative and absolute values and the attained values.*

Ecosystem service	Sort	Current level	Desir. level (abs.)	Desir. level (rel.)	Attain-ment
Harvested wood	$m^3\ ha^{-1}y^{-1}$	1.10	3.00	-	2.00
Dead wood	$m^3\ ha^{-1}$	10.44	12.53	120%	129%
Deciduous area	ha	19,535	23,442	120%	120%
Old forest	ha	50,766	60,919	120%	120%
Carbon stock	ton C ha^{-1}	86	104	120%	120%
Reindeer area*	ha	160,865	193,037	120%	111%

* The definition is slightly different than in the explorative scenarios; here the focus is more on migration as such than on forage during migration.

Table 9. *The distribution of forest area and forest management regimes on NIPF forest owner types for the BAU-scenario (%).*

		Forest management regimes						
Owner type	Area	LoAc	NaCo	InPr	LoRo	CCF	NoMa	Lodg
Economic oriented	51	0	0	95	0	0	5	0
Save for children	28	0	0	0	90	5	5	0
Nature conservation	7	0	65	0	0	20	15	0
Innovator	0	0	0	0	0	0	0	0
Boardwalk	0	0	0	0	0	0	0	0
Passive	14	65	0	0	0	5	30	0

8.3 Evaluations of participatory processes

The last part of this chapter will present the evaluation of the participatory processes from both the explorative and the normative scenario development phases. The local participants were asked to complete written questionnaires, and the national workshop participants were asked to complete a web questionnaire. The response rates were 100% for the explorative scenario workshop, 85% for the local focus groups, and 53% for the national workshop web evaluation. These evaluations are presented and discussed thoroughly in Paper I and III, where graphs illustrate the quantitative grading questions. Here, a summary will be offered, since these evaluations are important parts of the result of this research in participatory scenario analysis.

The evaluation questionnaires were developed and formulated in preparation for the workshops, although they were not initially connected to any specific theoretical framework. In Paper III, we chose to evaluate the participation based on the four norms of Communicative Action (Forester, 1980) combined with criteria from Menzel et al. (2012): comprehensibility, sincerity, legitimacy, truth and institutionalisation.

Generally, the evaluation questions considered the following aspects of the workshop's potential to stimulate learning, knowledge exchange, trust-building, and decision-making: the quality, meaningfulness and performance of the different tasks during the workshop; the ability to participate as intended and satisfaction with results; representativeness, whether the workshop task could be used to bring research and practitioners together; and information quality provided before the workshops. The questionnaires contained 12 questions combining grading, multiple-choice, and written answers, and are attached as appendices in paper I and III.

8.3.1 Evaluation of explorative scenario workshop

In this workshop, the participants were asked to discuss and vote for the most important factors influencing the future forested landscape as well as to indicate the factors' internal relation to each other (see Paper I section 3.2 on the structural analysis). This participatory part of the scenario development was evaluated regarding its potential to combine scientific and stakeholder knowledge. The process mainly aimed to gather information and opinions from the participants to the researcher team rather than to establish a two-way exchange.

Overall, most participants found that the workshop enhanced learning and knowledge exchange and trust building, qualities that could potentially improve decision-making processes. In addition, they found that the discussions had been meaningful: they contributed to the dialogue as they

desired and they were able to address local interests adequately. They noted that the information about the workshop provided beforehand was satisfactory. They wanted more time to deliberate deeper on the complex topics, a strategy that might also enhance trust and understanding of other participants' perspectives. The voting procedure seems to have worked well; however, the agreement of the definition of the factors could have been elaborated better. The part called structural analysis, comparing how different factors influence each other, was considered too technical and not the best use of the workshop time. Preferably, the researchers should have compiled the structural analysis themselves, focusing the workshop on discussion time and more scenario brainstorming, for instance, allowing participants to discuss potential manifestations of factors, as was the approach in studies by Walz et al. (2007) and Reed et al. (2013). Because conducting participatory scenario development is time-consuming (Höjer *et al.*, 2011), it is essential to ensure that the process has a meaningful value for the participants, who often contribute with their time and interest on voluntary basis, and provides possibilities for thorough discussions and knowledge exchange.

In summary, discussing future development of the local landscape was considered meaningful and constructive by the participants, helping them focus on shared interests and possibilities rather than conflicting discrepancies.

8.3.2 Evaluation of local focus group meetings

The task in the focus group workshops was to criticise the present situation by referring to three examples of explorative scenarios and to suggest desirable goals and possible measures for the forested landscape of Vilhelmina.

The information and summaries of the explorative scenarios were regarded as sufficient pre-information. The opportunity to have the meeting outdoors was highly appreciated, described as nice, relaxed, and enjoyable, stimulating creativity and idea storming, giving a variation to all indoor meetings.

The discussion of the explorative scenarios was considered interesting, instructive, well prepared, and constructive, addressing both obstacles and opportunities. This discussion was seen as an opportunity to both reflect and unite the group, as several participants shared thoughts with one another. Some respondents mentioned the challenge to focus on the future rather than the present. The next part of describing a desirable endpoint was also positively perceived. It was described not only as fun, stimulating, considerate, creative, and democratic, but also as difficult and challenging, especially when thinking outside of usual patterns and considering utopian scenarios rather than realistic ones.

The participants believed to a high degree that they had been able to take part in the discussions as desired, and the discussion quality was also valued as high and meaningful. The mix of representation and age was acknowledged particularly in one group. The discussion had increased trust and familiarity with colleagues, fostering a respect for other people's opinions. The importance of communication and knowledge exchange was stressed, which the workshop was considered to have contributed to. Having discussions in small groups was highly appreciated as it gave everyone space to fully take part and feel included. The two groups with participant cancellations understandably desired a larger group. Some participants regarded five people as optimal, whereas some suggested seven to ten people as that number of participants would better be able to represent gender, age, and opinions. The representation was understood to be restricted in small group settings.

Overall, the participants were satisfied and inspired by the meeting, describing the workshop as interesting, clear, transparent, well planned, illustrating both problems of today and suggestions for solutions, stimulating learning and knowledge exchange.

8.3.3 Evaluation from national workshop participants

National policy-makers and forest stakeholders were gathered to discuss how the local visions of Vilhelmina and Helgeå case study areas meet the national need of ES production and to suggest robust policy actions to reach the desired endpoints.

The pre-information was regarded to be sufficient. The workshop was considered to enhance possibilities for knowledge exchange and increased understanding to a rather large extent. The number of participants and the representation of relevant interests were considered good; however, the local connection could have been improved. The participants had been able to take part in the discussions as desired. The discussion was regarded as an opportunity to have a conversation rather than a debate. The workshop had provided new insights and inspiration, e.g., around regional development, the view on policy actions, and the role of governance institutions. The workshop design was considered to have potential to bring research and practice closer, an interactivity that was deemed important for actual decision making. However, criticism was directed towards the workshop method performance and structure. The first task to choose among the local desired goals and suggest additional ones was regarded as meaningful and interesting by a majority of participants. But the second task discussing policy actions to reach desired goals was tentative and obstructed due to time limits, unclear goal definitions, weak background knowledge, and vague instructions and guidance.

The respondents mentioned similar workshop methods (e.g., Sandström *et al.*, 2016a) that had worked out better. The group was unable to discuss and reach consensus on what goals to focus the policy discussions on properly.

9 Discussion and conclusions

This thesis has departed from the ultimate aim of how to achieve sustainable development in the rural forested landscape context by exploring how future scenario analysis can support forest resource management in order to address the need for participatory governance procedures and integrated landscape planning. This aim has been addressed by engaging local forest actors in discussions concerning the future of their forested landscape and community in Vilhelmina municipality. First, an interview study investigated factors that are important for forest owners and stakeholders in their forest management decisions and their views on the role of forest values and actors. Next, explorative (possible) and normative (desirable) scenarios were developed and presented as narratives and models of ecosystem services assessment, by combining qualitative and quantitative methods. The thesis includes four scientific papers. The first three papers discuss the performance and usability of scenario methods and the fourth discusses the need and opportunities for implementing integrated landscape planning in the Swedish forest sector. In the following chapter, I will discuss my main findings in connection to the research questions, the papers and the challenges regarding rural development, governance needs, and participatory scenario analysis methods.

9.1 Addressing the research questions

The first research question concerns if and how scenario development can be a constructive tool to facilitate discussions about the common forested landscape among forest actors, shifting the focus from individual interests to a landscape perspective to create new perspectives on future possibilities and desires. I argue that both the explorative and the normative scenario processes proved to be functional and creative exercises in this sense, given that methods are

adjusted to facilitate and secure the quality of the participatory elements as much as possible.

In the first workshop, which prepared for the development of the explorative scenarios, the participants found that discussing the factors that influence future development of the forested landscape was meaningful and constructive, helping them focus on common interests rather than conflicting opinions (Paper I). The combination of using stakeholder and scientific knowledge in a scenario development process such as ours provided useful information to build upon. However, we discovered it was difficult to find the balance between using rather technical methods and models (the structural and consistency analysis) and providing the most beneficial incentives for the participants. The technical procedure was based on the INTEGRAL methodology guidelines to create comparative data from all case study areas. In my opinion, this process did not give the participants an optimal space for discussion, learning, and knowledge exchange. Also it did not clearly enable the participants to create scenarios. Their contributions were rather indirect as they provided their views in interviews and through workshop voting procedures, compared with other participatory scenario development studies, where the workshop time was more focused on scenario creation and discussion (Walz *et al.*, 2007; Soliva *et al.*, 2008; Volkery *et al.*, 2008; Carvalho-Ribeiro *et al.*, 2010; Palomo *et al.*, 2011; Palacios-Agundez *et al.*, 2013).

In the combination of stakeholder and scientific knowledge, my reflection is that a higher weight was given to the scientific input. The reasons for this were mainly practical. A process based on qualitative methods in a series of workshop, which could have focused more on stakeholder input and discussions, would have been much more demanding in terms of time and resources for the stakeholders as well as the researchers. In a small community, stakeholder representatives are often involved in many projects and are very busy. Several of the participants in our study were small-scale entrepreneurs who needed to prioritize their business before voluntary engagements. To provide the participants with economic compensation for their time would be one way to create better preconditions for more intensive stakeholder involvement. Such a process could be useful for establishing a platform that include local stakeholders around a common future and stimulates social network building, knowledge exchange, and values of democracy.

Ideally, scenario analysis should be an on-going dynamic process of continuous deliberation between local stakeholders and decision-makers, enabling the creation of important participatory criteria such as building trust,

legitimacy, and a sense of ownership in the process (Keough & Blahna, 2006; Reed *et al.*, 2013). However, if the involvement of stakeholders mainly serves to provide researchers with knowledge about mapping landscape values, it is not very different from the understanding that the researchers can gain by actively working in the area themselves, a conclusion that Malinga et al. also made (2015).

In the second workshop round, where the local participants discussed the explorative scenarios, criticised the current reality and suggested desirable goals, the outcome quality of the participation elements was higher. The resulting normative scenario largely reflected the participants' input, as it was a compilation of the visions of the four focus groups. The local participants considered the exercise useful and rewarding, for enhancing learning and knowledge exchange, for broadening perspectives, for uniting the understanding of the common reality and future challenges (both between the participants and between researchers and practitioners), and for resulting in a concrete vision. All these gains are important steps in the creation of more accurate and policy-relevant knowledge (Fortmann & Ballard, 2011).

Regarding the national workshop part of the process, the result was less successful. The assignment to link the local visions with the national policy-making level proved deficient, since the national participants did not fully legitimise the local goals and criticised the workshop performance and design. Although both the local and national participants stressed the need for increased collaboration and knowledge exchange in multi-level governance processes, it proved difficult to step out of the traditional top-down perspective on policy-making and understanding of local level management (Paper III). Ideally, extended face-to-face meetings assembling both local and national participants could have made it possible to overcome these deficits and sincerely provided opportunities for sharing views, knowledge, and perspectives on the dynamic between local realities and national policy-making in all levels of forest resource management (Pinto-Correia *et al.*, 2006). However, such a setup is resource demanding, requiring generous time for participants to get to know each other, build trust, and create healthy dialogue. Therefore, economic compensation for participation may be needed in order to create a meaningful process and motivate participants to use their time (Robinson, 2003).

Paper III illustrated and confirmed that it is a challenge to bring policy-makers closer to local actors although the participants desire to create collaborative processes on all levels. Yet, linking multi-level participatory processes is the key to successful forest policy (Secco *et al.*, 2014).

By these statements, the answer to the second research question can be formulated. Combining landscape and future studies approaches have contributed to illustrate the institutional complexity and provide understanding for the challenges of bringing together local realities and national policy-making procedures. I therefore unite with the large group of scientists and practitioners who have described the potential in scenario analysis to support robust and sustainable decision-making through its suitability for engaging participants (see chapter 5), as well as the research community advocating for the need of integrated landscape planning (see chapter 4).

The use of a cross-sectorial landscape perspective and the use of scenario analysis may significantly inform multi-level governance processes aimed at fostering all elements of sustainable development in the rural context. In particular, there is a great potential in the participatory action research approach for facilitating deliberation among researchers and stakeholders to establish a stronger common ground and internalise multiple values in forest management and planning. Through the development of scenarios, it is possible to actively discuss key features or functions of future landscapes, what a desired landscape might be, and what is needed to achieve these desires. The creation of scenarios – e.g., through the CUAR method (see section 5.4.1) – can also move the focus on where we want to go instead of what we are losing, emphasising the "dynamic process of landscape" rather than "the product of landscape" (Dramstad & Sundli Tveit, 2016).

To answer the third research question, I find it highly relevant to combine qualitative and quantitative methods to project and illustrate potential as well as desirable future development on the landscape level. It is important to give qualitative and quantitative methods equal status, as qualitative methods have historically not been acknowledged as valid or equivalent but have been regarded as complementary to quantitative data in the positivistic tradition (Hesse-Biber, 2010). The mixed-methods approach enables a more comprehensive overview of complex socio-ecological systems, assessing higher validity through the use of multiple complementary methods (Cheong *et al.*, 2012). However, it is challenging for one researcher to master both methodological disciplines. Therefore, the need of researcher collaboration in interdisciplinary and transdisciplinary communities is crucial in order to provide the most accurate and well-supported research results (Tress *et al.*, 2006).

During the quantitative scenario modelling work, we identified some challenges regarding how to translate qualitative data to quantitative data. It was a demanding task to match the complex forest owner type categories with

complex forest management regimes in order to reflect the explorative and normative scenarios as representative as possible (Paper II). This difficulty had to do with the rather ambitious effort to reflect the diverse forest ownership structure as closely as possible, to avoid over simplifying the situation.

As we conclude in Paper II, we faced several challenges in modelling ecosystem services. First, it was difficult to consider all relevant ecosystem services that were included in the scenario narratives. The forest planning system Heureka, used to model the forest landscape scenarios, did not contain models specifically related to e.g. forest social values and water quality. This limitation is problematic when it comes to assessing ES, analytical tools and methods for multifunctional planning. Spatial aspects, an important factor in the assessment of many ES, were also problematic to model. In Paper II, the model produced results for ecosystem services in terms of average output on landscape level rather than spatially explicit results for provisions of ES in certain areas in the landscape, such as specific forest estates.

Furthermore, communication of complex models and modelling assumptions is challenging, but it is important to present transparent and intelligible output to the public, policy-maker and scientific community. In this sense, Heureka could be improved. The ES concept in itself is ambiguous and a consensus-based definition is missing, which obstructs its suitability in both modelling and communication. Lastly, it is important to keep in mind that when modelling forest ecosystem values for a longer period, the attitudes and preferences regarding those values will most likely change during the long rotation period of 80-120 years in the boreal forest. Still it is highly viable to investigate how constructive discussions between stakeholders and policy-makers can be supported through quantitative modelling tools and how this may support local governance of the forested landscape.

To address the fourth research question, I investigated what approaches and tools that could be developed to support participatory aspects in forest planning and management. A highly engaging issue among the participants is how forest policy and management could be developed to better meet the local needs in Vilhelmina. In addition to the scenario analysis methods that have been explored in this thesis, in paper IV we suggest three opportunities for the implementation of an integrated landscape planning approach: a landscape coordinator, the use of a collaborative network arena, and the development of the forest management plan. The Model Forest concept, where local stakeholders representing a broad range of interests discuss sustainable development of the common landscape, can support a holistic and integrative landscape approach, connecting the local forest resources to the socio-cultural

context. Both papers III and IV conclude that collaborative processes for uniting stakeholders on the local arena are crucial.

9.1.1 Limitations

Some limitations to the research study should be pointed out. Unfortunately, the representation is seldom perfect in participatory processes, neither was it in my study. The initial stakeholder analysis can be considered satisfactory. It was, however difficult to get in contact with the key persons and engage representatives from the reindeer husbandry and Sami communities, members of the municipality board, and representatives for nature conservation interests, although these actors were invited and contacted repeatedly. The most probable reason for lack of participation can be connected to the fact that four similar research projects were ongoing in Vilhelmina municipality at the same time. In such a small community with few inhabitants, stakeholder representatives are few and busy. "Stakeholder fatigue" has most certainly been prevalent in Vilhelmina as well as a lack of motivation for contributing to several participatory processes, where the useful gain and knowledge exchange are not obvious.

Second, it should be noted that the participatory processes in this study did not aim to result in decision-making or a "proper" planning *process.* The aim of the research was foremost to deliver data to the INTEGRAL network and to test and evaluate scenario methods as potential tools for policy-making, rather than taking the bottom-up approach of creating a process that would first of all aim at focus on and meet the interests of the participants. In comparison, in Action Research processes the initiative to the problem formulation and solution is often taken by the local citizens and supported by researchers. Consequently, this study cannot be properly evaluated according to participatory criteria (e.g., Menzel *et al.,* 2012). nor could we expect the project to provide ideal circumstances for learning and knowledge exchange among participants.

Third, it may be relevant to question why the scenario development process did not consider climate change or other ecological elements to a higher extent, since these issues are increasingly debated. Partly, the ecological values were not considered as the most actively influencing factors of change. That is, for example weather conditions do influence the forest ecosystem, but this is not a reciprocal action; that is, it is difficult if not impossible to influence the weather in return. In part, we regarded the outcome effects caused by climate change in the slow-growing boreal forest ecosystem as less decisive within the time period of 30 years, which was the chosen scenario horizon in INTEGRAL. In addition, the capability of the used modelling tool is

constrained regarding climate change complexity. Heureka does include climate scenarios, but the main effect is an increase in forest growth, which could be overestimated because the model does not include possible negative effects by increased wind damage, droughts, and pests related to climate change (Claesson *et al.*, 2015).

Finally, a relevant but complicated question to answer is whether the scenarios, both the explorative and the normative, resulted in innovative and creative outcomes from "thinking outside the box". As Shearer (2005) and Rickards *et* al. (2014) point out, future thinking tends to remain conservative and to project the present conditions. For instance, the participants considered the 'Fade out'-scenario to be a description of the current situation (see section 8.1.3). Since the explorative scenarios were conducted by the researcher team to a large extent and the discussion of the outcome has been limited to Vilhelmina, I regard these scenarios, including the normative, as a starting point for deeper discussions, that could hopefully and preferably be developed further if interest in, for example, the Vilhelmina Model Forest increases. As Dadd (1995) points out, the usefulness and practical application of the research is determined by the way receivers of the knowledge apply the results to their own context.

