UNIVERSITY OF TURKU
Turku School of Economics

Alternative Futures Images for Biodiversity in Finland's Commercial Forests in 2050

Master's Degree Programme in Futures Studies
Master's thesis

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27.3.2026
Turku

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Master's thesis

Subject: Futures Studies
Author(s): Tatjana Eskolin
Title: Alternative Futures Images for Biodiversity in Finland's Commercial Forests in 2050
Supervisor(s): Ville Lauttamäki, Minna Pappila
Number of pages: 73 pages (+ appendices 8 pages)
Date: 27.3.2026

Abstract

This study examines how Finnish forestry governance systems enable or constrain biodiversity-protecting structural change within a Future-oriented framework extending to 2050. It identifies institutional, economic, and knowledge-related barriers to transformation and explores alternative development pathways envisioned by experts.

The planetary boundaries framework shows that humanity has exceeded seven of nine limits essential for Earth's habitability, highlighting the urgent need for systemic societal change. Forestry plays a pivotal role in this transition due to its links with climate change, biodiversity, and economic well-being. In Finland, however, forest governance remains largely shaped by a historically production-oriented logic whose compatibility with planetary boundaries and biodiversity limits is uncertain.

Methodologically, the research combines Future-oriented Soft Systems Methodology with the Futures Images framework to analyse actors' expectations, normative imaginaries, and future narratives. Futures Images serve both as analytical tools and as support for envisioning alternative futures. The empirical material consists of 11 semi-structured expert interviews representing public government, education, research, advocacy and NGOs, analysed through qualitative content analysis.

The findings indicate that current governance arrangements inadequately support ecologically sustainable forest use. Key challenges include fragmented governance, conflicting economic incentives, lack of trust among stakeholders, and politicized knowledge. Biodiversity is frequently subordinated to economic objectives, while voluntary certification schemes offer limited leverage for deep change despite their broad coverage. Notably, greenwashing was found to extend into public government, undermining governance credibility and reinforcing systemic lock-ins. The prominent role of private forest owners highlights the social dimensions of forestry governance.

The study concludes that incremental policy measures are insufficient to achieve ecological sustainability in Finnish forestry. Instead, fundamental systemic reorientation within planetary boundaries is required. Existing governance structures maintain a production-centred lock-in where economic interests repeatedly override ecological constraints and greenwashing becomes normalized. Transformation emerges primarily as a political and normative choice rather than a technical optimization challenge. The study emphasizes the urgent need for integrated, science-based, and Future-oriented governance, offering concrete entry points through Futures Images for reorienting forestry toward a planetarily safe operating space.

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"I have used generative artificial intelligence to assist in the preparation of my thesis. In accordance with the instructions of Turku School of Economics, a detailed description of the AI tools I used during the thesis process and how they were used is provided in Appendix [Appendix 4]."

Keywords: Biodiversity, certification, commercial forest, Future-oriented Soft System Methodology, Futures Images, planetary boundaries

Pro gradu -tutkielma

Oppiaine: Tulevaisuudentutkimus
Tekijä(t): Tatjana Eskolin
Otsikko: Suomalaisten talousmetsien biodiversiteetin vaihtoehtoiset tulevaisuuskuvat vuonna 2050
Ohjaaja(t): Ville Lauttamäki, Minna Pappila
Sivumäärä: 73 sivua (+ liitteet 8 sivua)
Päivämäärä: 27.3.2026

Tiivistelmä

Planeetaaristen rajojen viitekehys osoittaa, että ihmiskunta on ylittänyt seitsemän yhdeksästä maapallon elinkelpoisuutta turvaavasta rajasta, mikä korostaa kiireellistä tarvetta muuttaa yhteiskunnallisia toimintamalleja. Metsätalous on keskeisessä asemassa tässä murroksessa, sillä se kytkeytyy samanaikaisesti ilmastonmuutokseen, luonnon monimuotoisuuteen ja taloudelliseen hyvinvointiin. Suomessa metsien käyttöä ohjaavat rakenteet perustuvat kuitenkin pitkälti historiallisesti rakentuneeseen tuotantokeskeiseen logiikkaan, jonka yhteensopivuus planetaaristen rajojen ja biodiversiteetin ekologisten reunaehtojen kanssa on epäselvä.

Tämän tutkimuksen tavoitteena on tarkastella, miten suomalaisen metsätalouden ohjausjärjestelmät mahdollistavat tai rajoittavat biodiversiteettiä turvaavaa rakenteellista muutosta vuoteen 2050 ulottuvassa tulevaisuuskehyksessä. Tutkimuksessa selvitetään, millaisia institutionaalisia, taloudellisia ja tiedollisia esteitä muutokselle on tunnistettavissa sekä millaisia vaihtoehtoisia kehityspolkuja asiantuntijat näkevät mahdollisina.

Metodologisesti työ yhdistää tulevaisuusorientoidun Soft Systems Methodology -lähestymistavan ja tulevaisuuskuvat (Futures Images) -viitekehyksen, jonka avulla analysoidaan toimijoiden nykyhetkeen sidottuja odotuksia, normatiivisia mielikuvia ja tulevaisuuden kertomuksia. Tulevaisuuskuvat toimivat sekä analyysivälineenä että suunnittelun tukena mahdollistaen vaihtoehtoisten tulevaisuuksien hahmottamisen. Tutkielman empiirinen aineisto koostuu 11 puolistrukturoidusta metsätalouden asiantuntijahaastattelusta, jotka edustavat julkisen hallinnon, koulutuksen, edunvalvonnan. tutkimuksen ja kansalaisjärjestöjen käytännön toimijoiden näkökulmia. Aineiston analysoinnissa käytettiin laadullista sisällönanalyysia.

Tulokset osoittavat, että nykyiset ohjausjärjestelmät eivät riittävästi tue ekologisesti kestävää metsien käyttöä. Keskeisiksi haasteiksi tunnistettiin ohjauksen pirstaleisuus, taloudellisten kannustimien ristiriitaisuus, toimijaryhmien välinen luottamuspula sekä tiedon politisoituminen. Biodiversiteetti jää usein taloudellisten tavoitteiden varjoon, ja vapaaehtoiset sertifiointijärjestelmät tarjoavat vain rajallisia välineitä syvälliseen muutokseen, vaikka ne kattavat valtaosan metsämaasta. Aineistosta nousi lisäksi yllättäen esiin hallintoon saakka ulottuva viherpesu, joka heikentää ohjauksen uskottavuutta ja vahvistaa systeemisiä lukkiutumia. Yksityismetsänomistajien keskeinen rooli korostaa ohjauksen sosiaalista ulottuvuutta.

Tutkimus osoittaa, että suomalaisen metsätalouden muutos kohti ekologista kestävyyttä ei ole saavutettavissa inkrementaalisilla, pieni askelin etenevillä politiikkatoimilla, vaan edellyttää perustavanlaatuista systeemistä uudelleen suuntaamista planetaaristen rajojen puitteissa. Nykyiset ohjausrakenteet ylläpitävät tuotantokeskeistä lukkiutumista, jossa taloudelliset intressit ohittavat toistuvasti ekologiset reunaehdot ja viherpesu normalisoituu osaksi hallinnollista käytäntöä. Muutos näyttäytyy ensisijaisesti poliittisena ja normatiivisena valintana, ei teknisenä optimointikysymyksenä. Tutkimus korostaa kiireellistä tarvetta integroidulle, tiedepohjaiselle ja tulevaisuusorientoituneelle hallinnalle sekä tarjoaa tulevaisuuskuva -lähestymistavan avulla konkreettisia lähtökohtia metsätalouden uudelleen suuntaamiselle kohti planetaarisesti turvallista toimintatilaa.

Ilmoitus tekoälyn (AI) käytöstä:

” Olen käyttänyt generatiivista tekoälyä opinnäytetyöni laatimisen apuna. Turun kauppakorkeakoulun ohjeistuksen mukaisesti opinnäyteprosessin aikana käyttämieni tekoälytyökalujen ja niiden käytön yksityiskohtainen kuvaus on liitteessä [Liite 4].”

Avainsanat: luonnon monimuotoisuus, sertifiointi, talousmetsä, tulevaisuusorientoituva pehmeä systeemimetodologia, tulevaisuuskuvat, planetaariset rajat

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1 Introduction

Forests and the ecosystem services they provide are often taken for granted. Different stakeholders pursue different objectives and employ different approaches to achieve desired levels of biodiversity. This complexity is further compounded by the fact that stakeholders often hold divergent views on what the problems are and how they should be addressed. Therefore, there is a need for appropriate methods and tools that enable stakeholders to identify, reflect upon, and address shared concerns that are not necessarily purely technical in nature.

For reasons that remain unclear, existing biodiversity-supporting measures and various voluntary practices have not succeeded in halting biodiversity loss or preserving diverse forest and habitat types. Nature protection and biodiversity enhancement are partly implemented through regulatory measures and agreements monitored by authorities. Some conservation and biodiversity promotion efforts are based on voluntariness and recommendations (Hyvärinen, Juslén, Kemppainen, Uddström & Liukko 2019, 49; Punttila, Piiroinen, Pappila & Annala 2024). As citizens, for instance, we are advised to follow certain dietary models for health reasons and to engage in a specified amount of weekly physical activity (Finnish Food Authority 2025; UKK Institute 2025). Similarly, forests are recommended to be managed according to good silvicultural practices, and certified forests follow their own guidelines (FSC 2023; Forest Management Recommendations 2025; PEFC 2025). These recommendations are advisory in nature, and compliance is largely a matter of personal conscience. In certified forests, external audits may be conducted. If deviations are observed during inspections, they are recorded, yet such observations rarely lead to follow-up actions.

Stakeholders working on biodiversity have largely acknowledged the continued decline of biodiversity despite various conservation and management efforts (FSC 2023; PEFC 2025; Näyhä 2019, 1295; Punttila et al. 2024). Although there is a willingness to address the issue, consensus has not been reached regarding the tools and strategies available.

The public debate on forests and biodiversity is currently intense and highly polarized. Progress and meaningful advancement require engagement among people who disagree. Polarization can be beneficial when it brings people together and promotes positive development. When individuals pursue the same goal, conflicts are common. Development depends on the willingness of opposing parties to understand one another. Framing issues in terms of “us” versus “them” easily creates divides between people with different ways of thinking. The strengthening of extremes generates problems

that are difficult to resolve due to the interdependencies among issues (Joutsenvirta & Salonen 2020, 29–30).

The aim of this thesis is to generate empirically grounded understanding of future biodiversity images in Finnish commercial forests while respecting planetary boundaries (PB). The study also applies Soft Systems Methodology (SSM), originally developed by Checkland (1985a, 1985b, 2000), to the systematic structuring of the empirical material. In the natural resources sector, problems have traditionally been framed through technical lenses emphasizing measurable indicators, optimization, and model-based solutions. This approach tends to obscure values, conflicts, and political dimensions, rendering governance decisions technocratic and difficult to make participatory. Future-oriented SSM (Mannermaa 1987) challenges this structure by foregrounding the worldviews, values, and perspectives of different actors and by asking: whose future, whose system, and whose values matter? The methodology thus offers a means to engage with complex, contested, and uncertain natural resource issues that conventional technical frameworks fail to adequately address.