9.2 Main findings - The need for integrated landscape planning

A main experience from my empirical studies has been the close relation between forest governance and rural development, and the importance of integrating the social and ecological systems in forest resource management. People are an integral part of the landscape (Luginbühl, 2008). They use, value, and shape their living environment and will eventually be the ones who implement ideas, work with conflict solving or make decisions (Patel *et al.*, 2007). Their daily practices, attitudes, and experiences should be reflected in the planning of how the socio-ecological functions and values are used, serving to secure a viable, resilient, and sustainable rural landscape (Jones *et al.*, 2007). People's sense of place (Smith *et al.*, 2011) and social interaction with the common landscape motivate them to enhance sustainability and resilience values (Selman, 2012). I therefore argue that the planning of forest resource management must adopt an integrated landscape approach including both social and ecological systems as well as participatory involvement. Such a planning approach could enhance a dynamic positive chain of reactions, where a strong ecological system strengthens the social system, and vice versa. The synergies and interactions between the systems must be carefully studied and communicated among actors. The fact that some values and functions co-exist

well and others are inevitably conflicting must be considered and jointly discussed in order to find negotiable trade-offs. In addition, it is crucial, although challenging, to understand the ongoing dynamics in time and space, but most of all, in a *contextual* way − how multifunctionality is affected, and how different landscape users act and react to find effective ways of guiding and influencing change (Selman, 2012; Pinto-Correia *et al.*, 2006, 2016). Essentially, we need to understand whose values are recognised and who the landscape is planned for, since political and power relations determine who is, and who is not, given voice and influence (Primmer & Kyllönen, 2006; Hermans & Thissen, 2009; Beland Lindahl *et al.*, 2015). When entering a participatory process, it is essential that the participants feel that the process aims to give them influence, rather than asking them to legitimise and implement pre-decided policy suggestions (Johansson, 2016).

This is rather an extensive change from current planning. Even though the Swedish Forestry Model is marketed as incorporating all sustainability elements of ecological, social, and economic values, and the establishment of a National Forest Programme is on its way, the governance procedures in practice needs new methods, tools, and routines for conducting holistic, landscape-oriented planning and management. It is especially challenging considering the strong sectorial planning traditions for natural and social resources in the Swedish policy and planning context. New negotiation measures, attitudes, and perspectives within research and policy-making are essential. In addition, property and tenure rights must be considered. Concrete incentives need to be explored and developed to motivate land owners to consider multiple values and actors.

It is important to create a planning procedure that is proactive rather than reactive (as often is the case today) (Westholm *et al.*, 2015). By exploring innovative participatory methods and incorporating a landscape perspective, the traditional sectorial planning tradition can be developed into new governance procedures that enhance multifunctionality of forest values and functions across policy sectors and scientific disciplines.

Researchers need to investigate and test the feasibility and quality of methods to negotiate about objectives and options, and design and develop a landscape structure that functionally supports values of all actors (Termorshuizen & Opdam, 2009; Jones & Stenseke, 2011; Westholm *et al.*, 2015). In this respect, understanding the landscape as a common arena becomes equally important as a specific expert knowledge for the capacity to manage change within local and regional communities (Clementsen & Schibbye, 2016). The lack of a common understanding of integrative research

concepts is a key barrier to integration in landscape projects and to communication (Tress *et al.*, 2006). The connections between the political sphere, the private sector, authorities, and research institutions must be concretely established to facilitate the understanding of each other's roles, perspectives, and objectives (Esselin, 2004; Mårald *et al.*, 2015). The transdisciplinary model is therefore a crucial part of the integrated landscape approach, involving multidisciplinary and interdisciplinary studies as well as the public and across sectors in a common perspective (Ahern, 2006; Antrop, 2006). The practical routines and selection of proper tools, procedures, involvement, and actions for achieving such collaborative landscape management must be examined further (Dramstad & Sundli Tveit, 2016).

Furthermore, I would like to emphasis the value of local knowledge. The perception of "proper knowledge" has been assumed to require scientific practice, which often has excluded local knowledge in a detrimental way (Luginbühl, 2008; Fortmann & Ballard, 2011). To enhance local participation in rural development is to use the knowledge, skills, entrepreneurship, and commitment that exist at the heart of where the development process is about to take place (Ray, 2000). Local plans and decisions should be based on local knowledge, which would improve the quality of information, increase credibility and legitimacy, as well as strengthen the local competence of action (Appelstrand, 2002; Saritas *et al.*, 2013). The collaboration between "civil" and "conventional" scientists would improve management and policy processes, compared to when working separately in different contexts (Fortmann & Ballard, 2011; Andre & Jonsson, 2015).

9.3 Concluding remarks

Throughout my research studies, the close relationship between forest resource management and rural development has been evident. The socio-cultural, ecological, and economic values of the forested landscape are interlinked and dependent on each other. The various challenges based on the need to make trade-offs between multifunctional values, acknowledging the diverse range of actors and the forest ownership structure, related to sectorial planning traditions, have been emphasised and illustrated in the Vilhelmina case study. I argue that these needs are best met by applying an integrated landscape planning approach, which includes all aspects of sustainable development, transdisciplinary collaboration in research, and governance and local participation for contextual connectivity. In that work, the use of scenario analysis is a functional and creative tool, suitable for supporting both

participatory governance processes and a landscape planning perspective, for exploring possible and desirable future developments. Scenario analysis can strengthen the local competence of action and help people define their needs and how these needs could be met. The diversity of knowledge and experiences among different local actors should be seen as a resource for creating new ideas and solutions. The balance between an increased participatory involvement in planning and research processes and the conditions for creating a successful high-quality process must be carefully considered when choosing methods. It is also crucial to ensure that the scenario analysis outcome is communicated to planners and policy-makers and captured in the governance processes – when planning for the common future.

10 Epilogue

Reflections over life as a PhD student

I will end this thesis by briefly reflecting over my experiences of being a PhD student in general, and in a European Union research project and cross-country network specifically.

First of all, I am truly grateful for the opportunity to take part in a research education. I believe that this experience has been a deep source for learning and development and has been enriched by the fact that it was part of a larger European project. Being part of INTEGRAL has given me additional understanding and perspectives on different research cultures, procedures, and disciplines. It has illustrated some crucial aspects related to collaboration, networking, and adaptability. It has shown me how far one can get with a positive and open mind, sincere interest and curiosity, a humble and encouraging attitude, as well as "sharp" elbows. The feeling of being part of something larger, where my part has been a crucial contribution to the whole, has been motivating and demanding: motivating in that I could refer to the future implementation and use of the research results from start; demanding, in that setting frames, deadlines, and requirements did not always fit my interest, preferences or local case study conditions. It has been a treat to be given the opportunity to visit other universities and countries around Europe during the project meetings, and it has been personally enrichening to make friends with researchers and PhD students from different disciplines and research interests.

This work has also been a training period for learning to accept and cope with the given circumstances and conditions in time and funding resources, supervising support, "external" time planning, and regarding the constraints of scientific writing and publishing. I would especially like to point out the way that such large research projects are not always well suited to integrate in parallel with the content, forms and processes of the PhD education.

Usually, a PhD education starts by defining the problem to be examined, and to study and deepen the knowledge in relevant theoretical frameworks, which then set the theoretical research context and guides the choice of methods and, for example, interview questions. After this phase, courses in methodological training, scientific writing, research ethics, and research philosophy are recommended, in preparation for conducting the empirical work of data collection. In parallel, theoretical courses for gaining knowledge in the research subject and related topics should be taken. The analysis of the collected data is then summarised and processed into scientific publications.

I did this process backwards. Others before me in the INTEGRAL research coordinating team defined the research problem and chose and designed the methods. When I started the work, I was handed an interview questionnaire, and instructed to translate it, contact a relevant set stakeholders and conduct interviews. Thereafter, the outcome was to be reported in a case study assessment. The research phases were performed in rapid succession. All of a sudden, two workshop phases had been planned and performed, scenarios had been developed and modelled, and results had been reported to the INTEGRAL team. Little by little, as the empirical phases proceeded, I took theoretical and methodological courses – most of them, however, *after* the empirical research. As a matter of fact, I realised the content and purpose of proper interview technique, coding, actor analysis, mixed-methods approach, and scenario development after actually conducting these phases. Regarding theoretical courses, two of the last (and best!) PhD student courses I took were in landscape ecology and in social-ecological systems; topics that I found highly interesting and relevant, and would have loved to study and incorporate more in my research during the previous years.

Overall, there are mainly two issues that I found constrained my research due to these conditions. First, there were theoretical topics regarding e.g. deliberative democracy, social learning, collaborative management, and participatory planning, that I would have found interesting to study and incorporate in my empirical work had I had time to explore them in advance. Ultimately, such topics would have emphasised the ambition and possibility to create participatory research where the benefit of all parties would have been mutual. That is, both the researchers and the local participants would have been motivated by the promise of a clear and useful result in the form of potential for continuing established collaborative processes and learning and knowledge exchange. Using an action research approach to a larger extent, where the process initiative is jointly taken by participants and researchers, would increase motivation, legitimacy, and meaningfulness. In addition, this approach would keep the participants from feeling that the researchers are only using

them as a source of data rather than as people who could immediately benefit from their participation. Second, the INTEGRAL methodology was not entirely applicable and relevant in reflecting the local context regarding the rural development in northern Sweden and the forest ownership structure.

In other future EU collaboration research projects, I suggest that some extra time is planned in the beginning of the research that would enable the PhD students to prepare with theoretical and methodological courses before conducting the empirical work, to provide facilitated conditions, and to secure data collection quality. Furthermore, I encourage organisers to create more specific meeting forums for the PhD students in the project where they can discuss and exchange knowledge and experiences, build networks, and develop publication collaborations.

In spite of these challenges, I managed to deliver all the demanded data and tasks. I managed to put the INTEGRAL produced work into a compelling and coherent set of papers in a theoretical context that interested me, and I even published some of them. It is likely that I have learned much more from this backward-way of writing a thesis, than I would have learned from the straight-forward way. Perhaps, this process has clarified "how to do research properly" by seeing what I should have done, an almost inevitably experience for any PhD position. I do wish there had been some time margins for enabling a new try of less successful achievements. But, to my employer's defence, this PhD position was created *ad hoc*, and we tried to make the best of it.

Last, I would like to stress the true importance of enhancing an encouraging and humble atmosphere in communication and collaboration processes. The qualities of cheering, showing care and engagement, paying attention sensitively, keeping up a good spirit albeit heavy workloads, and most of all expressing appreciation and support in everyday working life could never be underestimated or undervalued. Often, and sadly, academia keeps cultivating hierarchical systems, competition and tense working conditions, and premier success as merits "on paper" rather than personal skills and sincere efforts. Surprisingly, researchers studying sustainability issues themselves are constrained to, or do not consider, how to achieve sustainability elements in their own working lives. Preferably, academia should create environments where inspiration, creativity, encouragement, interdisciplinary and trans-disciplinary exchange, and human well-being flourish.

References

Aagaard Nielsen, K. & Nielsen, B. S. (2006). Methodologies in Action Research. In: Aagaard Nielsen, K. & Svensson, L. (Eds) *Action and interactive research : beyond practice and theory*. Maastricht: Shaker Publishing. ISBN 90-423-0289-5.

Ahern, J. (2006). Theories, methods and strategies for sustainable landscape planning. Chapter 9. In: Tress, B., Tress, G., & Fry, G. (Eds) *From Landscape Research to Landscape Planning: Aspects of Integration, Education and Application*. Wageningen, Netherlands: Springer.

Alarcón Ferrari, C. (2015). *Forests at the limits. Forestry, land use and climate change from political ecology and environmental communication perspectives : the case of Chile & Sweden.* Diss. Uppsala: Department of Urban and Rural Development, Swedish University of Agricultural Sciences. [online]. Available from: http://pub.epsilon.slu.se/11926/ [Accessed 2017-01-19].

Albert, C. & Vargas-Moreno, C. (2011). Planning-Based Approaches for Supporting Sustainable Landscape Development. *Landscape Online*, 19: 1-9.

Alcamo, J. (2008). *Environmental Futures: The Practice of Environmental Scenario Analysis*. Elsevier. ISBN 978-0-08-093298-9.

Alm, S., Palme, J., & Westholm, E. (2012). *Att utforska framtiden : valda perspektiv*. Institutet för framtidsstudier. Stockholm: Dialogos. (Serie framtider). ISBN 978-91-7504-252-7.

Almered Olsson, G., Bladh, G., Månsson, B & Nyberg, L. (Eds) (2004). *Inte bara träd : hållbart mångbruk av skogslandskapet*. Stockholm: Carlsson. ISBN 978-91-7203-599-7.

Ambjörnsson, E. L., Keskitalo, E. C. H. & Karlsson, S. (2016). Forest discourses and the role of planning-related perspectives: the case of Sweden. *Scandinavian Journal of Forest Research*, 31(1), pp 111–118.

Ambrose-Oji, B., Carter, C., Moseley, D., Lawrence, A. (2011). UK Planning Systems: Integrating Woodlands and Trees. Forest Research, Farnham.

Amer, M., Daim, T. U. & Jetter, A. (2013). A review of scenario planning. *Futures*, 46, pp 23–40.

Andre, K. & Jonsson, C. A. (2015). Science-practice interactions linked to climate adaptation in two contexts: municipal planning and forestry in Sweden. *Journal of Environmental Planning and Management*, 58(2), pp 297–314.

Andreescu, L., Gheorghiu, R., Zulean, M. & Curaj, A. (2013). Understanding normative foresight outcomes: Scenario development and the "veil of ignorance" effect. *Technological Forecasting and Social Change*, 80(4), pp 711–722.

Angelstam, P., Andersson, K., Axelsson, R., Degerman, E., Elbakidze, M., Sjölander, P. & Tornblom, J. (2015). Barriers and bridges for sustainable forest management: the role of landscape history in Swedish Bergslagen. In Kirby, K. J. & Watkins, C. (Eds) *Changing Woods and Forests. From Wildwood to Managed Landscapes*. Wallingford: CABI.

Angelstam, P., Grodzynskyi, M., Andersson, K., Axelsson, R., Elbakidze, M., Khoroshev, A., Kruhlov, I. & Naumov, V. (2013). Measurement, Collaborative Learning and Research for Sustainable Use of Ecosystem Services: Landscape Concepts and Europe as Laboratory. *Ambio*, 42(2), pp 129–145.

Antrop, M. (2006). From holistic landscape synthesis to transdisciplinary landscape management. Chapter 3. In: Tress, B., Tress, G., Fry, G., & Opdam, P. (Eds) *From Landscape Research to Landscape Planning: Aspects of Integration, Education and Application*. Wageningen: Springer.

Appelstrand, M. (2002). Participation and societal values: the challenge for lawmakers and policy practitioners. *Forest Policy and Economics*, 4(4), pp 281–290.

Appelstrand, M. (2007). *Miljömålet i skogsbruket – styrning och frivillighet*. Lund: Lund Studies in Sociology of Law.

Appelstrand, M. (2012). Developments in Swedish forest policy and administration – from a "policy of restriction" toward a "policy of cooperation". *Scandinavian Journal of Forest Research*, 27(2), pp 186–199.

Árnason, A., Shucksmith, M. & Vergunst, J. L. (2009). *Comparing rural development : continuity and change in the countryside of Western Europe* [online]. Farnham, Surrey, England ; Ashgate. Available from: http://catdir.loc.gov/catdir/toc/ecip0823/2008031184.html. [Accessed 2016-10-06].

Arts, B. & Babili, I. (2013). Global Forest Governance: Multiple Practices of Policy Performance. In: Arts, B. J. M., Behagel, J., van Bommel, S., Koning, J., & Turnhout, E. (Eds) *Forest and Nature Governance A Practice Based Approach*. pp 111–132. Dordrecht: Springer. ISBN 978-94-007-5113-2.

Arts, B. J. M., Behagel, J., van Bommel, S., Koning, J. & Turnhout, E. (2013). *Forest and Nature Governance - A Practice Based Approach.* Dordrecht: Springer [online]. Available from: http://dx.doi.org/10.1007/978-94-007-5113-2. [Accessed 2016-01-28].

Beland Lindahl, K. (2008). *Frame analysis, place perceptions and the politics of natural resource management: exploring a forest policy controversy in Sweden*. Diss. Uppsala: Dept. of Urban and Rural Development, Swedish University of Agricultural Sciences.

Beland Lindahl, K., Sténs, A., Sandström, C., Johansson, J., Lidskog, R., Ranius, T. & Roberge, J.-M. (2015). The Swedish forestry model: More of everything? *Forest Policy and Economics* [online] Available from: http://www.sciencedirect.com/science/article/pii/S1389934115300605. [Accessed 2015-11-20].

Bengtsson, B. (2004). *Allemansrätten - vad säger lagen?* Stockholm: Naturvårdsverket. ISBN 978-91-620-8161-4.

Berkel, D. B. & Verburg, P. H. (2012). Combining exploratory scenarios and participatory backcasting: using an agent-based model in participatory policy design for a multi-functional landscape. *Landscape Ecology*, 27(5), pp 641–658.

Berkes, F., Colding, J. & Folke, C. (2002). *Navigating Social-Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press. ISBN 978-1-139-43479-9.

Berlin, J. (2004). Aktionsforskning - en problematisering. In: Rönnerman, K. (Ed) *Aktionsforskning i praktiken : erfarenheter och reflektioner*. pp 209–219. Lund: Studentlitteratur. ISBN 978-91-44-03419-5.

Bettinger, P., Boston, K., Siry, J. P. & Grebner, D. L. (2009). *Forest management and planning*. Amsterdam ; London: Academic. ISBN 978-0-12-374304-6.

Biggs, R., Raudsepp-Hearne, C., Atkinson-Palombo, C., Bohensky, E., Boyd, E., Cundill, G., Fox, H., Ingram, S., Kok, K. & Spehar, S. (2007). Linking Futures across Scales: a Dialog on Multiscale Scenarios. *Ecology & Society*, 12(1).

Birkne, Y., Rydberg, D., Svanqvist, B., (2013). *Skogens sociala värden – en kunskapssammanställning*. Meddelande 2013:9. Skogsstyrelsens böcker och broschyrer. Available from: http://shop.skogsstyrelsen.se/shop/9098/art34/21046234-4c03ab-1592.pdf. [Accessed 2016-12-05]

Blackmore, C. (Ed) (2010). *Social Learning Systems and Communities of Practice* [online]. London: Springer. Available from: http://www.springer.com/us/book/9781849961325. [Accessed 2016-12-03].

Bolliger, J., Bättig, M., Gallati, J., Kläy, A., Stauffacher, M. & Kienast, F. (2010). Landscape multifunctionality: a powerful concept to identify

effects of environmental change. *Regional Environmental Change*, 11(1), pp 203–206.
Bonnell, B., de Camino, R., Diaw, C., Johnston, M., Majewski, P., Montejo, I., Segur, M. & Svensson, J. (2012). From Rio to Rwanda: Impacts of the IMFN over the past 20 years. *The Forestry Chronicle*, 88(3), pp 245–253.
Boon, T. E. (2000). *Conceptualisation and evaluation of public participation in Danish state forest management*. Diss. Danish Forest and Landscape Research Institute: Royal Veterinary and Agricultural University.
Boon, T. E., Meilby, H. & Thorsen, B. J. (2004). An Empirically Based Typology of Private Forest Owners in Denmark: Improving Communication Between Authorities and Owners. *Scandinavian Journal of Forest Research*, 19, pp 45–55.
Borch, K., Dingli, S. M. & Sogaard Jorgensen, M. (2013). *Participation and Interaction in Foresight: Dialogue, Dissemination and Visions*. Cheltenham: Edward Elgar Publishing.
Borrini-Feyerabend, G. (2004). *Sharing power: learning by doing in co-management of natural resources throughout the world* [online]. Cenesta, Tehran: IIED and IUCN/ CEESP/ CMWG. Available from: http://www.iucn.org/about/union/commissions/ceesp/ceesp_publications/sharing_power.cfm. [Accessed 2016-07-20].
Boström, M. (2002). *Skogen märks: hur svensk skogscertifiering kom till och dess konsekvenser*. Stockholm: SCORE. (SCORE Rapportserie; 3).
Bradfield, R., Wright, G., Burt, G., Cairns, G. & Van Der Heijden, K. (2005). The origins and evolution of scenario techniques in long range business planning. *Futures*, 37(8), pp 795–812.
Brandt, J. & Vejre, H. (2004). *Multifunctional landscapes. Vol. 1, Theory, values and history*. Southampton: WIT Press. (Advances in ecological sciences, 1369-8273 ; 14). ISBN 978-1-85312-936-0.
Brown, K. (2009). Human development and environmental governance: a reality check. Chapter 2. In: Adger, W. & Jordan, A. (Eds) *Governing sustainability*. pp 32–51. Cambridge ; New York: Cambridge University Press. ISBN 978-0-521-73243-7.
Brukas, V., Felton, A., Lindbladh, M. & Sallnäs, O. (2013). Linking forest management, policy and biodiversity indicators - A comparison of Lithuania and Southern Sweden. *Forest Ecology and Management*, 291, pp 181–189.
Brukas, V. & Sallnas, O. (2012). Forest management plan as a policy instrument: Carrot, stick or sermon? *Land Use Policy*, 29(3), pp 605–613.
Bryson, J. (2004). What to do When Stakeholders Matter: Stakeholder Identification and Analysis Techniques. *Public Management Review*, 6(1), p 29.

Buchy, M. & Hoverman, S. (2000). Understanding public participation in forest planning: a review. *Forest Policy and Economics*, 1(1), pp 15–25.

Bush, T. (2010). Biodiversity and Sectoral Responsibility in the Development of Swedish Forestry Policy, 1988–1993. *Scandinavian Journal of History*, 35(4), pp 471–498.

Butler, A. (2014). *Developing theory of public involvement in landscape planning.* Diss. Uppsala: Dept. of Urban and Rural Development, Swedish University of Agricultural Sciences. [online] Available from: http://pub.epsilon.slu.se/11251/. [Accessed 2015-05-30].

Böhling, K. & Arzberger, M. B. (2014). New modes of governance in Bavaria's alpine forests: The 'Mountain Forest Initiative ' at work. *Forest Policy and Economics*, 49, pp 43–50.

Börjeson, L., Höjer, M., Dreborg, K.-H., Ekvall, T. & Finnveden, G. (2006). Scenario types and techniques: Towards a user's guide. *Futures*, 38(7), pp 723–739.

Carlsson-Kanyama, A., Dreborg, K. H., Moll, H. C. & Padovan, D. (2008). Participative backcasting: A tool for involving stakeholders in local sustainability planning. *Futures*, 40(1), pp 34–46.

Carvalho-Ribeiro, S. M., Lovett, A. & O'Riordan, T. (2010). Multifunctional forest management in Northern Portugal: Moving from scenarios to governance for sustainable development. *Land Use Policy*, 27(4), pp 1111–1122.

Celino, A. & Concilio, G. (2010). Participation in environmental spatial planning: Structuring-scenario to manage knowledge in action. *Futures*, 42(7), pp 733–742.

Celio, E., Ott, M., Siren, E. & Gret-Regamey, A. (2015). A prototypical tool for normative landscape scenario development and the analysis of actors' policy preferences. *Landscape and Urban Planning*, 137, pp 40–53.

Chan, K. M. A., Satterfield, T. & Goldstein, J. (2012). Rethinking ecosystem services to better address and navigate cultural values. *Ecological Economics*, 74, pp 8–18.

Charmaz, K. (2006). *Constructing grounded theory: a practical guide through qualitative analysis*. London: SAGE. (Introducing qualitative methods). ISBN 978-0-7619-7353-9.

Chavez-Taur, J. & Zagt, R. J. (Eds) (2014). *Towards Sustainable Landscapes.* Wageningen, Netherlands: ETFRN and Tropenbos International. (ETFRN News; 56). ISBN 978-90-5113-124-6.

Cheng, A. S. & Mattor, K. M. (2006). Why Won't They Come? Stakeholder Perspectives on Collaborative National Forest Planning by Participation Level. *Environmental Management*, 38(4), pp 545–561.

Cheong, S.-M., Brown, D. G., Kok, K. & Lopez-Carr, D. (2012). Mixed methods in land change research: towards integration. *Transactions of the Institute of British Geographers*, 37(1), pp 8–12.

Claesson, S., Duvemo, A., Lundström, A. & Wikberg, P.-E. (2015). *Skogliga konsekvensanalyser 2015 - SKA 15.* Jönköping: Swedish Forest Agency. (10).

Clementsen, M. & Schibbye, B. (2016). Regional landscape characterisation in Sweden: bridging fields of competence in place. Chapter 9. In: Jørgensen, K., Clemetsen, M., Thorén, K. H., & Richardson, T. (Eds) *Mainstreaming landscape through the European Landscape Convention*. Abingdon, Oxon ; New York, NY: Routledge. ISBN 978-1-138-92229-7.

Council of Europe (2000). European Landscape Convention . CETS No. 176 . Strasbourg. Council of Europe. [online] Available from: http://conventions.coe.int/Treaty/en/Treaties/Html/176.htm. [Accessed 2015-09-15].

Creswell, J. W. (2009). *Research design : qualitative, quantitative, and mixed methods approaches*. Thousand Oaks, Calif.: Sage. ISBN 978-1-4129-6557-6.

Cuhls, K. (2003). From forecasting to foresight processes—new participative foresight activities in Germany. *Journal of Forecasting*, 22(2–3), pp 93–111.

Cullotta, S., Bončina, A., Carvalho-Ribeiro, S. M., Chauvin, C., Farcy, C., Kurttila, M. & Maetzke, F. G. (2015). Forest planning across Europe: the spatial scale, tools, and inter-sectoral integration in land-use planning. *Journal of Environmental Planning and Management*, 58(8), pp 1384–1411.

Currie-Alder, B. (2003). *Why participation? Enhancing our understanding of particaptory approaches to natural resource management. Living Document for Minga Programme Initiative.* Ottawa, Canada: International Development Research Centre.

Dadd, M. (1995). *Passionate enquiry and school development*. Lonen: The Falmer Press.

Dannemand Andersen, P. & Rasmussen, B. (2014). Introduction to foresight and foresight processes. Note to PhD-course Strategic Foresight in Engineering. Technical University of Denmark.

de Groot, R., 2006. Function-analysis and valuation as a tool to assess land use conflicts in planning for sustainable, multi-functional landscapes. *Landsc. Urban Plan* 75, 175–186.

de Groot, R., Alkemade, R., Braat, L., Hein, L., Willemen, L. (2010). Challenges in integrating the concept of ecosystem services and values in landscape planning, management and decision making. *Ecol. Complex., Ecosystem Services – Bridging Ecology, Economy and Social Sciences* 7, 260–272.

De Smedt, P. (2013). Interactions between foresight and decision-making. Chapter 2. In: Borch, K., Dingli, S. M., & Sogaard Jorgensen, M. (Eds) *Participation and Interaction in Foresight: Dialogue, Dissemination and Visions*. Cheltenham: Edward Elgar Publishing.

Dhubháin, Á. N., Cobanova, R., Karppinen, H., Mizaraite, D., Ritter, E., Slee, B. & Wall, S. (2007). The Values and Objectives of Private Forest Owners and Their Influence on Forestry Behaviour: The Implications for Entrepreneurship. *Small-scale Forestry*, 6(4), pp 347–357.

Dramstad, W. & Sundli Tveit, M. (2016). Landscape as product or process? Chapter 5. In: Jørgensen, K., Clemetsen, M., Thorén, K. H., & Richardson, T. (Eds) *Mainstreaming landscape through the European Landscape Convention*. Abingdon, Oxon ; New York, NY: Routledge. ISBN 978-1-138-92229-7.

Drewes Nielsen, L. (2006). The Methods and Implications of Action Research. In: Aagaard Nielsen, K. & Svensson, L. (Eds) *Action and interactive research : beyond practice and theory*. Maastricht: Shaker Publishing. ISBN 90-423-0289-5.

Drewes Nielsen, L., Jespersen, P. H. & Hartmann-Petersen, K. (2004). Future workshops on freight transport – a methodology for actor involvement. *World Transport Policy and Practice Journal*, 10(3), pp 36–41.

Duncker, P. S., Barreiro, S. M., Hengeveld, G. M., Lind, T., Mason, W. L., Ambrozy, S. & Spiecker, H. (2012). Classification of Forest Management Approaches: A New Conceptual Framework and Its Applicability to European Forestry. *Ecology and Society*, 17(4).

Eckerberg, K. (2015). Future Forest Governance: Multiple Challenges, Diverging Responses. Chapter 6. In: Westholm, E., Beland Lindahl, K., & Kraxner, F. (Eds) *The future use of Nordic forests: a global perspective*. pp 83–98. Cham: Springer. ISBN 978-3-319-14217-3.

Eckerberg, K. & Wide, J. (2001). *The nature of rural development: the case of Sweden*. Umeå: Univ, Department of Political Science. (Forskningsrapport / Umeå universitet, Statsvetenskapliga institutionen, 2001:1).

Eggers, J., Lämås, T., Lind, T. & Öhman, K. (2014). Factors Influencing the Choice of Management Strategy among Small-Scale Private Forest Owners in Sweden. *Forests*, 5(7), pp 1695–1716.

Elands, B. H. & Wiersum, K. F. (2001). Forestry and rural development in Europe: an exploration of socio-political discourses. *Forest policy and economics*, 3(1), pp 5–16.

Elbakidze, M., Andersson, K., Angelstam, P., Armstrong, G. W., Axelsson, R., Doyon, F., Hermansson, M., Jacobsson, J. & Pautov, Y. (2013). Sustained Yield Forestry in Sweden and Russia: How Does it Correspond to Sustainable Forest Management Policy? *Ambio*, 42(2), pp 160–173.

Enander, K.-G. (2007). *Skogsbruk på samhällets villkor: skogsskötsel och skogspolitik under 150 år*. Umeå: Institutionen för skogens ekologi och skötsel, Sveriges lantbruksuniversitet. ISBN 978-91-633-8327-4.

Eriksson, L. (2012). Exploring Underpinnings of Forest Conflicts: A Study of Forest Values and Beliefs in the General Public and Among Private

Forest Owners in Sweden. *Society & Natural Resources*, 25(11), pp 1102–1117.
Esselin, A. (2014). *Landskapsnoden - Förutsättningar*. Stockholm: Kungliga skogs- och lantbruksakademien (KSLA). [online] Available from: http://www.ksla.se/wp-content/uploads/2015/02/Landskapsnoden_F%C3%B6ruts%C3%A4ttningar-december-2014.pdf. [Accessed 2015-01-26]
Evans, K., de Jong, W. & Cronkleton, P. (2008). Future scenarios as a tool for collaboration in forest communities. *SAPI EN. S. Surveys and Perspectives Integrating Environment and Society* [online], (1.2). Available from: http://sapiens.revues.org/209. [Accessed 2014-04-10].
FAO, (Food and Agriculture Organization of the United Nations). (2010). *Global Forest Resources Assessment*. Main report. FAO Forestry Paper 163. Rome: FAO. [online] Available from: http://www.fao.org/docrep/013/i1757e/i1757e00.htm [Accessed 2016-12-09].
Farcy, C. (2004). Forest Planning in Europe: State of the Art, International Debates, Emergent Tools. In: Andersson, F., Birot, Y., & Päivinen, R. (Eds) *In Towards the Sustainable Use of Europe's Forests-Forest Ecosystem and Landscape Research: Scientific Challenges and Opportunities*. pp 11–20. Joensuu: European Forest Institute.
Farcy, C. & Devillez, F. (2005). New orientations of forest management planning from an historical perspective of the relations between man and nature. *Forest Policy and Economics*, 7(1), pp 85–95.
Favada, I. M., Karppinen, H., Kuuluvainen, J., Mikkola, J. & Stavness, C. (2009). Effects of Timber Prices, Ownership Objectives, and Owner Characteristics on Timber Supply. *Forest Science*, 55(6), pp 512–523.
Folkesson, L. (2004). Aktionsforskning - på vems villkor? In: Rönnerman, K. (Ed) *Aktionsforskning i praktiken : erfarenheter och reflektioner*. pp 111–123. Lund: Studentlitteratur. ISBN 978-91-44-03419-5.
Forester, J. (1980). Critical Theory and Planning Practice. *Journal of the American Planning Association*, 46(3), pp 275–286.
Forester, J. (1999). *The deliberative practitioner : encouraging participatory planning processes*. Cambridge, Mass; London: MIT. ISBN 0-262-06207-0.
Forsberg, G. (1996). Landsbygdens nykolonisation - en brokig bild växer fram. In: Månsson, H. & Granqvist, U. (Eds) *Med periferin i centrum: om landsbygden som motor i en långsiktigt hållbar utveckling*. pp 31–46. Östersund: Glesbygdsverket. (Glesbygdsverkets skriftserie, 1996:2). ISBN 978-91-972550-7-3.
Forsberg, M. (2012). Skogen som livsmiljö: En rättsvetenskaplig studie om skyddet för biologisk mångfald. Diss. Department of Law, Uppsala University. [online] Available from: http://www.diva-portal.org/smash/record.jsf?pid=diva2:544926. [Accessed 2014-04-10].

Fortmann, L. & Ballard, H. (2011). Sciences, knowledges, and the practice of forestry. *European Journal of Forest Research*, 130(3), pp 467–477.
Freeman, R. (1984). *Strategic Management: A Stakeholder Approach*. Boston: Pitman.
Friedman, V. J. (2001). Chapter 14 - Action Science: Creating Communities of Inquiry in Communities of Practice. In: Reason, P. & Bradbury, H. (Eds) *Handbook of action research: Participative inquiry and practice*. pp 159–173. London: Sage Publications.
Frittaion, C. M., Duinker, P. N. & Grant, J. L. (2011). Suspending disbelief: Influencing engagement in scenarios of forest futures. *Technological Forecasting and Social Change*, 78(3), pp 421–430.
Fry, G. L. A. (2001). Multifunctional landscapes—towards transdisciplinary research. *Landscape and Urban Planning*, 57(3–4), pp 159–168 (Bridging human and natural sciences in landscape research).
Gallent, N., Andersson, J. & Bianconi, M. (2004). *Vision for a Sustainable, Multi-Functional Rural-Urban Fringe. Cheltenham: Countryside Agency*. Cheltenham: Countryside Agency.
Graham, J., Amos, B. & Plumptre, T. (2003). Principles for Good Governance in the 21st Century. Policy Brief No. 15. Institute on Governance. Available from: http://unpan1.un.org/intradoc/groups/public/documents/UNPAN/UNPAN011842.pdf. [Accessed 2016-11-17].
de Groot, R. (2006). Function-analysis and valuation as a tool to assess land use conflicts in planning for sustainable, multi-functional landscapes. *Landscape and Urban Planning*, 75(3–4), pp 175–186 (Landscapes and sustainability).
Guisepelli, E. & Fleury, P. (2008). Landscape at the crossroads of local development choices: What knowledge for which issues? Which tools for action? In: Berlan-Darqué, M., Luginbühl, Y., & Terrasson, D. (Eds) *Landscape, from Knowledge to Action*. pp 247–258. Editions Quae. ISBN 978-2-7592-0060-3.
Gustafsson, L. & Perhans, K. (2010). Biodiversity Conservation in Swedish Forests: Ways Forward for a 30-Year-Old Multi-Scaled Approach. *AMBIO*, 39(8), pp 546–554.
Habermas, J. (1971). *Knowledge and Human Interests*. Boston: Beacon Press.
Hahn, W. A. & Knoke, T. (2010). Sustainable development and sustainable forestry: analogies, differences, and the role of flexibility. *European Journal of Forest Research*, 129(5), pp 787–801.
Halfacree, K. H. (1993). Locality and social representation: space, discourse and alternative definitions of the rural. *Journal of Rural Studies*, 9, pp 23–37.
Hannon, F. & Curtin, C. (2009). The Role of Identity in Contemporary Rural Development Processes. In: Árnason, A., Shucksmith, M., & Vergunst, J. L. (Eds) *Comparing rural development : continuity and*

change in the countryside of Western Europe. pp 125–142. Farnham, Surrey, England ; Ashgate. ISBN 978-0-7546-7518-1.

Hansen, H. P. (2014). Personal communication and introduction to CUAR and future creative workshop 2014-08-05. Researcher at the Department of Urban and Rural Development, section of Environmental Communication, Swedish University of Agricultural Sciences.

Hansen, H. P., von Essen, E. & Sriskandarajah, N. (2016). Citizens, Values and Experts Stakeholders: The Inveigling Factor of Participatory Democracy. Chapter 4. In: Hansen, H. P., Nielsen, B. S., Sriskandarajah, N., & Gunnarsson, E. (Eds) *Commons, Sustainability, Democratisation – Action Research and the Basic Renewal of Society.* New York: Routledge.

Hedlund, G. & Montin, S. (2009). *Governance på svenska*. Stockholm: Santérus Academic Press Sweden. ISBN 978-91-7335-021-1.

Helming, K. & Wiggering, H. (Eds) (2003). *Sustainable development of multi-functional landscapes*. Berlin: Springer. ISBN 978-3-540-00008-2.

Hengeveld, G. M., Didion, M., Clerkx, S., Elkin, C., Nabuurs, G.-J. & Schelhaas, M.-J. (2015). The landscape-level effect of individual-owner adaptation to climate change in Dutch forests. *Regional Environmental Change*, 15(8), pp 1515–1529.

Henningsson, M., Blicharska, M., Antonson, H., Mikusinski, G., Goransson, G., Angelstam, P., Folkeson, L. & Jonsson, S. (2015). Perceived landscape values and public participation in a road-planning process - a case study in Sweden. *Journal of Environmental Planning and Management*, 58(4), pp 631–653.

Henrichs, T., Zurek, M., Eickhout, B., Kok, K., Raudsepp-Hearne, C., Ribeiro, T. & Volkery, A. (2010). Scenario Development and Analysis for Forward-looking Ecosystem Assessments. Chapter 5. In: Ash, N. (Ed) *Ecosystems and human well-being : a manual for assessment practitioners*. pp 151–220. Washington, DC: Island Press. ISBN 978-1-59726-711-3.

Hermans, L. M. & Thissen, W. A. H. (2009). Actor analysis methods and their use for public policy analysts. *European Journal of Operational Research*, 196(2), pp 808–818.