The primary emphasis of this study lies in empirical analysis, while the role of Future-oriented SSM is supportive of the analytical process and deepens interpretation by providing a framework for understanding alternative perspectives and the complexity of the phenomenon. The purpose of this thesis is to explain, illustrate, and evaluate the suitability of Soft Systems Methodology (SSM) for creating futures images of biodiversity in Finnish commercial forests. In this context, the Future-oriented SSM has not previously been applied, positioning this thesis at the forefront of new knowledge. SSM has been widely used across multiple research fields, and a Google Scholar search yields over five million articles addressing the methodology. The literature has narrowed to studies related to natural resources and futures research, which inform the conceptual framework of this study. For example, Proches and Bodhanya applied SSM in 2015 to development conditions in the sugar industry (An Application of Soft Systems Methodology in the Sugar Industry) and Reid, Gray, Kelly & Kemp (1999) examined labour availability in New Zealand dairy production (An Application of SSM in the On-Farm Labour Situation in the New Zealand Dairy Industry).

The temporal scope of this thesis extends to 2050, approximately 30 years ahead. This timeframe reflects the long ecological and governance timescales through which key institutional factors shaping biodiversity in Finnish commercial forests notably the Forest Act enacted in 1997 and voluntary forest certification schemes introduced around the turn of the millennium and now covering nearly 90% of the forest area produce measurable impacts. In Finland, sustainable forest management, use, and conservation are governed by the Forest Act, which has since been amended and updated. The first

forest certificates were issued in Finland in 1999. Forest certification is a system for assessing and verifying the sustainability of forest management and use, aiming to promote responsible forestry and biodiversity conservation. Finland primarily employs two forest certification schemes: FSC (Forest Stewardship Council) and PEFC (Programme for the Endorsement of Forest Certification). FSC certification began in Finland in 1999 and PEFC certification in 2000 (FSC 2023; Forest Act 1996/1093; Forest Management Recommendations 2025; PEFC 2025; Punttila et al. 2024).

This master's thesis is conducted in collaboration with the Finnish Environment Institute and contributes to the project Confronting Sustainability: Governing Forests and Fisheries in the Arctic (ConSust) (Finnish Environment Institute 2023), funded by the Academy of Finland (decision number 346655). The thesis places greater emphasis on PEFC forest certification, as it was closely linked to the ConSust project conducted from 2020 to 2024. In addition to PEFC, this thesis explores alternative futures for strengthening biodiversity, keeping all options open.

1.1 The research questions

The focus of the study is the biodiversity of Finnish commercial forests, which can justifiably be defined in this case as an unstructured problem situation. The situation is inherently multi-actor, a part of reality open to interpretation, and the problem is not an objective fact but socially constructed. The unstructured problem situation is examined through interviews to gain a preliminary understanding of soft (human-centred) factors, such as goals, trust, leadership, communication, and overall operational efficiency. (Proches & Bodhanya 2015, 5.) Brenton (2007, 13) encourages gathering and examining as much available information as possible in the first phase of the process. Attention should be paid to how things are done within the organization, to understanding the organization's particular language as well as possible, and to learning as much as possible about the people and things important to the organization. In this study, the interviewees were asked about the research questions thematically as follows: attitude, opinion, experience, communication, and bottlenecks.

The biodiversity of commercial forests as a structural problem can be placed into the forest sector network illustrated in the image below. The image is very simple and entirely lacks other parts of society, such as consumers, political decision-makers, markets, and international influences. It serves as a starting point to understand how complex and multidimensional the issue is. The image helps to see how the biodiversity of commercial forests is simultaneously influenced by ecological factors, economic interests, the choices of forest owners, legislation, and various societal expectations. The research group initially outlined the forest sector network as part of the KOKOMETSÄ project by

depicting it as a network formed by its various functions, structured using colours (Soini et al 2022, 12). The image also aims to illustrate the hierarchies between functions through variations in shades. The light green background of the image symbolizes biodiversity. This visual simplification functions like a map, reminding us that safeguarding forest biodiversity is linked to wide networks and many interdependent actors.