Hesse-Biber, S. N. (2010). *Mixed methods research merging theory with practice*. New York: Guilford Publications, Inc. Ho, V. M., Bonnell, B., Kuschalappa, C., Mooney, G., Sarasin, J., Svensson, J. & Verbinsky, R. (2014). Governance solutions from the International Model Forest Network. *Towards Sustainable Landscapes*. pp 26–34. Wageningen, Netherlands: ETFRN and Tropenbos International. (ETFRN News; 56). ISBN 978-90-5113-124-6.

Holmgren, E. (2009). *Forest commons in boreal Sweden aims and outcomes on forest condition and rural development*. Diss. Umeå: Department of Forest Resource Management, Swedish University of Agricultural

Sciences. Available from: http://epsilon.slu.se/200996.pdf. [Accessed 2016-11-10].
Holmgren, L. *Forest ownership and taxation in a Swedish boreal municipality context*. (2006). Diss. Umeå: Department of Forest Resource Management and Geomatics, Swedish University of Agricultural Sciences. [online]Available from: http://pub.epsilon.slu.se/1135/. [Accessed 2016-11-18].
Holmgren, P. (2013). On Landscapes – Part 1: Why are landscapes important? *CIFOR Forests News Blog*. Available from: http://blog.cifor.org/19702/on-landscapes-part-1-why-are-landscapes-important?fnl=en. [Accessed 2016-11-27].
Holmgren, S. (2015). *Governing forests in a changing climate: exploring patterns of thought at the climate change-forest policy intersection*. Diss. Uppsala: Department of Forest Products, Swedish University of Agricultural Sciences. Available from: http://pub.epsilon.slu.se/12196/ [Accessed 2016-11-03].
Holmgren, S. & Arora-Jonsson, S. (2015). The Forest Kingdom - with what values for the world? Climate change and gender equality in a contested forest policy context. *Scandinavian Journal of Forest Research*, 30(3), pp 235–245.
Hooper, R. (2013). *Learning about Vilhelmina Kommun climate, impacts and adaptation* [online]. Umeå: Forest Resource Management, SLU. (Master Thesis, Report 393).
Hummel, D., Janowicz, C. & Lux, A. (2013). Demographic changes, sustainability and the regulation of supply systems. Chapter 6. In: Siebenhüner, B., Arnold, M., Eisenack, K., & Jacob, K. (Eds) *Long-Term Governance for Social-Ecological Change*. London ; New York: Routledge.
Huttunen, R. & Heikkinen, H. L. T. (1998). Between facts and norms: action research in the light of Jürgen Habermas's theory of communicative action and discourse theory of justice1. *Curriculum Studies*, 6(3), pp 307–322.
Hysing, E. (2009). Statslös samhällsstyrning? - Governance i svensk skogspolitik. In: Hedlund, G. & Montin, S. (Eds) *Governance på svenska*. Stockholm: Santérus Academic Press Sweden. ISBN 978-91-7335-021-1.
Hysing, E. & Olsson, J. (2008). Contextualising the Advocacy Coalition Framework: theorising change in Swedish forest policy. *Environmental Politics*, 17(5), pp 730–748.
Hytönen, M. (1995). *Multiple-use forestry in the Nordic countries*. Vantaa: METLA, The Finnish Forest Research Institute. ISBN 978-951-40-1421-5.
Höjer, M., Dreborg, K. H., Engström, R., Gunnarsson-Östling, U. & Svenfelt, Å. (2011). Corrigendum to "Experiences of the development and use

of scenarios for evaluating Swedish national environmental objectives". *Futures*, 43(4), p 497.

Höjer, M., Svenfelt, Å. & Wangel, J. (2012). Backcasting öppnar upp framtiden. Kapitel 11. In: Alm, S., Palme, J., & Westholm, E. (Eds) *Att utforska framtiden : valda perspektiv*. Institutet för framtidsstudier Stockholm: Dialogos. (Serie framtider). ISBN 978-91-7504-252-7.

Ingemarson, F., Lindhagen, A. & Eriksson, L. (2006). A typology of small-scale private forest owners in Sweden. *Scandinavian Journal of Forest Research*, 21(3), pp 249–259.

Innes, J. L., Hickey, G. M. & Hoen, H. F. (2005). *Forestry and environmental change: socioeconomic and political dimensions : report no. 5 of the IUFRO Task Force on environmental change*. Wallingford, UK: New York, NY. (IUFRO research series ; 11). ISBN 978-0-85199-002-6.

International Model Forest Network (IMFN). [online] (2015). Available from: www.imfn.net. [Accessed 2015-09-15].

Jansson, R., Nilsson, C., Keskitalo, E. C. H., Vlasova, T., Sutinen, M.-L., Moen, J., Chapin, F. S., Brathen, K. A., Cabeza, M., Callaghan, T. V., van Oort, B., Dannevig, H., Bay-larsen, I. A., Ims, R. A. & Aspholm, P. E. (2015). Future changes in the supply of goods and services from natural ecosystems: prospects for the European north. *Ecology and Society*, 20(3), p 32.

Johansson, E. (1994). *Skogarnas fria söner : maskulinitet och modernitet i norrländskt skogsarbete*. Stockholm: Nordiska museet. ISBN 978-91-7108-371-5.

Johansson, E. (2002). *Periferins landskap: historiska spår och nutida blickfält i svensk glesbygd*. Lund: Nordic Academic Press. (Skrifter från forskningsprojektet Flexibilitet som tradition, Ängersjöprojektet, 7). ISBN 978-91-89116-41-2.

Johansson, J. (2013). *Constructing and contesting the legitimacy of private forest governance: the case of forest certification in Sweden*. Diss. Umeå: Statsvetenskapliga institutionen, Umeå universitetet. Available from: http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-63948. [Accessed 2016-11-08].

Johansson, J. (2016). Participation and deliberation in Swedish forest governance: The process of initiating a National Forest Program. *Forest Policy and Economics*, 70, pp 137–146.

Jones, M. (2016). Landscape democracy and participation in a European perspective. Chapter 11. In: Jørgensen, K., Clemetsen, M., Thorén, K. H., & Richardson, T. (Eds) *Mainstreaming landscape through the European Landscape Convention*. pp 119–128. Abingdon, Oxon ; New York, NY: Routledge. ISBN 978-1-138-92229-7.

Jones, M., Howard, P., Olwig, K. R., Primdahl, J. & Herlin, I. S. (2007). Multiple interfaces of the European landscape convention. *Norsk Geografisk Tidsskrift-Norwegian Journal of Geography*, 61(4), pp 207–215.

Jones, M. & Stenseke, M. (2011). The Issue of Public Participation in the European Landscape Convention. Chapter 1. In: Jones, M. & Stenseke, M. (Eds) *The European Landscape Convention : challenges of participation*. pp 1–26. Dordrecht: Springer Verlag. (Landscape series 13). ISBN 978-90-481-9931-0.

Jungk, R. & Müllert, N. R. (1984). *Håndbog i fremtidsværksteder*. (Translated from: Zukunftswerkstatten, Wege zur Wiederbelebung der Demokratie, 1981.). København: Politisk revy. ISBN 87-7378-024-3.

Jungk, R. & Müllert, N. R. (1987). *Future workshops: How to create desirable futures.* London: Institute for Social Inventions.

Jørgensen, K., Clemetsen, M., Thorén, K. H. & Richardson, T. (2016). *Mainstreaming landscape through the European Landscape Convention*. Abingdon, Oxon ; New York, NY: Routledge. ISBN 978-1-138-92229-7.

Kahn, H. & Wiener, A. (1967). *The Year 2000: a Framework for Speculation on the Next Thirty-three Years.* New York, USA.: Macmillan.

Kangas, J., Leskinen, P. & Pukkala, T. (2000). Integrating timber price scenario modeling with tactical management planning of private forestry at forest holding level. *Silva Fennica*, 34(4), pp 399–409.

Kardell, L. (2004). *Svenskarna och skogen. D. 2, Från baggböleri till naturvård*. Jönköping: Skogsstyrelsens förl. ISBN 978-91-88462-57-2.

Karlsson, S. (2007). *Att äga rum : En undersökning av skogsägande och lokal utveckling i tre värmländska församlingar.* Diss. Karlstad University Studies. [online]. Available from: http://kau.diva-portal.org/smash/record.jsf?pid=diva2%3A6668&dswid=8947. [Accessed 2016-11-01].

Karlsson, S. (2008). Skogsägare i stan - spelar det någon roll vem som äger skogen? In: Johansson, B. & Salonen, P. (Eds) *Ska hela Sverige leva?*. pp 49–58. Stockholm: Formas. (Formas fokuserar ; 13). ISBN 978-91-540-6013-9.

Karppinen, H. (1998). Values and objectives of non-industrial private forest owners in Finland. *Silva Fennica*, 32(1).

Kasemir, B. (2003). *Public Participation in Sustainability Science: A Handbook.* Cambridge University Press. ISBN 978-0-521-52144-4.

Keough, H. L. & Blahna, D. J. (2006). Achieving integrative, collaborative ecosystem management. *Conservation Biology*, 20(5), pp 1373–1382.

Khadka, C., Hujala, T., Wolfslehner, B. & Vacik, H. (2013). Problem structuring in participatory forest planning. *Forest Policy and Economics*, 26, pp 1–11.

Kindstrand, C., Norman, J., Boman, M. & Mattsson, L. (2008). Attitudes towards various forest functions: A comparison between private forest owners and forest officers. *Scandinavian Journal of Forest Research*, 23(2), pp 133–136.

Kleinschmit, D., Alarcón-Ferrari, C. & Hansen, H. P. (2012). The social relevance of forest policy research – views from the Nordic countries. *Scandinavian Journal of Forest Research*, 27(2), pp 105–107.
Kok, K., Biggs, R. & Zurek, M. (2007). Methods for Developing Multiscale Participatory Scenarios: Insights from Southern Africa and Europe. *Ecology & Society*, 12(1).
Kok, K. & van Delden, H. (2009). Combining two approaches of integrated scenario development to combat desertification in the Guadalentín watershed, Spain. *Environment and Planning B: Planning and Design*, 36(1), pp 49–66.
Kok, K., van Vliet, M., Bärlund, I., Dubel, A. & Sendzimir, J. (2011). Combining participative backcasting and exploratory scenario development: Experiences from the SCENES project. *Technological Forecasting and Social Change*, 78(5), pp 835–851.
Kronholm, T. (2015). *Forest owners' associations in a changing society*. Diss. Umeå: Department of Forest Resource Management, Swedish University of Agricultural Sciences. Available from: http://pub.epsilon.slu.se/12729/. [Accessed 2016-11-10].
Krueger, R. A. & Casey, M. A. (2009). *Focus groups : a practical guide for applied research*. Thousand Oaks, Calif.: Sage Publications. ISBN 978-1-4129-6947-5.
KSLA (2015). Forests and Forestry in Sweden. [Kungl. Skogs- och Lantbruksakademien / Royal Swedish Academy of Agriculture and Forestry]. Available from: http://www.ksla.se/publikationer/ovriga-publikationer/forests-and-forestry-in-sweden/. [Accessed 2016-11-09].
Kushner, S. (2002). I'll Take Mine Neat: Multiple Methods but a Single Methodology. *Evaluation*, 8(2), pp 249–258.
Kvale, S. (1996). *Interviews - An introduction to Qualitative Research Interviewing*. Thousand Oaks, CA.: Sage Publications, Inc.
Larsson, S., Lundmark, T., Mårald, E. & Sandström, C. (2014). Förstudie om det Nationella Skogsprogrammets dialogprocess. Future Forests Rapportserie 2014:2. SLU, Enheten för skoglig fältforskning.
Lidestav, G. & Ekström, M. (2000). Introducing Gender in Studies on Management Behaviour Among Non-industrial Private Forest Owners. *Scandinavian Journal of Forest Research*, 15(3), pp 378–386.
Lidestav, G. & Nordfjell, T. (2005). A conceptual model for understanding social practices in family forestry. *Small-scale Forest Economics, Management and Policy*, 4, pp 391–408.
Lindroos, O., Lidestav, G. & Nordfjell, T. (2005). Swedish nonindustrial private forest owners: A survey of self-employment and equipment investments. *Small-scale Forest Economics, Management and Policy*, 4, pp 409–426.
Lisberg Jensen, E. (2002). *Som man ropar i skogen: Modernitet, makt och mångfald i kampen om Njakafjäll och i den svenska skogsbruksdebatten 1970-2000.*. Diss. Lund: Lund University.

Luginbühl, Y. (2008). Conclusion. In: Berlan-Darqué, M., Luginbühl, Y., & Terrasson, D. (Eds) *Landscape, from Knowledge to Action*. pp 273–280. Editions Quae. ISBN 978-2-7592-0060-3.

Lundberg, B. & Karlsson, S. (2002). Lokala utvecklingsstrategier - perspektiv, resurser och beroenden. In: Lundberg, B., Gustafsson, G., & Andersson, L. (Eds) *Arvegods och nyodlingar : kulturgeografi i Karlstad vid millennieskiftet*. pp 149–162. Karlstad: Karlstad University Studies. (2002:47). ISBN 978-91-85019-14-4.

Lundmark, L. (2006). *Restructuring and employment change in sparsely populated areas : examples from Northern Sweden and Finland*. Diss. Umeå: Kulturgeografiska institutionen, Umeå universitet. [online] Available from: http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-793. [Accessed 2016-11-01].

Lundström, J. (2013). *Reserve selection in boreal forest: focusing on young forest biodiversity potential*. Diss. Uppsala: Department of Ecology, Swedish University of Agricultural Sciences. Available from: http://pub.epsilon.slu.se/10426/. [Accessed 2016-11-28].

Luz, F. (2000). Participatory landscape ecology–a basis for acceptance and implementation. *Landscape and urban planning*, 50(1), pp 157–166.

Lönnstedt, L. (1997). Non-industrial private forest owners' decision process: A qualitative study about goals, time perspective, opportunities and alternatives. *Scandinavian Journal of Forest Research*, 12(3), pp 302–310.

MacFarlane, R. (2007). Multi-functional landscapes: conceptual planning issues for the countryside. Chapter 8. In: Benson, J. F. & Roe, M. H. (Eds) *Landscape and sustainability*. 2nd ed. London ; New York: Routledge. ISBN 0-415-40443-6.

Maginnis, S. & Sayer, J. A. (2013). *Forests in Landscapes: Ecosystem Approaches to Sustainability*. London, UK: Routledge. (Earthscan Forest Library).

Malinga, R., Gordon, L. J., Lindborg, R. & Jewitt, G. (2013). Using Participatory Scenario Planning to Identify Ecosystem Services in Changing Landscapes. *Ecology and Society*, 18(4).

Masini, E. B. & Vasquez, J. M. (2000). Scenarios as seen from a human and social perspective. *Technological forecasting and social change*, 65(1), pp 49–66.

MCPFE, M. C. on the P. of F. in E. (1995). Pan-European Criteria and Indicators for Sustainable Forest Management. Available from: http://www.fao.org/docrep/004/AC135E/ac135e09.htm. [Accessed 2016-11-10].

MEA, Millenium Ecosystem Assessment. (2005). *Ecosystems and human well-being*. Washington: Island Press.

Menzel, S., Nordström, E.-M., Buchecker, M., Marques, A., Saarikoski, H. & Kangas, A. (2012). Decision support systems in forest management:

requirements from a participatory planning perspective. *European Journal of Forest Research*, 131(5), pp 1367–1379.
Mora, O., Banos, V., Regolini, M. & Carnus, J.-M. (2013). Using scenarios for forest adaptation to climate change: a foresight study of the Landes de Gascogne Forest 2050. *Annals of Forest Science*, 71(3), pp 313–324.
Morris, J. B., Tassone, V., de Groot, R., Camilleri, M. & Moncada, S. (2011). A Framework for Participatory Impact Assessment: Involving Stakeholders in European Policy Making, a Case Study of Land Use Change in Malta. *Ecology & Society*, 16(1).
Mostert, E. (2003). The challenge of public participation. *Water policy*, 5(2), pp 179–197.
Myrdal, J. (2008). Att begripa med begrepp - den nya produktionen. In: Johansson, B. & Salonen, P. (Eds) *Ska hela Sverige leva?*. pp 37–48. Stockholm: Formas. (Formas fokuserar ; 13). ISBN 978-91-540-6013-9.
Mårald, E., Sandström, C., Rist, L., Rosvall, O., Samuelsson, L. & Idenfors, A. (2015). Exploring the use of a dialogue process to tackle a complex and controversial issue in forest management. *Scandinavian Journal of Forest Research*, 30(8), pp 749–756.
Nassauer, J. I. & Corry, R. C. (2004). Using normative scenarios in landscape ecology. *Landscape ecology*, 19(4), pp 343–356.
Nordlund, A. & Westin, K. (2010). Forest Values and Forest Management Attitudes among Private Forest Owners in Sweden. *Forests*, 2(1), pp 30–50.
Nordström, E-M. (2010). *Integrating multiple criteria decision analysis inot participatory forest planning.* Diss. Umeå: Department of Forest Resource Management, Swedish University of Agricultural Sciences. Available from: http://pub.epsilon.slu.se/2385/ [Accessed 2014-04-10]
Nordström, M. & Mårtensson, F. (2001). *Att bo på landet är olika en miljöpsykologisk studie av hur landsbygdsbor ser på boendemiljö och byliv* [online]. Alnarp: Institutionen för landskapsplanering, Sveriges lantbruksuniversitet. Available from: http://pub.epsilon.slu.se/12823/ [Accessed 2016-10-14].
Norman, J. (2009). *Amenities of Swedish forests: attitudes and values among stakeholders*. Diss. Alnarp: Swedish University of Agricultural Sciences.
Norra Skogsägarna. [online] (2016). Available from: http://www.norra.se/omnorra/Pages/default.aspx. [Accessed 2016-11-10].
Norrskog. [online] (2016) (Norrskog). Available from: http://www.norrskog.se/Om-Norrskog/. [Accessed 2016-11-10].
van Notten, P. W. F., Rotmans, J., van Asselt, M. B. A. & Rothman, D. S. (2003). An updated scenario typology. *Futures*, 35(5), pp 423–443.
Nylund, J.-E. & Ingemarson, F. (2007). *Forest tenure in Sweden: a historical perspective*. Uppsala: Deptof Forest Products, Swedish University of

Agricultural Sciences. (Rapport (SLU, Institutionen för skogens produkter), 5).
O'Brien, F. (2004). Scenario planning—lessons for practice from teaching and learning. *European Journal of Operational Research*, 152(3), pp 709–722.
Olsson, O. (2014). *Out of the wild: studies on the forest as a recreational resource for urban residents*. Umeå: Department of Geography and Economic History, Umeå University, Sweden. (GERUM; 2014:1). ISBN 978-91-7601-158-4.
Olwig, K. R. (2007). The practice of landscape 'Conventions' and the just landscape: The case of the European landscape convention. *Landscape Research*, 32(5), pp 579–594.
Ostrom, E. & Schlager, E. (1996). The Formation of Property Rights. In: Hanna, S., Folke, C., & Mäler, K.-G. (Eds) *Rights to Nature*. pp 127–156. Washington, DC: Island Press.
Palacios-Agundez, I., Casado-Arzuaga, I., Madariaga, I. & Onaindia, M. (2013). The Relevance of Local Participatory Scenario Planning for Ecosystem Management Policies in the Basque Country, Northern Spain. *Ecology and Society*, 18(3), p UNSP 7.
Palomo, I., Martín-López, B., López-Santiago, C. & Montes, C. (2011). Participatory Scenario Planning for Protected Areas Management under the Ecosystem Services Framework: the Doñana Social-Ecological System in Southwestern Spain. *Ecology & Society*, 16(1).
Patel, M., Kok, K. & Rothman, D. S. (2007). Participatory scenario construction in land use analysis: An insight into the experiences created by stakeholder involvement in the Northern Mediterranean. *Land Use Policy*, 24(3), pp 546–561.
Pelli, P. (2008). *Review on forest sector foresight studies and exercises.* European Forest Institute. (29).
Pillkahn, U. (2008). *Using Trends and Scenarios as Tools for Strategy Development*. Erlangen, Germany: Publicis Corporate Publishing.
Pinto-Correia, T., Guiomar, N., Guerra, C. A. & Carvalho-Ribeiro, S. (2016). Assessing the ability of rural areas to fulfil multiple societal demands. *Land Use Policy*, 53, pp 86–96.
Pinto-Correia, T., Gustavsson, R. & Pirnat, J. (2006). Bridging the Gap between Centrally Defined Policies and Local Decisions – Towards more Sensitive and Creative Rural Landscape Management. *Landscape Ecology*, 21(3), pp 333–346.
Potschin, M., Haines-Young, R.H., Fish, R., Turner, R.K., (eds) (2016). *Routledge handbook of ecosystem services.* Oxon ; New York: Routledge.
Primmer, E. & Kyllönen, S. (2006). Goals for public participation implied by sustainable development, and the preparatory process of the Finnish National Forest Programme. *Forest Policy and Economics*, 8(8), pp 838–853.