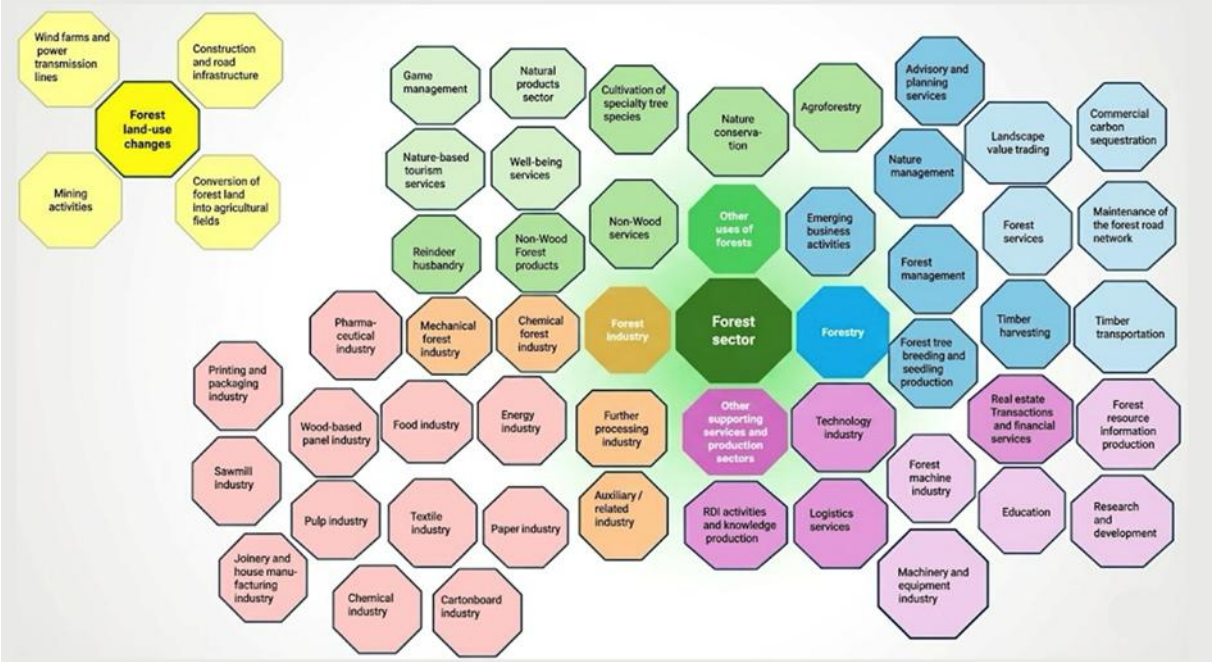

Figure 1 Forestry network. The forest sector is presented as a network composed of different functions and the hierarchical relationships between them, without examining the economic and social significance of individual products, services, or activities. (Soini et al, 2022, 12.)

To explore alternative future images for Finnish commercial forests, the following research questions are proposed.

Research question 1: What are the necessary and acceptable means to strengthen the biodiversity of commercial forests?
Research question 2: What will forest and nature management look like in 2050?
Research question 3: How will forest legislation and forest certification systems develop over the next 30 years?

In this study, the alternative Future Images for the biodiversity of Finland's commercial forests in 2050 serve as a framework supporting the synthesis of the research, bringing together answers to all research questions. They are based on an analysis of measures considered necessary and acceptable for strengthening biodiversity (RQ 1) and utilize this knowledge base to examine different development pathways. Images of the future illustrate possible ways of managing forests and nature in 2050 (RQ 2) and outline alternative trends in the development of regulation and certification

systems over the next three decades (RQ 3). The purpose of the Futures Images is not to predict the future, but to produce structured and comparable alternatives that can be used to assess the impact of decision-making and governing mechanisms on the biodiversity of commercial forests. Futures images therefore provide a comprehensive framework in which ecological, economic, and institutional perspectives can converge, and through which the work produces understanding of possible alternative futures within planetary boundaries.

2 Theoretical framework

2.1 Planetary boundaries (PB)

The study is built within the framework of planetary boundaries concept, because the future of humanity depends on our ability to act within the limits set by nature's carrying capacity, and to act now. The framework is used as a normative and analytical reference point to assess whether Finnish forest governance systems operate within ecologically safe limits. The role of planetary boundaries is to act as a knocker-up in this study.

The planetary boundaries framework defines safe operating conditions within which the stability of natural systems and the continuity of life can be ensured. According to the 2025 assessment, seven out of nine planetary boundaries have already been exceeded, increasing risks for all species and future generations (Kitzmann, Caesar, Sakschewski & Rockström 2025; Rockström et al. 2023). In Europe, the key challenges are the decline in biodiversity, the degradation of ecosystems and the overconsumption of natural resources, and in Finland these are complemented by the slow development of the circular economy, the weakening of carbon sinks and limited progress in reducing transport emissions (European Environment Agency 2025).

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The current development model based on gross domestic product (GDP) emphasizes continuous economic growth as the primary indicator of well-being. The GDP model measures market-based production and consumption but does not consider the state of ecosystems, the depletion of natural resources, social justice, or the distribution of well-being. As a result, environmental harm is often seen as inevitable side effects of economic activity that are not compensated for without legislative coercion. (Hellström 2023, 24; Landrum 2018, 305.) A growth-oriented economy maintains linear production and consumption logic based on the continuous exploitation and overconsumption of new natural resources and thus accelerates environmental crises (Costanza et al. 2023).

From a planetary boundaries' perspective, the economy is a subsystem that is completely dependent on the functioning of the biosphere. The well-being of smaller systems is always linked to the state of larger systems, and functions must be considered as wholes and not as separate components. For example, in forestry, individual mitigation measures, such as leaving conservation trees in clearcuts, do not prevent the transfer of nutrients and solids to waterways, which illustrates the system-level influence relationships. (Fullerton 2015; Hellström 2023, 29–30; Landrum 2018, 303–307; Mang & Reed 2012, 31–33; Veijalainen 2024; Veijalainen, Grénman & Räikkönen 2023, 115; Zuehlsdorff 2024.)

The transition towards sustainable well-being requires a redefinition of the role of the economy: production and consumption are seen as instruments aimed at moderation, equitable distribution of resources and justice. The value of ecosystem services and human dependence on nature must be systematically integrated into decision-making. This means limiting the use of natural resources, phasing out fossil fuels, building energy systems based on renewable energy, and protecting and restoring ecosystems. (Costanza et al 2023.)

Holistic well-being and inclusive co-development require going beyond established practices and seeking inspiration from natural ecosystems, where solutions have evolved to be sustainable over millions of years. This perspective guides the construction of a future where everything affects everything, and development is not sought through individual improvements (Salonen & Joutsenvirta 2018, 94).

A sustainable future requires adaptive and participatory governance, based on scientific knowledge and considering the well-being of both people and nature. Decision-making must be based on planetary boundaries to ensure that living conditions can be secured for all generations (Costanza et al 2023). At the same time, maintaining hope is essential to prevent stagnation and enable change (Kitzmann et al 2025; Meadows 2001; Rockström et al 2023).

2.2 Definition of the biodiversity

This paragraph describes the concept of biodiversity.

Originally, biodiversity mainly referred to the diversity of species. Over the years, however, the concept has developed and expanded to encompass the inherent dynamics of nature and various natural processes (Mönkkönen 2004, 20; Sandström 2001, 7). Therefore, it is not possible to give a clear and precise definition of biodiversity. Kouki (1993) has defined biodiversity as follows: "Biodiversity means all-natural variation that occurs in living phenomena on Earth at all levels of

spatial, temporal and ecological hierarchy. The living environment can be seen as a functional and structural hierarchy, which clearly includes the idea of diversity as a process that manifests itself in time and space. Diversity is not only existing structures, populations and species, but a way of being of the living environment, in which change is a key factor. In this context, diversity is not only a permanent property of nature, but a constantly developing and changing feature. Diversity does not arise and is not maintained without processes belonging to the living environment, such as extinctions, the emergence of new species and interactions between species. The central elements of the biodiversity of nature, or life, are ecological and evolutionary processes that renew and produce diversity."

Biodiversity, or diversity, can be further divided into taxonomic, habitat and genetic diversity. In ecological research, diversity is often divided into three parts. Taxonomic diversity describes the number and abundance of species and the variation in species composition over time and space. Ecological diversity, in turn, refers to the variation in different ecosystems and habitats. Genetic diversity consists of the variation in the genome of individuals and the genetic diversity of the species and populations that form (Mönkkönen 2004, 20; Sandström 2001, 6–7).

The temporal and spatial variability of biodiversity poses challenges for the interpretation and utilization of information. In addition, scale is of great importance, as changes at a higher level are always reflected at lower levels. Temporal variability is related to the development stages of the forest, which can be the result of human activities, such as forestry, or natural disturbances. It is important to note that the current state of the forest is not necessarily the result of recent management but reflects the long-term development of the forest area. Biodiversity is characterized by a delayed response to environmental changes, which can manifest itself as a so-called extinction debt or slow recovery of species and habitats (Mönkkönen 2004, 21–23; Sandström 2001, 6–7).

2.2.1 Loss of biodiversity

In Finland, forests are an important source of economy and employment, and at the same time, several ecosystem services, such as carbon sinks, cleaning effects, recreational opportunities and maintenance of biodiversity, are not available sufficiently (Mönkkönen et al. 2022, 1). When ownership changes, either through direct land sales or inheritance, the forest remains. The forest tells its story about the previous owners, their actions and possible negligence. (Kotilainen & Rytteri 2011,429; Karppinen 27.4.2023.)

In the late 18th century, the Germans developed scientific forestry. A similar forestry model was introduced in Finland in the 19th century. This model is based on sustainable forestry, in which forests are managed in a way that ensures their growth, development and renewal in the long term. In the transition to the 21st century, in addition to the sustainability of wood production, more attention has been paid to securing forest biodiversity and the production of forest ecosystem services, while also considering the economic profitability of forest use. (Kotilainen & Rytteri 2011, 430; Kellokumpu & Säynäjäkangas 2022, 25.) The silvicultural and breeding methods used today, excluding those that primarily promote biodiversity, have been in use for about a hundred years. Finnish forests have transitioned from natural, mixed-age forests to even-aged forestry through previously used selective logging. This forestry method has been an efficient way to produce large amounts of wood for industrial needs, but it has led to the homogenization of forests, which has reduced the natural diversity of forests. There are no longer large and old trees in the forest, and the cultivation of a single tree species is also popular. In addition, efforts have been made to promote forest growth through large-scale fertilization and drainage, which have caused environmental impacts, such as eutrophication of water bodies and acidification of soil. (Kellokumpu & Säynäjäkangas 2022, 22–26; Kouki et al. 2018; Mönkkönen et al. 2022, 2–6.)

Historically, tree growth has been increasing (Korhonen, K., Räty, M., Haakana, H., Heikkinen, J., Hotanen, J-P, Kuronen, M. & Pitkänen, J. 2024, 1–43), but at the same time, forest biodiversity has decreased. This is mainly due to the large-scale use of forests, which includes deforestation, land use changes, the effects of climate change and pollution in addition to forestry. Such human activities can lead to changes in the structure, composition and species diversity of forests, which can negatively affect forest ecosystem services and biodiversity. Growth can be a good indicator of the well-being of forests and their health. However, growth alone does not tell the whole truth about the state of forests. (Hyvärinen et al 2019, 49; Mönkkönen et al. 2022, 1.)

Research results show that the amount of dead wood, or decayed wood, has increased in commercial and conversation forests over the past thirty years. However, current measures have not been sufficient to prevent the loss of biodiversity, although more decayed wood may be left in the forest today, large and old trees may be left there, and burning may be increased. Natural disturbances, such as forest fires and insect pests, can also increase biodiversity, but despite the above-mentioned measures, more measures are needed to stop and increase biodiversity. (Hyvärinen et al 2019, 49; Korhonen et al 2024, 36–37, 43; Mönkkönen et al. 2022, 8; Punttila et al 2024, 9–12.)