Prop 1992/93:226. *Om en ny skogspolitik*. Governmental bill about the new forest policy.
Rametsteiner, E. & Simula, M. (2003). Forest certification—an instrument to promote sustainable forest management? *Journal of Environmental Management*, 67(1), pp 87–98.
Ray, C. (2000). Endogenous socio-economic development in the European union — issues of evaluation. *Journal of Rural Studies*, 16(4), pp 447–458.
Reed, M. G. (2003). Marginality and Gender at Work in Forestry Communities of British Columbia, Canada. *Journal of Rural Studies*, 19, pp 373–389.
Reed, M. S. (2008). Stakeholder participation for environmental management: A literature review. *Biological Conservation*, 141(10), pp 2417–2431.
Reed, M. S., Kenter, J., Bonn, A., Broad, K., Burt, T. P., Fazey, I. R., Fraser, E. D. G., Hubacek, K., Nainggolan, D., Quinn, C. H., Stringer, L. C. & Ravera, F. (2013). Participatory scenario development for environmental management: A methodological framework illustrated with experience from the UK uplands. *Journal of Environmental Management*, 128, pp 345–362.
Renöfält, B. M., Jansson, R. & Nilsson, C. (2010). Effects of hydro power generation and opportunities for environmental flow management in Swedish riverine ecosystems. *Freshwater Biology*, 55(1), pp 49–67.
Rickards, L., Wiseman, J., Edwards, T. & Biggs, C. (2014). The problem of fit: scenario planning and climate change adaptation in the public sector. *Environment and Planning C-Government and Policy*, 32(4), pp 641–662.
Richnau, G., Angelstam, P., Valasiuk, S., Zahvoyska, L., Axelsson, R., Elbakidze, M., Farley, J., Jönsson, I. & Soloviy, I. (2013). Multifaceted Value Profiles of Forest Owner Categories in South Sweden: The River Helge å Catchment as a Case Study. *AMBIO*, 42(2), pp 188–200.
Robinson, J. (2003). Future subjunctive: backcasting as social learning. *Futures*, 35(8), pp 839–856.
Rogers, E. & Weber, E. P. (2010). Thinking harder about outcomes for collaborative governance arrangements. *Am R Pub Adm*, 40, pp 546–567.
Rounsevell, M. D. A. & Metzger, M. J. (2010). Developing qualitative scenario storylines for environmental change assessment: Developing qualitative scenario storylines. *Wiley Interdisciplinary Reviews: Climate Change*, 1(4), pp 606–619.
Rowe, G. (2004). Evaluating Public-Participation Exercises: A Research Agenda. *Science, Technology & Human Values*, 29(4), pp 512–556.
Rönnerman, K. (2004). Vad är aktionsforskning? In: Rönnerman, K. (Ed) *Aktionsforskning i praktiken : erfarenheter och reflektioner*. pp 13–29. Lund: Studentlitteratur. ISBN 978-91-44-03419-5.

Sametinget (2015). Preparatory Report from the Sami Parliament in Sweden for the United Nations Special Rapporteur on the Rights of Indigenous Peoples. Available from: https://www.sametinget.se/dokument. [Accessed 2016-11-02].

Sametinget (2016). Nordic Sami Convention. Available from: https://www.sametinget.se/dokument. [Accessed 2016-11-02].

Sandström, C., DiGasper, S. W. & Öhman, K. (2013). Conflict resolution through ecosystem-based management: the case of Swedish moose management. *International Journal of the Commons*, 7(2), pp 549–570.

Sandström, C. (2009). Institutional Dimensions of Comanagement: Participation, Power, and Process. *Society & Natural Resources*, 22(3), pp 230–244.

Sandström, C., Carlsson-Kanyama, A., Lindahl, K. B., Sonnek, K. M., Mossing, A., Nordin, A., Nordström, E.-M. & Räty, R. (2016a). Understanding consistencies and gaps between desired forest futures: An analysis of visions from stakeholder groups in Sweden. *Ambio*, 45(2), pp 100–108.

Sandström, C. & Lindkvist, A. (2009). *Competing land use associated with Sweden's forests* [online]. Umeå, Sweden. (Future Forest).

Sandström, C., Lindkvist, A., Öhman, K. & Nordström, E.-M. (2011). Governing Competing Demands for Forest Resources in Sweden. *Forests*, 2(4), pp 218–242.

Sandström, C. & Widmark, C. (2007). Stakeholders' perceptions of consultations as tools for co-management — A case study of the forestry and reindeer herding sectors in northern Sweden. *Forest Policy and Economics*, 10(1–2), pp 25–35.

Sandström, P. (2015). *A toolbox for co-production of knowledge and improved land use dialogues: the perspective of reindeer husbandry*. Diss. Umeå: Department of Forest Resource Management, Swedish University of Agricultural Sciences. Available from: http://pub.epsilon.slu.se/11881/. [Accessed 2016-08-19].

Sandström, P., Cory, N., Svensson, J., Hedenås, H., Jougda, L. & Borchert, N. (2016b). On the decline of ground lichen forests in the Swedish boreal landscape: Implications for reindeer husbandry and sustainable forest management. *Ambio*, pp 1–15.

Saritas, O., Pace, L. A. & Staplers, S. (2013). Stakeholder participation and dialogue in foresight. Chapter 3. In: Borch, K., Dingli, S. M., & Sogaard Jorgensen, M. (Eds) *Participation and Interaction in Foresight: Dialogue, Dissemination and Visions*. Cheltenham: Edward Elgar Publishing.

Sarlöv Herlin, I. (2007). Sarlöv Herlin, I. (2007) Multiple interfaces of the European Landscape Convention: the interface with landscape ecology. Norsk Geografisk Tidsskrift, 61, 210-211. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*, 61, p 210´211.

Sayer, J. A. & Collins, M. (2012). Forest Governance in a Changing World: Reconciling Local and Global Values. *The Round Table*, 101(2), pp 137–146.

Schlyter, P. & Stjernquist, I. (2010). Regulatory challenges and forest governance in Sweden. *Environmental Politics and Deliberative Democracy: Examining the Promise of New Modes of Governance*. pp 180–196. Cheltenham: Edward Elgar Publ.

Scholz, R. W. & Tietje, O. (2002). *Embedded Case Study Methods - Integrating Quantitative and Qualitative Knowledge.* Thousand Oaks, CA: Sage Publications, Inc.

Scott, J. (2000). *Social Network Analysis. A Handbook.* 2nd. ed London: SAGE Publications Ltd.

Secco, L., Da Re, R., Pettenella, D. M. & Gatto, P. (2014). Why and how to measure forest governance at local level: A set of indicators. *Forest Policy and Economics*, 49, pp 57–71.

Selman, P. H. (2012). *Sustainable landscape planning : the reconnection agenda*. Milton Park, Abingdon, Oxon ; Routledge. ISBN 978-1-84971-262-0.

SEPA, Swedish Environmental Protection Agency. (2016a) *Nås miljökvalitetsmålen?* [online] Available from: http://www.miljomal.se/sv/Miljomalen/Uppfoljning-utvardering/nas-miljokvalitetsmalen/. [Accessed 2016-11-11].

SEPA, Swedish Environmental Protection Agency. (2016b) *Sweden's environmental objectives - an introduction.* [online] Available from: http://www.miljomal.se/sv/Publikationer-och-bilder/Broschyrer/2016/Swedens-environmental-objectives.pdf. [Accessed 2016-11-11].

SFA, (Swedish Forest Agency) (2011). *Swedish statistical yearbook of forestry 2011*. Jönköping: Swedish Forest Agency.

SFA, (Swedish Forest Agency) (2014). *Swedish statistical yearbook of forestry 2014*. Jönköping: Swedish Forest Agency.

SFA, (Swedish Forest Agency) (2016a). *Record of forest holdings and forest owners in Vilhelmina municipality.* [online] [Accessed 2016-01-22].

SFA, (Swedish Forest Agency). (2016b). *Sektorsråden för skogliga frågor - Skogsstyrelsen*. [online] Available from: http://www.skogsstyrelsen.se/Myndigheten/Om-oss/Var-verksamhet/Radgivande-grupper/Sektorsraden-for-skogliga-fragor/. [Accessed 2016-11-08].

Shearer, A. W. (2005). Approaching scenario-based studies: three perceptions about the future and considerations for landscape planning. *Environment and Planning B: Planning and Design*, 32(1), pp 67–87.

Shoemaker, P. J. (1993). Multiple scenario development: its conceptual and behavioural foundation. *Strategic management journal*, 14, pp 193–213.

Sipila, M. & Tyrvainen, L. (2005). Evaluation of collaborative urban forest planning in Helsinki, Finland. *Urban Forestry & Urban Greening*, 4(1), pp 1–12.

Smith, J. W., Davenport, M. A., Anderson, D. & Leahy, J. E. (2011). Place meanings and desired management outcomes. *Landscape and Urban Planning*, 101, pp 359–370.

Soliva, R., Rønningen, K., Bella, I., Bezak, P., Cooper, T., Flø, B. E., Marty, P. & Potter, C. (2008). Envisioning upland futures: Stakeholder responses to scenarios for Europe's mountain landscapes. *Journal of Rural Studies*, 24(1), pp 56–71.

Sotirov, M., Cappelmann, L., Riemer, A. & Eriksson, L. O. (2013). Implementing the vision of sustainable forestry through integrated forest management? INTEGRAL 1st Policy Brief. Available from: http://www.integral-project.eu/images/Documents/Publications/PolicyBriefs/INTEGRAL_policy_brief_1_2015.pdf.

Sotirov, M., Storch, S. & Aggestam, F. (2015). Forest Policy Integration in Europe: Lessons learnt, challenges ahead, and strategies to support sustainable forest management and multifunctional forestry in the future. INTEGRAL EU Policy Paper. Available from: http://www.integral-project.eu/images/Documents/EuPolicyPaper/Policy%20Paper_WEB.pdf. [Accessed 2016-11-06].

SOU (1999). *Samerna - ett ursprungsfolk i Sverige. Frågan om Sveriges anslutning till ILO:s konvention nr 169*. Swedish Government Official Reports / Statens offentliga utredningar SOU 1999:25.

SOU (2006). *Mervärdesskog Del 2 Slutbetänkande av Skogsutredningen 2004*. Swedish Government Official Reports / Statens offentliga utredningar SOU 2006:81.

SOU (2007). *Sverige inför klimatförändringarna - hot och möjligheter*. Swedish Government Official Reports / Statens offentliga utredningar SOU 2007:60.

SOU (2013). *Långsiktigt hållbar markanvändning - del 1*. Swedish Government Official Reports / Statens offentliga utredningar SOU 2013:43.

Stake, R. (1995). *The art of case study research*. Thousand Oaks, CA.: Sage Publications, Inc.

Stenman, L. (1983). *Delimitation in the Lapland Region of the County of Västerbotten.* Uppsala: Uppsala Universiet. (Forskningsrapporter från Kulturgeografiska institutionen; 83).

Sténs, A., Bjärstig, T., Nordström, E.-M., Sandström, C., Fries, C. & Johansson, J. (2016). In the eye of the stakeholder: The challenges of governing social forest values. *Ambio*, 45(2), pp 87–99.

Sténs, A. & Sandström, C. (2013). Divergent interests and ideas around property rights: The case of berry harvesting in Sweden. *Forest Policy and Economics*, 33, pp 56–62 (Forest Land Use and Conflict Management: Global Issues and Lessons Learned).

Stenseke, M. & Jones, M. (2011). Conclusion: Benefits, Difficulties, and Challenges of Participation Under the European Landscape Convention. Chapter 15. In: Jones, M. & Stenseke, M. (Eds) *The European Landscape Convention : challenges of participation*. pp 295–310. Dordrecht: Springer Verlag. (Landscape series 13). ISBN 978-90-481-9931-0.

Stojanovska, M., Miovska, M., Jovanovska, J. & Stojanovski, V. (2014). The process of forest management plans preparation in the Republic of Macedonia: Does it comprise governance principles of participation, transparency and accountability? *Forest Policy and Economics*, 49, pp 51–56.

Sundström, G. (2005). *Målstyrningen drar åt skogen - om government and governance i svensk skogspolitik.* Stockholm: SCORE. (SCORE Rapportserie; 6).

Svensson, J., Fries, C. & Jougda, L. (2004). *Synthesis of the model forest concept and its application to Vilhelmina model forest and Barents model forest network.* Jönköping: Skogsstyrelsen. (2004:6).

Svensson, J., Sandström, P., Sandström, C., Jougda, L. & Bär, K. (2012). Sustainable landscape management in the Vilhelmina Model Forest, Sweden. *Forestry Chronicle*, 88(3), pp 291–297.

Sörlin, S. (1988). *Framtidslandet - debatten om Norrland och naturresurserna under det industriella genombrottet.* Stockholm: Carlsson. (Kungliga Skytteanska Samfundets Handlingar.).

Taylor, C. N., Bryan, C. . & Goodrich, C. . (2004). *Social Assessment: Theory, Process and Techniques.* Middleton, Wisconsin: Social Ecology Press.

Termorshuizen, J. W. & Opdam, P. (2009). Landscape services as a bridge between landscape ecology and sustainable development. *Landscape Ecology*, 24(8), pp 1037–1052.

Thellbro, C. (2006). *Local natural resource dependency in a Swedish boreal municipality context*. Diss. Umeå: Department of Forest Resource Management and Geomatics, Swedish University of Agricultural Sciences. Available from: http://epsilon.slu.se/10158700.pdf. [Accessed 2016-10-14].

Tidholm, P. (2012). *Norrland : essäer & reportage*. Luleå: Teg Publishing. ISBN 978-91-979115-3-5.

Tippett, J., Handley, J. F. & Ravetz, J. (2007). Meeting the challenges of sustainable development—A conceptual appraisal of a new methodology for participatory ecological planning. *Progress in Planning*, 67(1), pp 9–98.

Tofteng, D. & Husted, M. (2011). Theatre and action research: How drama can empower action research processes in the field of unemployment. *Action Research*, 9(1), pp 27–41.

Torfing, J. (2006). Introduction: Democratic Network Governance. In: Marcussen, M. & Torfing, J. (Eds) *Democratic network governance in Europe*. Basingstoke: Palgrave Macmillan. ISBN 978-0-230-59628-3.

Tress, B., Tress, G., Fry, G. & Opdam, P. (Eds) (2006). *From Landscape Research to Landscape Planning: Aspects of Integration, Education and Application.* Wageningen: Springer. [online]. Available from: http://library.wur.nl/ojs/index.php/frontis/issue/view/210. [Accessed 2016-04-20].

Trubins, R. (2014). *Non-industrial private land use and forest management landscape and policy perspectives.* Diss. Alnarp: Southern Swedish Forest Research Centre, Swedish University of Agricultural Sciences. [online] Available from: http://pub.epsilon.slu.se/11164/ [Accessed 2016-06-13].

Törnqvist, T. (1995). *Skogsrikets arvingar: en sociologisk studie av skogsägarskapet inom privat, enskilt skogsbruk = Inheritors of the woodlands : a sociological study of private, non-industrial forest ownership*. Diss. Uppsala: Department of Forest Products, Swedish University of Agricultural Sciences.

Uliczka, H., Angelstam, P., Jansson, G. & Bro, A. (2004). Non-industrial private forest owners' knowledge of and attitudes towards nature conservation. *Scandinavian Journal of Forest Research*, 19(3), pp 274–288.

Van Berkel, D. B., Carvalho-Ribeiro, S., Verburg, P. H. & Lovett, A. (2011). Identifying assets and constraints for rural development with qualitative scenarios: A case study of Castro Laboreiro, Portugal. *Landscape and Urban Planning*, 102(2), pp 127–141.

Vergunst, J. & Shucksmith, M. (2009). Conclusions: Comparing Rural Development. In: Árnason, A., Shucksmith, M., & Vergunst, J. (Eds) *Comparing rural development : continuity and change in the countryside of Western Europe*. pp 171–184. Farnham, Surrey, England ; Ashgate. ISBN 978-0-7546-7518-1.

Volkery, A., Ribeiro, T., Henrichs, T. & Hoogeveen, Y. (2008). Your Vision or My Model? Lessons from Participatory Land Use Scenario Development on a European Scale. *Systemic Practice and Action Research*, 21(6), pp 459–477.

Vygotskij, L. S. & Öberg Lindsten, K. (2001). *Tänkande och språk*. Göteborg: Daidalos. ISBN 978-91-7173-143-2.

Walz, A., Lardelli, C., Behrendt, H., Grêt-Regamey, A., Lundström, C., Kytzia, S. & Bebi, P. (2007). Participatory scenario analysis for integrated regional modelling. *Landscape and Urban Planning*, 81(1–2), pp 114–131.

Weiss, G., Weber, M. & Schonenberger, W. (2002). New silvicultural and planning paradigms for integrated mountain forest management. Proceedings of the International Research Course: the formulation of Integrated Management Plans (IMPs) for mountain forests. Bardonecchia (TO) 30 June - 5 July 2002. Quaderni del dipartimento di economia e ingegneria agraria, forestale e ambientale, Grugliasco. pp 11–18.

Welp, M., de la Vega-Leinert, A., Stoll-Kleemann, S. & Jaeger, C. C. (2006). Science-based stakeholder dialogues: Theories and tools. *Global Environmental Change*, 16(2), pp 170–181.

Wennberg DiGasper, S. (2008). *Natural resource management in an institutional disorder : the development of adaptive co-management systems of moose in Sweden*. Diss. Luleå: Luleå University of Technology. Available from: http://ltu.diva-portal.org/smash/record.jsf?pid=diva2:999637. [Accessed 2016-11-17].

Westholm, E. (1996). Landsbygden - förnyelsens landskap efter industrialismen. In: Månsson, H. & Granqvist, U. (Eds) *Med periferin i centrum: om landsbygden som motor i en långsiktigt hållbar utveckling*. pp 11–30. Östersund: Glesbygdsverket. (Glesbygdsverkets skriftserie, 1996:2). ISBN 978-91-972550-7-3.

Westholm, E. (1999). Kompentens för den nya regionalpolitiken. *Nordisk Samhällsgeografisk Tidskrift.*, Maj(28).

Westholm, E. (2008). Vad menas egentligen med landsbygd? In: Johansson, B. & Salonen, P. (Eds) *Ska hela Sverige leva?*. pp 49–58. Stockholm: Formas. (Formas fokuserar ; 13). ISBN 978-91-540-6013-9.

Westholm, E. (2015). Future Studies in the Field of Natural Resources. Chapter 2. *The future use of Nordic forests: a global perspective*. pp 11–24. Cham: Springer. ISBN 978-3-319-14217-3.

Westholm, E., Beland Lindahl, K. & Kraxner, F. (2015). *The future use of Nordic forests: a global perspective*. Cham: Springer. ISBN 978-3-319-14217-3.

Westholm, E. & Waldenström, C. (2008). Kunskap om landsbygden. *Arbetsrapport Insitutet för framtidsstudier* [online], 1. Available from: http://www.framtidsstudier.se/wp-content/uploads/2011/01/20080213175154fil70rGy03245Xynk30fBa9.pdf. [Accessed 2014-04-10].

Widmark, C. (2009). *Management of multiple-use commons: focusing on land use for forestry and reindeer husbandry in northern Sweden*. Diss. Umeå: Swedish University of Agricultural Sciences.

Wiersum, K. F., Elands, B. H. & Hoogstra, M. A. (2005). Small-scale forest ownership across Europe: characteristics and future potential. *Small-scale Forest Economics, Management and Policy*, 4(1), pp 1–19.

Wikström, P., Edenius, L., Elfving, B., Eriksson, L. O., Lämås, T., Sonesson, J., Öhman, K., Wallerman, J., Waller, C. & Klintebäck, F. (2011). The Heureka Forestry Decision Support System: An Overview. *Mathematical and Computational Forestry & Natural Resource Sciences*, 3(2), pp 87–95.

Willebrand, T. (2009). Promoting hunting tourism in north Sweden: opinions of local hunters. *European Journal of Wildlife Research*, 55(3), pp 209–216.

Willebrand, T., Sandström, C. & Lundgren, T. (2006). Reaching for new perspectives on socio-ecological systems: exploring the possibilities for adaptive co-management in the Swedish mountain region. *International Journal of Biodiversity Science & Management*, 2(4), pp 359–369.

Wingborg, M. (2011) *Mors Lilla Olle. Så exploateras asiatiska bärplockare i de svenska skogarna.* Swedwatch Report No. 14. Available from: http://www.swedwatch.org/sites/default/files/swedwatch_-_mors_lilla_olle.pdf [Accessed 2016-12-05]

Winkel, G. & Sotirov, M. (2011). An obituary for national forest programmes? Analyzing and learning from the strategic use of "new modes of governance" in Germany and Bulgaria. *Forest Policy and Economics*, 13(2), pp 143–154 (Change in Forest Governance as a Collective Learning Process).

Wollenberg, E., Edmunds, D. & Buck, L. (2000). Using scenarios to make decisions about the future: anticipatory learning for the adaptive co-management of community forests. *Landscape and Urban Planning*, 47(1), pp 65–77.

Wondolleck, J. M. & Yaffee, S. L. (2000). *Making Collaboration Work: Lessons From Innovation In Natural Resource Managment*. Island Press. ISBN 978-1-55963-462-5.

Wu, J. (2013). Landscape sustainability science: ecosystem services and human well-being in changing landscapes. *Landscape Ecology*, 28(6), pp 999–1023.

Wylie, J. (2007). *Landscape* [online]. Oxdon: Routledge. Available from: http://www.loc.gov/catdir/toc/ecip078/2007001873.html. [Accessed 2016-12-08].

Xiang, W.-N. & Clarke, K. C. (2003). The use of scenarios in land-use planning. *Environment and Planning B: Planning and Design*, 30(6), pp 885–909.

Zeichner, K. . & Noffke, S. (2001). Practitioner research. In: Richardson, V. (Ed) *Handbook of research on teaching*. pp 298–330. Washington: AERA.

Östlund, L. & Zachrisson, O. (2000). The forest history of boreal Sweden: A multidisciplinary approach. In: Agnoletti, M. & Anderson, S. (Eds) *Methods and approaches in forest history.* pp 119–128. Oxon: CABI Publishing. (IUFRO Research Series; 3).

Appendix

This appendix presents the full descriptions of the 12 elements and their possible manifestations, which were the building bricks for the explorative scenarios. The elements are categorised in four groups: Social, Technological, Economic and Political elements.

Social Element 1

S1	**Population**
Factors	• Population structure (age, gender, ethnicity, fertility, education level) • Migration (local, in and out of Vilhelmina municipality) • Urbanisation • Employment possibilities • Global migration development • Infrastructure and services

Population dynamics including number of inhabitants, age structure and migration patterns between urban and rural areas. The population dynamics is connected to many other factors, especially the employment development. Vilhelmina municipality mainly consists of rural area with one community centre, where 3557 people lived in 2010. In November 1st 2012, the total population in Vilhelmina was 6958 people, 3408 (women) and 3550 (men). The population density is 0,8 person per square kilometre (SCB, 2013).

Vilhelmina is experiencing a demographic challenge. The population has been constantly decreasing during the past decades, mainly due to lack of employment opportunities. In the summer 2013, the largest private employer, the saw mill, shut down. Young people move in order to study, work and get life experiences, and are difficult to attract to move back. The mean age of the remaining population is increasing. Women move away in higher extent than men. The growing age structure, lower number of child births, and out-migration will decrease the population.

People in rural areas tend to have lower education background. At the same time as the labour market is limited in number of job opportunities and variety, it is hard for remote rural areas like Vilhelmina to recruit high educated, specialists and chief positions. There will be a growing unbalance in where the demands are compared to where the educated working population lives.

References: Andersson 1998; Ds 2013:19; Holm *et al.*, 2013, Karlsson 2012, Niedomysl & Amcoff 2010; Pettersson 2002; SCB 2012, 2013; SNF 2009; SOU 2003:29; Strömbäck & Knape 2012; Swedish Ministry of Rural Affairs 2013; Westholm & Waldenström 2008; Örstadius 2012.

Different manifestations due to…	• Migration (local, in and out of Vilhelmina municipality) • Urbanisation • Employment possibilities • Degree of entrepreneurship • Personal life quality achievements • Global migration development

ALTERNATIVE MANIFESTATIONS

S1a. Urbanisation dominates

- *Urban population increasing*
- *Rural population*
  - *Decreasing due to migration and mortality*
  - *Fertility low – less childbirths*
  - *Rising age structure*
- *Infrastructure & services – decreases in numbers and density in rural areas*

Urbanisation to larger urban areas is the prevailing population dynamic. Every year some percentage of the rural population moves to the urban areas outside Vilhelmina. The population ages increases while young people move in order to study and search for employments, and rarely returns to settle with their own family later on, there are low preferences for living on the countryside. The foreign immigrants move to the coast cities. The density of services such as healthcare, commuter traffic and petrol stations decreases, making it difficult to sustain good life in rural areas. Lower access to infrastructure due to high investment costs shared on few households. Difficulties in keeping commercial and public services.

S1b. New employment possibilities

- *Urban population stagnant*
- *Rural population*
  - *Stagnant or increasing due to migration for employment possibilities*
  - *Fertility increasing – more childbirths*
  - *Moderately sinking age structure*
- *Infrastructure & services – slightly increasing development in rural areas*

New employment possibilities are established: a diversity of small enterprises in different sectors and/or decentralised authorities and/or a larger employer establishing, perhaps in mill, forest product or tourism industry. It results in increased population to some degree in Vilhelmina, but also an increase of people commuting to and from Vilhelmina, on daily or weekly basis. Income tax, services and infrastructure increase only slightly in Vilhelmina.

S1c. Live and work in several places

- *Interaction between urban and rural population*
  - *Stagnant or increasing population*
  - *Fertility increasing – more childbirths*
  - *Moderately sinking age structure*
- *Infrastructure & services – increasing in density in rural areas*

Increased commuting to and from Vilhelmina. People combine city life and time at their leisure house, or people commute on seasonally basis in and out of Vilhelmina. Both young and elder adults settle down in rural areas in search of good life, proximity to nature and cheaper accommodation. Possible occupations would be to have a small enterprise or self-supply farming. In society as a whole there is an increased interest of entrepreneurship, self-subsistence and farming. Other people settle in Vilhelmina on seasonal basis, commute from other parts, or move to Vilhelmina. Income tax increases in Vilhelmina, as new regulations provide tax to the municipality where spare time houses are located. Food stores, petrol stations, schools and healthcare are easily available services in rural areas. Cultural activities, services and infrastructure improves.

S1d. Increase of foreign immigrants

- *Urban population stagnant or increasing*
- *Rural population*
  - *Increases due to migration from abroad*
  - *Fertility increases – more childbirths*
  - *Sinking age structure*
- *Infrastructure & services – increasing in density in rural areas*

Population in Vilhelmina increases as Sweden and Europe opens up for increased asylum to refugees from areas in the world severely affected by climate changes, that has disabled settlement, security and living conditions in their home countries. Work migrants (young people and high educated) are another suggested group – from European countries with financial crisis and high unemployment rates.

Social Element 2

S2	**Ownership structure**
Factors	• Age structure of forest owners • Gender structure of forest owners • Permanent residence of forest owners (on/in close proximity to/far away from forest holding) • Property size • Forest estate market • Ownership situation – shared or inherited etc.
Ownership structure primarily considers who own forest land and the nature of the ownership, described by features such as age, gender, residence and economic situation of the forest owner. This element concerns the structure only, and not the view on ownership rights or what attitudes forest owners have. Property size and the estate market: There is a new category of investors with availability to capital from other sources than forestry. High prices on forest land will exclude certain buyers and encourage others, including foreign buyers, resulting in a possible change in the ownership structure within the area. The trend of increasingly frequent owner shifts due to an ageing owner community is included in all the manifestations for the next 30 years. The result is a sinking age structure in the end of the time period. There is a possibility that forest heritage will skip one generation; hence the grandchildren will inherit the forest rather than their elder parents. Increasingly, ownership is shared among relatives, and the share of female owners also growing. References: Andersson 2010; Holmgren 2006; Holmgren 2009; Ingemarsson *et al.*, 2006; Nylund & Ingemarson 2007; SOU 2006:81.	
Different manifestations due to…	• Owner types • Age structure of forest owners • Permanent residence of forest owners (on/in close proximity to/far away from forest holding) • Forest estate market • Ownership situation – shared ownership, inherited, etc.
ALTERNATIVE MANIFESTATIONS	
S2a. Company-owned land increases	
• *Few owners with strong capital, non-resident, both forest companies and other business sectors, e.g. investing in forestry for economic benefits or buying forests for climate compensation* • *Average property size increasing* • *Estate market active* • *Increase of inherited properties and shared ownership*	
Forest land is owned by forest companies or entrepreneurs from other business sectors to a larger extent. The forest companies are active on the estate market, but also a category of investors with large investment capital from other sources than forest and for example foreign buyers. (However, this is prohibited according to the present Land Acquisition Act (Jordförvärvslag); forest companies are not allowed to increase their land holding, disabling a few large land owners to buy very large areas. Forest	

companies can only buy land if they abstain properties on another spot). The heirs of retiring or dying forest owners are more likely to sell off the property to one buyer or to share the inheritance with siblings/family members than to split the ownership between themselves. Thus resulting in fewer divisions of forest estates and a concentration of ownership.

S2b. State-owned land increases

- *Property size increasing*
- *Other income sources and availability to capital is common*
- *Estate market active*
- *Increase of inherited properties and shared ownership*

Forest companies sell off land in northern Sweden in order to move enterprises and buy land abroad alternatively jurisdiction changes leading to sell-off. Large properties are split up in smaller ones, mainly bought by state and/or municipalities for climate adaptation, CO^2-compensation, social values, nature reserves, reindeer husbandry, etc., in order to facilitate governance of multifunctional values.

S2c. Increased private non-local ownership

- *Property size stable*
- *Number of permanent residencies on/in close proximity to forest holding decreasing*
- *Other income sources and availability to capital is common*
- *Estate market low activity*
- *Increase of inherited properties and shared ownership*

Owner shifts from older to younger are increasingly frequent connected to estate heritage. The majority of forest owners live far away from their forest holdings. The ration female/male forest owners is close to 50/50. Age structure varied.

S2d. Increased local ownership

- *Property size stable*
- *Number of permanent residencies on/in close proximity to forest holding stable or increasing*
- *Combined with other income sources / forestry for self-sustentation*
- *Inherited or new bought properties*
- *Estate market active*

Increasingly often the new owners inherit or buy the forest estate in order to live on the estate (both young, mid-aged and retired). This manifestation is connected to the S1b and S1d, perhaps also to increased recreation enterprises. The increasing proportion of permanent residencies increases the degree of activity and the self-employment. Wood utilization for household needs is likely to increase as a higher proportion of the forest owners are depending on their forest as a source of income. The ration female/male forest owners are close to 50/50. Jurisdiction might give local inhabitants priority of forest ownership.

S2e. Forest commons
• *Property size increasing as properties are united* • *Number of permanent residencies on/in close proximity to forest holding decreasing* • *Other income sources and availability to capital is common* • *Increase of inherited properties and shared ownership* • *Estate market low activity*
Private forest owners in a village unite their properties, owning and managing the forest land together. Connected to increased heritage and shared ownership of forest properties, and to living and working in several places.

Social Element 3

S3	**Public opinion on forest resources**
Factors	• "Green" values / Multiple forest values • Culture, tradition and history • Nature resource distribution nationally (i.e. national park initiatives, water resources, carbon sequestration) • Climate change perception • Risk perception
Society´s knowledge, norms and values on forestry and nature resources. References: Beland Lindahl 2008; Eriksson 2012; Fredman *et al.*, 2013; Gundersen & Frivald 2008; Kindstrand *et al.*, 2008; Lindhagen 1996; Norman 2009; Skogsinsdustrierna 2007; Sandström *et al.*, 2011; Sandström & Widmark 2007; SOU 2006:81; Westling 2013; Zaremba 2012.	
Different manifestations due to…	• Degree of interaction in forest resource issues.
ALTERNATIVE MANIFESTATIONS	
3a. Weak public claim on forest resources	
• *Climate change perception – low concern* • *Risk perception – moderate awareness* • *Nature resource distribution – moderate concern* • *Culture, tradition and history – low concern*	
The public interest in nature resources is low.	
3b. Strong public claim on forest resources	
• *Forest multiple values* • *Climate change perception – high concern* • *Risk perception – high awareness* • *Nature resource distribution – high concern* • *Culture, tradition and history – high concern*	
The public opinion demands a developed incorporation of multiple values and sustainability in the forestry sector. There is a great concern regarding the effects of climate change and what risk adaptation the forestry sector is taking. The issue of national nature resource distribution is publically debated.	

Technological Element 1

T1	Forest technology and management methods
Factors	• Costs for forest management technology • Professionals with experience and knowledge • Forest owners´ economic situation

The prevailing forest management methods used in Swedish forestry is the clear-cutting silviculture, with even-aged forest stands. Depending on interest and knowledge among forest owners, there might be a raised demand for alternative management methods such as continuous cover forestry, which is considered to allow higher nature and social values at the same time as timber production is gained. The possibility to keep a small-scale forest management is demanded already today; however the system of profitability on the commodity market is strongly directed towards high efficiency and large-scale harvests. The option of doing smaller harvests or small-scale management activities is not reasonable looking at the costs for hiring machines, labor and transport today. The available technology for large-scale or small-scale forestry is not assumed to be a limiting factor; the technology will adjust according to demand and supply for new innovations.

Management costs are not assumed to be limiting the use of consults, certification, forest management plans or insurance.

References: Andersson 2006; Andersson 2010; Eriksson *et al.*, 2008; Haatanen *et al.*, 2014; KSLAT 2012; Lindroos *et al.*, 2005; Nordlund & Westin 2011; SOU 2006:81; Thor 2012; Wilhelmson 2011.

Different manifestations due to…	• The view on profitability & industry development • Knowledge and objectives of forest owners • Consultation on forest management methods • Accessibility of knowledge and information • Quality of knowledge and information • Quality and content of forest education programs • Alternative investments

ALTERNATIVE MANIFESTATIONS

T1a. Clear-cutting method dominates

- *Costs for clear-cutting forestry – reasonable*
- *Costs for alternative methods – expensive*
- *Professional knowledge specialised on clear-cutting methods*

Focus on even-aged forest management practicing clear-cutting harvesting systems including variations in rotation time, cleaning and thinning intensity and regeneration strategies. The harvesting is executed by single-grip harvesters performing felling, de-branching as well as cutting into assortments, while the timber is transported to roadside by a forwarder. From road side the timber is transported by trucks/railway to the industries. Hired contractors are carrying out the harvesting and other forest management measures - often connected to a timber purchasing organisation. The degree of self-employment among forest owners themselves is low. The professional knowledge and recommendations are directed towards clear-cutting methods, large-scale and efficient wood production. The overall nature conservation strategy on productive forest land is according to the legislation in terms of ‘general concern’, meaning green tree retention, high stumps and buffer zones.

T1b. Alternative management methods dominate
• *Costs for clear-cutting forestry – expensive* • *Costs for alternative methods – reasonable* • *Professional knowledge specialised on alternative methods*
Focus on continuous forestry cover (CCF) management, as an adjustment to raised nature conservation concerns and social values of forestry, responding to both forest owner and public opinion, and governmental incentives and legislation towards sustainability. The professionals are educated towards CCF. Smaller machines are employed for the operations in forests managed according to CCF methods. Forest owners are taking care of management practices themselves and together with neighbours in a larger extent.
T1c. Several methods are used
• *Costs for clear-cutting forestry – reasonable* • *Costs for alternative methods – reasonable* • *Professional knowledge specialised on several methods*
The management paradigm can be seen as a balance between the even-aged forest management strategy and CCF, where costs and profitability conditions make it possible for increased variation and larger freedom of management choice for the forest owners, depending on their economic situation. Management is becoming more sensitive to and optimised for site conditions, stand structure and owner/manager preferences, to gain as many ecosystem services as possible. Technological solutions are adjusted to meet multiple demands.