2.3 Private forest landowner in Finland

In Finland, 86 percent, or 26.3 million hectares, of the total land area is classified as forestry land. Of this forestry land, 77 percent is forest land, one tenth is low-yielding fallow land and 12 percent is almost or completely wasteland. In addition, about one percent consists of forest roads and other management areas required by forestry. 52 percent of the forest land is owned by private individuals. The state owns 35 percent and companies own eight percent. The remaining six percent is owned by municipalities, parishes and communities. The average size of these farms is 30.3 hectares, and there is a total of 620,000 private forest owners. This means that approximately one in nine Finns owns a forest. They own approximately 350,000 forest farms and make approximately 100,000 timber transactions annually. Private forest owners are responsible for approximately 70 percent of the growth of the forest stand and act as carbon sinks in the same proportion. In addition, they supply 80 percent of the domestic wood needed by industry. (Karppinen et al. 2020, 42; Korhonen et al 2024, 13; Kulju et al. 2023, 17.)

The significant relationship of Finns with forests and nature is also reflected in the fact that Finland respects everyone's rights. They mean that everyone living in Finland could use nature regardless of who owns or manages the area. The use of everyone's rights does not require the permission of the landowner and does not involve a fee, but their use must not cause harm or disturbance. Sparse settlements and large natural areas create favourable conditions for the realization of everyone's rights. Several laws protect, guide and limit the use of everyone's rights. (Ministry of the Environment 2026.)

The general aging of the population is also reflected in the forest owner population. Forest owners are clearly older than the general population, with an average age of 62 years. The age of a forest owner has often been found to affect timber behaviour: the older the owner, the less likely he or she is to sell timber. (Karppinen et al. 2020, 55–56.)

The goals of forest owners have changed in a surprising direction in the 21st century: intangible goals have not been strengthened. Nature conservation, biodiversity and landscape values are not considered as significant values as economic values, which have been emphasized. Forest owners now emphasize the economic benefits offered by forests, such as financial security in old age and the possibility of making larger purchases. (Eskolin 2017, 26; Karppinen et al. 2020, 55.)

In the future, female forest owners consider promoting biodiversity to be the most important thing, while male forest owners rank it as the third most important factor (Eskolin 2017, 26). Forest owners seem to be interested in biodiversity, but economic interests may obscure its importance.

2.3.1 Forestry stakeholders

In this study, the most significant stakeholders in terms of biodiversity are private forest owners, administration, politicians, wood-using industries, engineering contractors, forest professionals, indigenous peoples, researchers and forestry education providers. For comparison, the SSM-based studies selected for this study, which have selected the most central stakeholders, have had the most power to influence and decide on matters (Proches & Bodhanya 2015,13).

Table 1 Examples of relevant stakeholders (Kayaga 2006; Proches & Bodhanay 2015; Reid et al 1999)

Sugar industry South Africa	**Dairy industry New Zealand**	**Water sector Uganda**
Growers	Farmers	International Donors
Mill	Farm labour	Ministry of Finance
Haulier	Dairy industry	Politicians
Natural Sugar Association		Sector Staff
Sugar Research Unit		Private Sector
		The Public
		Civil Society

2.4 Policy instruments for forestry

Next, the regulatory framework governing Finnish commercial forests over the three decades is examined, focusing on national forest legislation, international agreements, the European Union's forest and biodiversity policy, and voluntary protection and certification mechanisms. It can be noted that since 1993, regulations have shifted from a framework that mainly emphasizes minimum requirements for wood production towards a framework that focuses on securing biodiversity and maintaining ecosystem services.

The Forest Act (1093/1996) still forms the basic structure in force, which was modified in the 2014 reform by increasing the forest owner's freedom of choice, but also by loosening ecological criteria.

International agreements, in particular the UN Convention on Biological Diversity (CBD) and the recommendations of the FOREST EUROPE process, have created a framework for national policy (Convention on Biological Diversity, 1992; Forest Europe, n.d.). The EU Nature and Birds Directives and the Natura 2000 network have introduced direct legal obligations, and the EU Biodiversity Strategy and the Deforestation Regulation (EUDR) have strengthened the regulatory focus (Council of the European Union, 1992; European Commission, 2020; European Parliament & Council, 2009; European Commission, n.d.; European Parliament & Council of the European Union, 2023).

Among the voluntary mechanisms, the METSO programme has been a key enabler of forest biodiversity conservation in Southern Finland, based on the voluntary protection of private forests in exchange for compensation (Ministry of the Environment & Ministry of Agriculture and Forestry, 2026). The Helmi programme, in turn, is a broader habitat initiative that strengthens biodiversity throughout Finland by protecting, restoring and managing various habitats, including mires, bird wetlands, traditional biotopes, forests and small waters, while also supporting ecosystem services such as water protection, carbon sequestration and climate change adaptation (Gummerus-Rautiainen, Alanen, Eisto, Ilmonen, Keskinen, Krüger, Matveinen, Svensberg, Rintala, Raatikainen, Ryömä & Siitonen, 2021.) In addition, the PEFC and FSC certification schemes aim to guide forest practices beyond legislative requirements, particularly regarding nature management and social criteria (Programme for the Endorsement of Forest Certification, n.d.; Forest Stewardship Council, n.d.).