Economic Element 1

E1	**Forest commodity market**
Factors	• Forest market development and innovations • Income from wood production • Certification demand (market steering) • Energy costs • Trade possibilities
The forest commodity market is the market on which the forest owners and managers sell their wood. Global markets for forest products are reflected in the pricelists for timber assortments through many pathways, but also regional, industrial demand interacts. During the summer of 2013, the last local saw mill in Vilhelmina shut down (spruce), which is why the distances for timber transport have increased. Regarding bio fuel, there has been several regional heating mills, however facing challenges in profitability following warm winters with low demand for buying bio fuel wood as a result. Today the market situation is far from stable and is affected by versatile factors: an export dependent industry, regulation of round wood prices through import, industrial focusing on bulk supply of spruce, IT-development decreasing the demand for graphical paper, house markets in Europe and North America as well as Japan and North Africa, investments by forest industry outside Sweden, new innovative products not requiring any larger volumes, profitability of forest management depending on share of saw logs, demand for packaging, hygiene paper and for bioenergy, bioenergy import and economic incentives from government. The forest commodity market supply is mainly steered by the demand for sawn goods since the price of saw-logs decides the profitability of forest harvesting and management. The prices of other assortments are closely following the prices of saw-logs. The division into pulp and paper or energy wood is due to other forces such as EU policy and economic incentives for renewable energy production. References: CEPI 2011; Hetemäki 2005; Jonsson 2011, 2013; Nilsson 2012; Roughley 2005.	
Different manifestations due to…	• Import possibilities • Export possibilities • Trade regulations (EU FLEGT, EU Timber trade regulation (EUTR), tropic tree species) • Climate mitigation & adaptation targets (transports etc.) • Subsidies & stability of investments • Production increase (stumps, exotics, fertilization) • Alternative energy sources (wind/sun/hydro power) • Global house markets (tree species) • ITC development

Comment to the division of manifestations

The dynamics of the forest commodity market are too complex in a global perspective to describe in detail here and the reasoning in the research group has been to make it more concrete on a case study level and ask the question – what is important for the forest owner and manager when deciding upon forest management measures? What will be manifested in the landscape are mainly their choices of rotation time & thinning strategies that will result in different dimensions available to the market. The owners' and managers choice of tree species will not affect the landscape in Vilhelmina as much as in southern Sweden during the first coming decades, but might be more important later on, due to climate changes.

ALTERNATIVE MANIFESTATIONS

E1a. High price for all dimensions & qualities

Utilization of wood fibre:

- *Timber assortments (construction, furniture, certain boards etc.) – high demand*
- *Energy production (direct burning, pellets, biogas etc.) - high demand*
- *Fibre refinery (pulp, paper, viscos, nano-cellulose, certain boards, composite materials etc.) - high demand*

Large demand for any kind of fibre material from the forest. High competition between industries of different manufacturing. High income and profitability for forest owners and managers.

E1b. Low price for all dimensions & qualities

Utilization of wood fibre:

- *Timber assortments (construction, furniture, certain boards etc.) – low demand*
- *Energy production (direct burning, pellets, biogas etc.) – low demand*
- *Fibre refinery (pulp, paper, viscos, nano-cellulose, certain boards, composite materials etc.) – low demand*

Low demand for any kind of fibre material from the forest. Competition over raw material low. Low income and profitability for forest owners and manager – resulting in a generally low degree of activity in the forest.

E1c. High price <u>only</u> for saw-log dimensions and qualities

Utilization of wood fibre:

- *Timber assortments (construction, furniture, certain boards etc.) – high demand*
- *Energy production (direct burning, pellets, biogas etc.) – low demand*
- *Fibre refinery (pulp, paper, viscos, nano-cellulose, certain boards, composite materials etc.) – low demand*

Green building and EU regulations (EUTR and FLEGT) have a large impact on the market and promote utilization of wood produced in Europe or from other sources where it is possible (easy) to get sufficient documentation for sustainable managed forests and chain of custody. The result is a high demand for large dimension and hardwood timber within Europe. Relatively speaking there is a small set-off for smaller dimensions. Decreased capacity within the paper- and pulp industry plus the fact that other (cheaper?) sources of raw material are used within the energy sector. Forest owners and managers are given incentives to use longer rotation times or selective cuttings (CCF).

E1d. Saw-log dimensions and quality doesn't pay off
Utilization of wood fibre: • *Timber assortments (construction, furniture, certain boards etc.) – low demand* • *Energy production (direct burning, pellets, biogas etc.) – high demand* • *Fibre refinery (pulp, paper, viscos, nano-cellulose, certain boards, composite materials etc.) – high demand*
There is no market for sawn goods and consequently the prices in sawn-log dimensions and qualities are not well paid in comparison to smaller dimensions and other qualities. The incentive to the forest owner and managers are then for short rotations and intensive thinning regimes. Large dimensions and timber for construction and furniture in the forest will just not pay off.

Economic Element 2

E2	**NTFPs market in Vilhelmina**
Factors	• Public opinion and demand on forest resources • Ecosystem services • Development of green economic growth and market systems putting prices on ecosystem services and nature capital

The forest commodity market of non-timber-forest-products (NTPFs) concerns how the forest can provide with different services than wood production. Demand for different ecosystem-services such as; biodiversity, conservation, recreation, tourism, hunting and fishing, wildlife management, water management, berries, mushrooms and herbs, carbon sequestration. There are the many other sectors connected to the forest landscape: reindeer husbandry, mining industry. Also the importance of forest values for housing surroundings, living environment, public health, historical, cultural and traditional values. What are the interests or demands of the large majority of people paying taxes but not living on the rural areas have?

Wind milling, solar energy and water power is not included in the NTFPs-element, but in the Energy-element.

Prices are expressed in relative terms in relation to the situation on the commodity market today.

References: Ds 2013:19, Fredman *et al.,* 2013; Gundersen & Frivald 2008; Kindstrand *et al.,* 2008; Lindhagen 1996; Lundmark *et al.,* 2012; Mattson & Li 1993; Nordlund & Westin 2011; Norgaard 2010; Norman 2009; Skogsinsdustrierna 2007; SNF 2009, SNF 2013; SOU 2006:81; Stryamets e*t al.,* 2012; Westling 2013; Zaremba 2012.

Different manifestations due to…	• National interests vs local importance of NTFPs • Welfare development • Climate change mitigation

ALTERNATIVE MANIFESTATIONS

E2a. High demand for multiple values

- *Tourism sector – high demand*
- *Public health – nature is ordinated on medical recipes*
- *Food sector – high demand*
- *Biodiversity and water management – high demand*
- *Culture, tradition and history – high concern*
- *Housing – high prices on close to nature-sites*
- *Carbon sequestration – high demand*

Large demand for forest multiple values, from both Swedish inhabitants and foreign tourists. High competition between entrepreneurs. High income and profitability for forest owners and managers, e.g. tourism enterprises pay the forest owner to not harvest. A market is developed for ecosystem services, where nature capital is measured and valued in economic terms, creating resource flow to the rural areas which are rich in ecosystems (green economic growth) , but the change is also stimulated by governmental steering.

E2b. Low demand for multiple values
• *Tourism sector – low demand* • *Public health – not nature oriented* • *Food sector – low demand* • *Biodiversity and water management – low demand* • *Culture, tradition and history – low concern* • *Housing – low prices* • *Carbon sequestration – low demand*
It is mainly local people who demand the NTFPs, with lower will and possibility to pay for those services that has been for free through the Rights of Public Access. However, the interest for those products is raised and given larger emphasis in forest planning and legislation.

Economic Element 3

E3	**National welfare development**
Factors	• National economic resources; natural capital (e.g. oil, minerals), human capital (e.g. competence) and energy resources (e.g. hydro, wind and bioenergy) • Trade (partnerships, regulations) • Average income in Sweden (relative to Europe and globally) • Resource distribution
The welfare development in Sweden is predicted to affect the forested landscape in Vilhelmina not only through the forest commodity market, but also through e.g. the development of the labour market and consumer preferences. The welfare development influences e.g. the importance of NTFPs in comparison to traditional timber assortment; high welfare renders larger importance of NTFPs. Natural and human capitals as well as trade partnerships are all fundamental for the welfare development of Sweden. Competitiveness, employment rates, relative salaries and security issues will further influence the development. The emerging economies creating demand for forest products in Europe, have gained the development in Sweden. If Sweden is doing well economically, the potential of increasing the welfare level on rural areas increase. The state of the nation is increasingly challenged by globalisation. New connections and correlations disregarding national borders are made. Sweden will depend continuously on developments and policy decisions taken within the European Union. References: Ds 2013:19; Nilsson 2012; Niedomysl & Amcoff 2010; SOU 2003:29; SOU 2006:81; Swedish Ministry of Rural Affairs 2013; Westholm & Waldenström 2008.	
Different manifestations due to…	• Competitiveness of Swedish goods & services • Employment rate • Educational quality • Entrepreneurship • Climate change awareness and policy handling • Social resilience for the individual and society • Society services • Well-functioning transport system and infrastructure • Efficient decision-making processes
ALTERNATIVE MANIFESTATIONS	
E3a. Positive	
• *National economic resources – high* • *Trade of Swedish products and services – good* • *Median income – high* • *Resource distribution – overall high and equally spread geographically* • *Competitiveness – good* • *Employment rate – increasing* • *Educational quality - good* • *Entrepreneurship – strong* • *Forest social values – high paying capacity*	

Positive welfare development in Sweden promotes import of forest commodities compared to export. Forest industry faces disadvantages from increased relative salaries and higher production costs. Preferences for NTFP and the willingness to pay for recreation and other social and environmental values increase. Availability to competence decreases as employment rates are high, but education quality and entrepreneurship are good and strong - increasing the competitiveness of Sweden. The more regions with strong economy, the better for the weaker regions, as the economic growth in Sweden is the sum of the growth of all country parts.

E3b. Negative

- *National economic resources – low*
- *Trade of Swedish products and services – low*
- *Median income – low*
- *Resource distribution – overall low and equally spread geographically in Sweden*
- *Competitiveness - weak*
- *Employment rate – decreasing*
- *Educational quality - low*
- *Entrepreneurship – weak*
- *Forest social values – low paying capacity*

Negative welfare development in Sweden might promote export of forest commodities compared to import (forest industry benefits from decreased relative salaries and lower production costs), but could also mean that Swedish forest products is meeting low demand, both on foreign and domestic markets. Preferences for NTFP and the willingness to pay for recreation and other social and environmental values decreases. Lower access to infrastructure due to high investment costs shared on few households. Westholm & Waldenström 2008. Availability to competence increases as unemployment rates are high, but education quality and entrepreneurship are low and weak decreasing the competitiveness of Sweden.

Economic Element 4

E4	**Energy sources**
Factors	• Laws and regulations • National incentives in energy policies • European energy policy development • Energy markets – demand/supply • European / global influence on national policy • Energy consumption • Innovation development
This element concerns the composition of energy sources, whether based on renewable or fossil fuels. References: Beland Lindahl & Westholm 2011; Bergh 2007; EREC 2011; Ericsson *et al.,* 2004; Haatanen *et al*., 2014; KSLAT 2013; Leung & Yang 2012; Nilsson 2012; SOU 2013:84; Wallin 2012.	
Different manifestations due to…	• Dominating energy sources
ALTERNATIVE MANIFESTATIONS	
E4a. Biofuel dominates	
• *Energy sources mainly from biofuel sources* • *Innovation development – decreased energy consumption*	
Biofuel is the dominating energy source, increasingly produced of forest products, but also by biogas, bio-refinery products and by-products from forest production. There is a local heating mill and a good market for selling biofuels to industry, e.g. wood material from pre-thinning Intense research and production of bioenergy and bio materials. Black liqour, by-products (bark, sawdust, cutter shavings), thinning and harvesting residues, stumps.	
E4b Renewable energy sources dominate	
• *Energy sources – renewable* • *Innovation development – decreased energy consumption*	
A combination of energy sources is dominating and replacing fossil fuels: wind, water, solar, biogas energy.	
E4c Fossil fuel dominates	
• *Energy sources – fossil fuels* • *Renewable fuels low market demand* • *Innovation development – weak*	
Fossil based energy sources and material are still dominating (oil, nuclear power and brown coal). The Swedish forestry focuses on timber, pulp and bioenergy wood, however without strong technological innovation development.	

Political Element 1

P1	Laws and regulations
Factors	• National legislation & regulations • EU policy on economy, energy, agriculture, environment, trade, rural development. • Infrastructure policies (ICT)
Swedish national laws and regulations influencing the management of forested landscapes in Sweden. Legal settings allow and restrain individual and collective behaviour, no regional laws are applied. Swedish legislation is often confirming current trends and opinions in society, rather than acting pro-actively. Relevant legislation for forest landscapes are foremost the Forestry Act and the Environmental code, expressing production and environmental targets for forest land. Other relevant legislation and regulations concerns climate change mitigation/adaptation targets and wild life management. Regulations and policies also include for example: Nature 2000; Water, Habitat and Birds directive (EU); National environmental quality objectives (incl. Sustainable forests), RES-directive, electricity certificates, Right of public access, tourism policy, Forest Kingdom. References: Beland Lindahl 2008; Kleinschmidt *et al*., 2012; KSLAT 2012; Nilsson 2012; Nylund 2009, 2010; SOU 2006:81.	
Different manifestations due to…	• Legislative measures • Voluntary measures (e.g. certification, CSR) • Institutional capacity (e.g. advisory services) • Policy steering to handle climate changes • Reformulations of the nature resource legislation
ALTERNATIVE MANIFESTATIONS	
P1a. Soft law	
• *Forestry legislation states the minimum requirements for nature protection and other considerations on productive forest land* • *Focus on voluntary measures, initiatives coming from forest owners and managers* • *Legislative measures are the exception* • *Deregulation – fewer laws & regulations* • *Institutional capacity (e.g. advisory services) are focused on information and communication*	
The national law and regulations are formulated in general terms and applies a soft law approach with focus on management by objectives and voluntary measures – the forest owners have "freedom with responsibility". The aims of the government are mediated through information campaigns and advisory services organised by the Forest Agency and other actors. The implementation of the aims is therefore relying on the institutional capacity of the forest agency and other actors and institutions to supply advice and consulting. The soft law strategy renders considerable freedom to the owners and managers to choose their management strategies following their personal preferences. The strategy is considered to lead to a diversification of management strategies in the landscape. The manifestation in the landscape will be more dependent on the ownership structure and paradigms in society and forest management.	
P1b. Hard law	

- *Forestry legislation strictly regulates the - by the government considered necessary - requirements for nature protection and other values on productive forest land*
- *Laws and regulations concrete and in detail*
- *Legislative measures are in focus and readily executed*
- *Institutional capacity (e.g. advisory services) focusing on control and punishment*

The national laws and regulations are formulated in strict and detailed terms, applying a hard law approach focusing on legislative measures. The aims of the government are implemented mainly by stating examples in court. The implementation of the policy goals is therefore increasingly a matter for the jurisdiction and the Forest Agency is a controlling institution. The hard law strategy renders little freedom to the owners and managers to choose their management strategies following their personal preferences. The strategy is considered to lead to a homogenisation of management strategies in the landscape. The manifestation in the landscape is more dependent on the direction of the government and supposedly follows the national forest program.

P1c. Combination of hard and soft law

- *Forestry legislation strictly regulates the - by the government considered necessary - requirements for nature protection and other values on productive forest land*
- *Laws and regulations concrete and in detail for some areas, less for others.*
- *Legislative measures are used to some degree, leaving rather much freedom.*
- *Institutional capacity (e.g. advisory services) focusing on both control and information.*

The government structures certain legislation around forestry to meet demands for more detail articulated regulation around nature conservation and social values. Apart from that, still "freedom with responsibility" for the forest owners. For example, there might be more strict regulations around key biotopes, but not considering pre-thinning. There is a possibility that the Forestry Act will be incorporated under a legislation Code for nature resources, including e.g. environmental values, mining legislation. Legislation is also implementing EU directives and international agreements in a more expressed way.

Political Element 2

P2	Steering instruments
Factors	• Taxes (estate, fuel, energy, biodiversity, social values…) • Fees • Subsidies
Economic tools and incentives dictated by the government to steer forest owners and others towards the goals formulated in the legislation and regulations. Classic governmental tools are taxes, fees and subsidies. Taxation is most relevant in case of ownership shifts and large scale harvesting operations, as well as for the energy and transport sector. Fees and subsidies affect the profitability of different management strategies. The Swedish government have stated that the value of ecosystem services shall be publically known and included in economic positions, policy considerations and decisions in society by 2018. References: Appelstrand 2012; Brukas & Sallnäs 2012; KSLAT 2012; Myrdal 2008; Nylund 2009; SNF 2009; Swedish Ministry of Rural Affairs 2013.	
Different manifestations due to…	• Degree of economic incentives, investment funds, contracts • Direction of policies • Tax management (e.g. forest accounts) • Welfare development – are there money to put in forestry? • Forest management objectives
ALTERNATIVE MANIFESTATIONS	
P2a. BAU	
• *Few economic tools and incentives* • *Taxes – favourable in general* • *Subsidies - unusual*	
There are few economic tools and incentives, giving few or no incentives for forest management decisions. The taxation of forest property and profit is favourable for the forest owners and managers.	
P2b. Increased economic steering towards production	
• *Increased number of economic tools and incentives directed towards activities improving production on forest land* • *Taxes – favouring production on forest land* • *Subsidies – favouring increased production*	
Increasing number of economic tools and incentives to strengthen production values and capacity. Fees are executed for different types of behaviour in order to ensure high degree of activity in the forest. Subsidies are given for measures taken to ensure increased activity and production on forest lands, e.g.fertilization.	
P2c. Increased economic steering towards environmental protection	

• *Increased number of economic tools and incentives directed towards activities improving environmental protection* • *Taxes – favouring environmental protection* • *Subsidies – favouring environmental protection*
Increasing number of economic tools and incentives. Fees are executed for different types of behaviour in order to ensure protection of the environment. Subsidies are given for different kind of measures taken to ensure the protection of the environment.
P2d. Increased economic steering towards multiple forest values
• *Increased number of economic tools and incentives directed towards activities with different objectives – a balance between different forest management objectives* • *Taxes – favouring a balance of forest management goals* • *Subsidies – favouring different ecosystem services*
Increasing number of economic tools and incentives. Fees are executed for different types of behaviour in order to ensure that there is a balance in the forest between productivity and environmental protection and social values of forest recreation. Forest owners are compensated for ecosystem services such as protection for floods, carbon sequestration, maintenance of biodiversity, water quality, keeping the landscapes open and attractive (SNF 2009, Myrdal 2008).

Political Element 3

P3	**Local planning**
Factors	• Comprehensive plans • Participatory planning • Local inhabitants and stakeholder influence • Public opinion
An element considering different ways of local planning and dialogue integrating forest landscape planning. Vilhelmina municipality is a relatively large forest owner, owning appr. 6000 hectares. The future role of the forest estates in the mandatory Comprehensive plan can evolve in different ways. The governance structure of the municipality in itself and in relation to national steering can continue to follow a top-down-steering, or change towards a bottom-up approach with increased inhabitant influence and local planning on nature resources. There may be future difficulties in finding candidates for political commissions of trust, as fewer people have experiences of political work and understandings of stake conflicts impacting decision making. There are differences in political participation between groups having strong resp. weak resources. References: Appelstrand 2012; Buchy & Hoverman 2000; Ds 2013:19; Elbakidze et al 2010; Hildingsson 2010; Klenk *et al.,* 2013; Sandström *et al.,* 2011; Svensson *et al.,* 2012; Westholm & Waldenström 2008.	
Different manifestations due to…	• Governance structure • Welfare distribution • Resource distribution • Forest management objectives • Ownership structure • Opinions about ownership rights • The European Landscape Convention • Model Forest-concept
ALTERNATIVE MANIFESTATIONS	
P3a. Top-down-steering	
• *Power – the steering of today with strong centralised national institutions* • *Comprehensive plan – forestry is not a big part of it* • *Local habitant influence - low*	
"Planning as usual".	
P3b. Bottom-up initiatives	
• *Power – large of municipalities and the Model Forest* • *Comprehensive plan – participatory planning around forestry* • *Local habitant influence – large* • *Improved policy regulations supporting local decision-making*	
Rural development and rural politics is being initiated from bottom-up-perspectives – more power is given to municipalities and Model Forest-associations around nature resources. Local engagement and decision rights of local resources. Local management in partnerships and networks. Municipalities are developing management plans for forest production, protection and inhabitant use connected to the comprehensive plan in a larger extent.	