2.5 Voluntary forest certification schemes in Finland

2.5.1 PEFC

PEFC (Programme for the Endorsement of Forest Certification) is an international forest certification scheme established in 1999, which was developed specifically to meet the needs of small and family forest owners in response to the perceived lack of consideration of private landowners by FSC (PEFC Suomi 2026b). PEFC aims to promote ecological, socially, economically and culturally sustainable forestry (PEFC F Suomi 2026a). The system emphasizes sustainable use of forests, wood traceability, and consideration of the environment, but its requirements regarding biodiversity protection and conservation areas have been considered relatively modest.

Finland's first certification under the PEFC standard came into force in 2000, when all areas of the then forest centres were included in the group certification (PEFC Suomi 2026b). In 2024, approximately 83% of Finland's forest land area, or approximately 16.9 million hectares, was PEFC certified, and PEFC is also the largest forest certification system in terms of area globally (PEFC

Suomi 2026a). The PEFC standard is updated every five years within the framework of an international system; work on updating the current standard started in 2022 and was approved in 2024 (PEFC Suomi 2026c).

2.5.2 FSC

The FSC (Forest Stewardship Council) was established in 1993 at the initiative of WWF and other environmental organizations to promote environmentally responsible, socially beneficial and economically viable forest management (FSC Finland 2023b). In Finland, the development of FSC certification began in 2000, and the first official national FSC standard was approved in 2011, when several large forest companies also committed to the system (FSC 2024b). In 2024, FSC covered approximately 12% of the Finnish forest area, or approximately 2.5 million hectares (FSC 2024a). FSC sets stricter environmental and social requirements than PEFC, with a particular emphasis on biodiversity protection, indigenous peoples' rights and social responsibility in forestry, which has made it particularly attractive to markets that emphasize responsibility.

The update of the current Finnish FSC standard started in 2016 and entered into force in August 2023. The update was guided by changes in the international FSC principles and the introduction of new international generic indicators (IGI), which aim to harmonise the application of the criteria in different countries (FSC 2023a). Only official FSC member organisations, which are divided into economic, social and environmental chambers, can participate in the update. In Finland, representatives from ten member organisations participated in the process, and all chambers had equal voting rights in decision-making (FSC Suomi 2023a).

2.5.3 Key developments from 1993 to 2023

The following table (Punttila et al 2024) chronologically summarizes the key changes related to the regulation and control mechanisms of Finnish commercial forests. The table includes key events, not all individual regulatory changes.

Table 2 Key events (Punttila et al, 2024)

Year	Key events / regulatory changes
1993	FSC is established internationally; certification of sustainable forest management emerges.
1994	Finland ratifies the UN Convention on Biological Diversity (CBD).

1996	The Forest Act (1093/1996) and the Nature Conservation Act (1096/1996) are adopted; an ecological minimum standard for managed forests is established.
1997	The Forest Act enters into force in practice.
1999	PEFC is established; Finland joins the system during its preparatory phase.
2000	Finland's PEFC system is officially approved (FFCS → PEFC Finland).
2002	Implementation of the Natura 2000 network expands and becomes linked to restrictions on the use of commercial forests.
2003	The first FSC certifications begin in Finland on a limited scale.
2007	The METSO Programme is launched on a large scale to strengthen biodiversity in southern Finland's forests.
2009	The revised Birds Directive (2009/147/EC) (European Union, 2009) enters into force in the EU; impacts intensify, particularly regarding the protection of threatened bird species.
2010	The PEFC standard is updated in Finland; requirements concerning deadwood and nature management are specified.
2011	The Water Act is reformed (578/2011).
2014	A major reform of the Forest Act increases landowner flexibility while weakening the protection of particularly important habitats.
2015	The FSC standard is revised in Finland; stricter requirements for retention trees and protected areas are introduced.
2017	METSO targets are updated; demand for voluntary conservation increases, especially in key biotopes.
2019	The EU prepares a biodiversity strategy; climate policy becomes increasingly linked to forest use (LULUCF Regulation).
2020	The EU Biodiversity Strategy for 2030 is adopted; forest restoration targets are strengthened.
2021	Supreme Court rulings related to interpretations of the Sámi Parliament Act clarify forest use in Sámi areas. EU Forest Strategy adopted (European Commission, 2021).
2022	The FSC standard is revised again; emphasis on Indigenous peoples' rights and preventing biodiversity loss increases.
2023	The EU Deforestation Regulation (EUDR, 2023/1115) enters into force; traceability requirements for wood products increase.

2.6 Positioning the Study in the Academic Context

This chapter reviews interdisciplinary literature relevant to understanding alternative futures images of biodiversity in Finland's commercial forests. The reviewed research spans three complementary domains: futures studies, forest biodiversity and socio-ecological forest use, and governance and policy instruments shaping forest management outcomes. The literature was chosen to provide both conceptual and empirical grounds for addressing the long-term transformations of complex socio-ecological systems.

Futures studies aims to identify and analyse alternative development pathways in complex socio-ecological systems (Amara, 1991; Appadurai, 2013; Rubin, 2013). Previous research emphasizes that Finland's commercial forests constitute a substantial part of the national natural resource base, providing economic goods, ecosystem services, and biodiversity, while decisions concerning their use have been shown to generate wide-ranging environmental and societal impacts (Korhonen et al., 2024; Mönkkönen et al., 2022).

This study seeks to synthesize prior research to outline what kinds of alternative futures images of biodiversity in Finland's commercial forests can be identified toward 2050. The review addresses the research question of how forest use might be reconciled with biodiversity conservation within planetary boundaries through arrangements of governance, steering, and stakeholder interaction.