Political Element 4

P4	**Indigenous people's rights**
Factors	• Reindeer husbandry • Traditional, historical and cultural values • Human rights • Resource distribution

Sweden has not signed and ratified the UN ILO-convention No. 169 on indigenous and tribal people. These manifestations differ depending on whether Sweden decides to sign within the coming 30 years. The ratification will mainly result in changes for the reindeer husbandry sector, not for the entire indigenous population.

Reindeer herding is taking place on the entire northern half of Sweden, and can only be performed by Sami people. Reindeer husbandry consultations are demanded on land used during the whole year for reindeer herding, and on mountain forests, when the forest owner is planning for regeneration felling or felling for forest road construction. However, consultation is only demanded for forest stands larger than 500 hectares productive forest land where more than 20 hectares are planned to harvest. In mountain areas the harvest area must be larger than 10 ha to claim consultation. If an area specifically important for reindeer husbandry is affected, consultations should always be held.

References: Bengtsson 2000; Johansson & Klang 2004; Governmental proposal 2004; Sandström & Widmark 2007, SOU 1999:25; Widd 2005,

Different manifestations due to…	• National laws & regulations • NTFP development • Ecosystem services status • Public opinion on forest resources • Forest owner opinions and attitudes

ALTERNATIVE MANIFESTATIONS

P4a. Indigenous people rights strengthened

- *Sweden signs the ILO Convention No 169.*
- *Reindeer grazing land interests prioritized before other forest production (incl ESS) values*

The indigenous people are gaining stronger land property rights (which will mainly concern and gain reindeer husbandry, Bengtsson 2000), hunting-and fishing rights are articulated. Stronger emphasis on reindeer husbandry rights towards other forest values.

P4b. Indigenous people rights unchanged

- *Sweden does not sign the ILO Convention No 169.*
- *Also possible: Sweden do sign the convention, but the practical consequences remain unchanged (as happened in Norway)*
- *Consensus based dialogue/Information duty for forest harvests larger than 500 ha.*

The indigenous people are not gaining stronger land property rights. Continuation of consensus based dialogue with reindeer husbandry for forest harvests as described to the left. Hunting and fishing rights are not clearly articulated.

References to Appendix.

Andersson, G. (1998) Från Glesbygd till Storstad? En kunskapsöversikt om flyttströmmar [From the landscape to cities? Overview of internal migration patterns]. Stockholm: Svenska kommunförbundet.

Andersson, E. (2006) Alternative forest management in Scandinavia – a well needed complement? Master thesis 2006:73. Department of forest products and markets, Swedish University of Agricultural Sciences, Uppsala.

Andersson, M. (2010) Non-industrial private forest owners´ management decisions. Doctoral thesis. Acta Universitatis Agriculturae Sueciae No 2010:57. Swedish University of Agricultural Sciences, Umeå.

Appelstrand, M. (2012) Developments in Swedish forest policy and administration – from a "policy or restriction" toward a "policy of cooperation". Scandinavian Journal of Forest Research 27(2) 186-199.

Beland Lindahl, K. (2008) Frame Analysis, Place Perceptions and the Politics of Natural Resource Management: Exploring a forest policy controversy in Sweden. Doctoral thesis. Acta Universitatis Agriculturae Sueciae No. 2008:60. Swedish University of Agricultural Sciences, Uppsala.

Beland Lindahl, K & Westholm, E. (2011) Food, paper, wood or energy? Global trends and future Swedish forest use. Forests 2(1): 51-65

Bengtsson, M. (2000) ILO 169 och samernas äganderätt till mark – föremål för tolkningar i Sverige. [ILO 169 and the Sami land ownership right – objects for interpretations in Sweden] Master Thesis. Department of industrial economy and social sciences, Luleå University.

Bergh, J. (2007) Effekter av ett förändrat klimat på skogen och implikationer för skogsbruket. [Effects of climate change on forest and implications on forestry] Working report 2007:34. Southern Swedish Forest Research Centre. Swedish University of Agricultural Sciences, Alnarp.

Brukas, V & Sallnas, O. (2012) Forest management as a policy instrument: Carrot, stick or sermon? Land use policy 29(3):605-613.

Buchy, M & Hoverman, S. (2000) Understanding public participation in forest planning: a review. Forest Policy and Economics 1(2000): 15-25.

CEPI Confederation of European Paper Industries Roadmap (2011) The Forest Fibre Industry, 2050 Roadmap to a low-carbon bio-economy. Accessed online 2013-11-06: http://www.skogsindustrierna.org/MediaBinaryLoader.axd?MediaArchive_FileID=986941f7-dbcc-4d86-b802-1171f0982c2d&FileName=CEPI+Roadmap+2050+unfold+the+future.pdf

Ds Departementserien 2013:19. Svenska framtidsutmaningar. Slutrapport från regeringens Framtidskommission. [Swedish future challenges. Final report from the governmental future commission.] Regeringskansliet, Statsrådsberedningen [Governmental Office for Administrative Affairs], Departementserien 2013:19.

Elbakidze, M., Angelstam, P., Sandström, C., Axelsson, R. (2010) Multi-stakeholder collaboration in Russian and Swedish model forest initiatives: adaptive governance toward sustainable forest management? Ecology and Society 15(2):14

EREC European Renewable Energy Council, (2011) Mapping Renewable Energy Pathways towards 2020: EU Roadmap.

Ericsson, L., Huttunen, S., Nilsson LJ., et al (2004) Bioenergy policy and market development in Finland and Sweden. Energy Policy 32(15):1707-1721.

Eriksson, L., Gullberg, T., Woxblom L. (2008) Forest treatment methods for the private forest owner. Working report 2008:10, Department of forest products, Swedish University of Agricultural sciences, Uppsala.

Eriksson, L. 2012. Exploring underpinnings of forest conflicts: a study of forest values and beliefs in the general public and among private forest owners in Sweden. Society & Natural Resources: An international journal, 25(11): 1102-1117.

Fredman, P., M. Stenseke, K. Sandell, A. Mossing (eds) (2013) Friluftsliv i förändring: Resultat från ett forskningsprogram. Slutrapport. Rapport 6547. Stockholm: Naturvårdsverket.

Governmental Proposal (2004) En svensk anslutning till ILO 169 [A Swedish ratification of ILO 169] Swedish governmental proposal 2004/05:K330 [online] 2013-10-15: http://www.riksdagen.se/sv/Dokument-Lagar/Forslag/Motioner/En-svensk-anslutning-till-ILO-_GS02K330/?text=true

Gundersen, V., & L. Frivald (2008) Public preferences for forest structures: A review of quantitative surveys from Finland, Norway and Sweden. Urban Forestry & Urban Greening, 7 241-258.

Haatanen, A., den Herder, M., Leskinen, P., Lindner, M., Kurttila, M., Salminen, O. (2014) Stakeholder engagement in scenario development process – Bioenergy production and biodiversity conservation in eastern Finland. Journal of environmental management, 135:45-53.

Havnevik, K. (2002) Från jordbruksproduktion till landsbygdsutveckling [From agricultural production to rural development]. Jordbruks-konferensen 2002. Uppsala: Swedish University of Agricultural Sciences.

Hetemäki, L. (2005) Information technology and trends in the paper market. Paper and Timber 87: 424-427.

Hildingsson, R. (2010) The deliberative turn in Swedish sustainability governance: participation from below or governing from above? In Bäckstrand, K., Khan, J., Kronsell, A., Lövbrand, E., 2010. Environmental politics and Deliberative Democracy. Examining the promise of new modes of governance. Cheltenham: Edward Elgar Publishing.

Holm, E., Karlsson, S., Strömgren, M., Westin, K. (2013) Vad ska man ha ett land till? Matchning av bosättning, arbete och produktion för tillväxt. [What is a country good for? Matching settlement, employment and production for growth] VINNOVA Swedish Governmental Agency for Innovation Systems. Report 2013:06.

Holmgren, L. (2006) Forest ownership and taxation in a Swedish boreal municipality context. Doctoral thesis. Acta Universitatis Agriculturae Sueciae No. 2006:05. Swedish University of Agricultural Sciences, Umeå.

Holmgren, E. (2009) Forest commons in boreal Sweden – Aims and outcomes on forest condition and rural development. Acta Universitatis agriculturae Sueciae 2009:96. Umeå: Swedish University of Agricultural Sciences.

Ingemarsson, F., Lindhagen, A., Eriksson, L. (2006) A typology of small-scale private forest owners in Sweden. Scandinavian Journal of Forest Research, 21:3, pp249-259.

Johansson, R. Klang, M. (2004) Den svenska implementeringsprocessen av ILO 169. En politik utan förankring? [The Swedish implementation process of ILO 169. A policy without anchor?] Master Thesis, Luleå University of Technology, SHU 2004:234.

Jonsson, R. (2011) Trends and Possible Future Developments in Global Forest-Product Markets—Implications for the Swedish Forest Sector. Forests 2(1): 147-167

Jonsson, R. (2013) How to cope with changing demand conditions – the Swedish forest sector as a case study: an analysis of major drivers of change in the use of wood resources. Can. J. For. Res. 43:1-14

Karlsson, A. (2012) Allt färre bor i glesbygd. [Less people live in the rural areas]. Välfärd nr 2 / 2012. Stockholm: SCB.

Kindstrand, C; Norman, J; Boman, M; Mattson, L. (2008) Attitudes towards various forest functions: A comparison between private forest owners and forest officers. Scandinavian Journal of Forest Research, 2008, vol 23(2): 133-136.

Kleinschmidt, D., Ingemarsson, F., Holmgren, S. (2012) Research on forest policy in Sweden – Review. Scandinavian Journal of Forest Research, 27:2, 120-129.

Klenk, N., Reed, M.G., Lidestav, G., Carlsson., J. (2013) Models of representation and participation in model forests: Dilemmas and implications for networked forms of environmental governance involving indigenous people. Environmental Policy and Governance. 23:11 (2013).

KSLAT (2012) Dags att utvärdera den svenska modellen för brukande av skog. [Time to evaluate the Swedish model for silviculture]. Kungl Skogs-och Lantbruksakademins Tidskrift [Journal of Royal Swedish Academy of Agriculture and Forestry] 151(8).

KSLAT (2013) Förnybar energi. [Renewable energy] Kungl Skogs-och Lantbruksakademins Tidskrift [Journal of Royal Swedish Academy of Agriculture and Forestry] 2013:8.

Leung, D., Y., C., Yang, Y., (2012) Wind energy development and its environmental impact: A review. Renewable and Sustainable Energy Reviews, Volume 16, pp. 1031-1039

Lindhagen, A. (1996) Forest recreation in Sweden: Four case studies using quantitative and qualitative methods. Doctoral Thesis. . Acta Universitatis Agriculturae Sueciae. Department of Environmental Forestry. Uppsala: Swedish University of Agricultural Sciences.

Lindroos, O., Lidestav, G., Nordfjell, T. (2005) Swedish non-industrial private forest owners – a survey of self-employment and equipment investments. Small-scale Forest Economics, Management and Policy 4(4), 409-426.

Lundmark, L.J.T., Fredman, P., Sandell, K. (2010) National parks and protected areas and the role for employment in tourism and forest sectors: a Swedish case. Ecology and Society 15(1):19.

Mattsson, L. & C. Li (1993) The non-timber value of northern Swedish forests: An economic analysis. Scandinavian Journal of Forest Research, 8 426-434.

Myrdal, J. (2008) Framtiden – om femtio år. Global utveckling och rural-urbant i Norden. Stockholm: Institutet för Framtidsstudier

Niedomysl, T & Amcoff, J. (2010) Is there a hidden potential for rural population growth in Sweden? Working paper 2010:2 , Institute for Future Studies, Stockholm. Accessed online: 2013-10-16. http://www.iffs.se/wp-content/uploads/2011/01/20100504091956filWDKDgX2LTflL1562W9Ps.pdf

Nilsson, S. (2012) Future Swedish Forest Policy Process. Miljömålsberedningen [All Party Committee on Environmental Objectives] 2010:04. Consult report. Accessed online 2013-08-05. http://www.sou.gov.se/content/1/c6/21/35/84/5268fa59.pdf

Nordlund, A. and Westin, K. (2011) Forest Values and Forest Management Attitudes among Private Forest Owners in Sweden. Forests, 2011, vol 2(1): 30-50.

Norgaard, R.B. (2010) Ecosystem services: From eye-opening metaphor to complexity blinder. Ecological Economics 2010. Vol 69(6):1219-1227.

Norman, J. (2009) Amenities of Swedish forests: Attitudes and values among stakeholders. Doctoral Thesis. Doctoral thesis. Acta Universitatis Agriculturae Sueciae. Southern Swedish Forest Research Centre. Swedish University of Agricultural Sciences, Alnarp.

Nylund, J-E., Ingemarson, F. (2007) Forest tenure in Sweden – a historical perspective. Department of Forest Products, Report No. 5. Uppsala: Swedish University of Agricultural Sciences.

Nylund, J-E. (2009) Forestry legislation in Sweden. Department of Forest Products Report No. 14. Uppsala: Swedish University of Agricultural Sciences.

Nylund, J-E. (2010) Swedish forest policy since 1990. Department of Forest Products, Report No. 16. Uppsala: Swedish University of Agricultural Sciences.

Pettersson, Ö. (2002) Socio-Economic Dynamics in Sparse Regional Structures. Doctoral Thesis, 2002:2, Gerum kulturgeografi [Department of cultural geography] Umeå University.

Riemer, A., Betuch, H-O., Zhirkova, I., Winkler, J., Wappler, S., Storch, S. (2013) Impact of selected structural factors on the forest-based sector in the European Union. Report. INTEGRAL WP 3.1. p. 150-157.

Roughley, D. J. (2005) Nanotechnology: Implications for the Wood Products Industry. Final Report. Forintek Canada Corporation, North Vancouver, Canada. Online at: http://www.nanotechbc.ca/resources_/documents/Wood_Products+Nanotech-05.pdf29.

Sandström, C & Widmark, C. (2007) Stakeholder´s perceptions of consultations as tools for co-management – A case study of the forestry and reindeer herding sectors in northern Sweden. Forest Policy and Economics 10:27-35.

Sandström, C., Lindkvist, A., Öhman, K., Nordström, E-M. (2011) Governing competing demands for forest resources in Sweden. Forests, 2, 218-242.

SCB Statistics Sweden (2012) Sveriges framtida befolkning 2012–2060. [Future Swedish population 2012-2060] Stockholm: Statistiska centralbyrån [Statistics Sweden].

SCB Statistics Sweden 2013. Population statistics, 1 nov 2012. [online] accessed 2013-10-28:http://www.scb.se/Pages/TableAndChart____345302.aspx

Skogsindustrierna (2007) The general public's view on the Swedish forestry sector 1985-2007. Stockholm: Skogsindustrierna.

SNF Sveriges Naturskyddsförening [Swedish Society for Nature Conservation] (2009) Guidehandledning Framtidens landskap. [Guide book for Future Landscapes] Accessed online 2013-10-04: http://www.naturskyddsforeningen.se/sites/default/files/dokument-media/handledning/Guidehandledning_framtidens_landskap.pdf

SOU (1999) (Statens offentliga utredningar) [Governmental public investigations] Samerna – ett ursprungsfolk i Sverige. Frågan om Sveriges anslutning till ILO:s konvention nr 169. Betänkande av utredningen om ILO-konvention nr 169. [The Sami people – an indigenous people in Sweden. [The issue on Sweden´s ratification of the ILO Convention No. 169] 1999:25. Swedish Ministry of Culture.

SOU (2003) (Statens offentliga utredningar) [Governmental public investigations] Mot en ny landsbygdspolitik [Towards a new rural policy] 2003:29 Swedish Ministry of Rural Affairs.

SOU (2006) (Statens offentliga utredningar) [Governmental public investigations] Mervärdesskog Del 1 Förslag och ställningstaganden, slutbetänkande av skogsutredningen 2004. [Forest multiple values Part 1]. SOU 2006:81. Swedish Ministry of Rural Affairs.

SOU (2013) (Statens offentliga utredningar) [Governmental public investigations] Fossilfrihet på väg. [Fossil independency on its way] 2013:84 Swedish Ministry of Enterprise, Energy and Communications.

Stryamets, N., Elbakidze, M., Angelstam, P. (2012) Role of non-wood forest products for local livelihoods in countries with transition and market economies: case studies in Ukraine and Sweden. Scandinavian Journal of Forest Research 27(1):74-87.

Strömbäck, J. & A. Knape (2012) Så får vi ungdomarna att stanna i glesbygd [How do we keep young people in the countryside?]. Aftonbladet, 2012/11/23. Accessed online: 2012/12/20. http://www.aftonbladet.se/debatt/article15819604.ab

Svensson, J., Sandström, P., Sandström, C, et al. (2012) Sustainable landscape management in the Vilhelmina Model Forest, Sweden. Forestry Chronicle 88(3):291-297

Swedish Ministry of Rural Affairs (2013) Rural Development Programme for Sweden the period 2007-2013. Jo 08.008. Information material. Government Offices of Sweden. Online: http://www.regeringen.se/content/1/c6/08/27/31/de111eed.pdf

Thor, M. (2012) Forskning och innovation för produktiv och skonsam skogsteknik: en strategisk fråga för hela den svenska skogsnäringen. [Research and innovation for productive and sensitive forest technology: a strategic issue for the entire Swedish forest sector] KSLA Tidskrift, 1:151. [Journal of Royal Swedish Academy of Agriculture and Forestry 1:151]

Wallin, I. (2012) Bioenergy from the forest – a source of conflict between forestry and nature conservation? An analysis of key actor´s positions in Sweden. Master thesis. 2012:97. Department for forest products, Swedish University of Agricultural Sciences, Uppsala.

Westholm, E. Waldenström, C. (2008) Kunskap om landsbygden, dags för en ny agenda [Knowledge of rural areas, time for a new agenda].Working report, 2008:1, The Institute for Future Studies, Stockholm.

Westling, U. (2013) Tvister om skogens sociala värden. Om mediernas roll i fyra skogliga konflikter [Conflicts on forest social values. The role of media in four forest conflicts]. Future Forests. Working report.

Widd, C. (2005) Samernas rätt till land och vatten. [Sami Rights to land and water] Master thesis. Faculty of Law, Lund University.

Wilhelmsson, E. (2011) Enskilda markägares målformulering. [Goal formulation of non-industrial private forest owners] Working Report 305. Department of Forest Resource Management, Swedish University of Agricultural Sciences, Umeå.

Zaremba, M. (2012) Skogen vi ärvde. [The forest we inherited] Accessed online: 2013-03-20 http://www.dn.se/Stories/stories-kultur/skogen-vi-arvde Also available in printed book through Stockholm: Weyler.

Örstadius, K. (2012) Glesbygden töms på folk i allt snabbare takt. [The rural areas are emptied with people rapidly] Dagens Nyheter 2012-01-18. Accessed online: http://www.dn.se/nyheter/sverige/glesbygden-toms-pa-folk-i-allt-snabbare-takt.