Scholars conceptualize futures images as instruments for examining societal expectations and anticipating the long-term impacts of decision-making (Bazzani, 2023; Bell & Mau, 1971). Futures research does not seek deterministic prediction; instead, it emphasizes the construction of alternative narratives and futures images through which probable, possible, and normatively desirable development trajectories can be explored (Moore & Milkoreit, 2020; Rubin, 2013).

Bazzani (2023) and Mäkelä et al. (2020) distinguish between present-oriented expectations, normatively charged imaginaries, future narratives that connect these elements, and futures images, which synthesize evaluative understandings of possible future states. Following Mäkelä et al. (2020), this study employs futures images as its primary analytical framework, as the concept has previously been applied in both futures studies and the Finnish forestry context.

Futures images allow present-bound assumptions to be identified, alternative and normatively desirable futures to be structured, and concrete development pathways to be articulated. They serve as an interface between empirical data and strategic foresight, thereby supporting biodiversity enhancement in commercial forests toward 2050.

Research documents that Finnish commercial forests have undergone significant structural changes over the past century in terms of tree species composition, forest management practices, and ownership structures (Karppinen et al., 2020; Korhonen et al., 2024). Landscape homogenization, intensive timber harvesting, and even-aged silviculture are widely identified as key drivers of declining habitat diversity and species persistence (Hyvärinen et al., 2019; Kouki, 1993; Mönkkönen, 2004).

Historical analyses indicate that biodiversity conservation is not the result of isolated interventions but requires long-term policy commitments and practical governance instruments (Kotilainen & Rytteri, 2011). Forest use is therefore framed as a socio-ecological issue in which diverse stakeholder values, interests, and knowledge bases shape governance outcomes (Käppi et al., 2021; Pitzén et al., 2025).

Studies note that commercial forest use in Finland is governed by national legislation and voluntary certification schemes, particularly FSC and PEFC (FSC Finland, 2023a, 2023b; PEFC Finland, 2026a, 2026c; Punttila et al., 2024). These certifications specify biodiversity-related requirements such as deadwood retention, habitat protection, and riparian buffer zones.

However, empirical evidence suggests that practical outcomes depend on monitoring effectiveness, economic incentives, and forest owners' commitment to certification criteria (Finnish Environment Institute, 2023; Punttila et al., 2024). Certification systems can also be interpreted as Future-oriented governance instruments through which alternative scenario pathways may be operationalized and their ecological consequences evaluated toward 2050.

The literature characterizes biodiversity challenges in commercial forests as a typical soft problem field, in which ecological processes, economic structures, and institutional practices interact. Soft Systems Methodology (SSM) has been proposed as a suitable framework for examining such complex socio-ecological systems by combining analytical modelling with participatory learning (Checkland, 1985a; 2000; Checkland & Poulter, 2010; Rubin, 2004).

SSM facilitates participatory futures research by enabling shared problem definitions and the co-creation of alternative development pathways. Previous studies demonstrate that the approach allows exploration of the conditions under which economic forestry and biodiversity conservation might be aligned (Brenton, 2007; Córdoba & Farquharson, 2008; Tikkanen et al., 2015).

When combined with futures images, SSM supports the systematic structuring of stakeholders' current perceptions, normative objectives, and alternative pathways, thereby bridging empirical material and Future-oriented decision-making.

In this study, Mannermaa's (1987) Future-oriented SSM provides a structure through which stakeholder-generated futures images are connected to concrete transformation pathways. The approach supports strategic foresight by integrating futures images thinking with participatory systems modelling and enables the articulation of biodiversity-enhancing development alternatives toward 2050.

Kitzmann et al. (2025) and Rockström et al. (2023) argue that human activities are constrained by planetary biophysical limits, the transgression of which increases the likelihood of nonlinear environmental change and systemic risk. Biodiversity loss is identified as a critical boundary closely linked to land-use change and intensive forest exploitation.

Planetary boundaries therefore provide a normative framework for interpreting futures images by defining the ecological conditions under which forest-use futures can be regarded as sustainable in the long term. Alternative futures toward 2050 are positioned along a continuum ranging from economic optimization to stricter adaptation of forest use to ecological constraints. In addition, futures research urges us to think globally and act locally (Meristö, 12.2.2026).

2.6.1 Summary and Transition to Methodology

The literature indicates that the future of biodiversity in Finland's commercial forests is shaped by governance systems, certification practices, political steering, and stakeholder interaction. Futures images can be constructed through narrative, participatory, and systemic approaches that integrate ecological, economic, and social knowledge within a single analytical framework (Checkland & Poulter, 2010; Moore & Milkoreit, 2020; Rubin, 2023).

Building on these theoretical and methodological foundations, next chapter examines the Futures Images that stakeholders construct regarding biodiversity in Finland's commercial forests toward 2050 and how these relate to planetary ecological boundaries. The analysis draws on the Futures Image's framework and Mannermaa's (1987) Future-oriented Soft Systems Methodology, through which stakeholder perceptions, normative goals, and alternative development pathways are systematically linked. This methodological combination enables comparison between future models and present conditions and supports the formulation of development programs aimed at enhancing biodiversity in commercial forests.

3 Methodology and methods

This chapter presents the methodological approaches adopted in the study. It begins by establishing the research setting. Next, first introduce SSM in general and then a Future-oriented version of it as well as how to apply it and Futures Images, followed by an outline of the data-driven content analysis. The chapter concludes with a presentation of the expertise matrix.

3.1 Research setting

The aim of this study is to analyse how Finnish forestry governance systems enable or constrain structural changes that safeguard biodiversity within ecological boundaries defined by planetary limits, in a future-oriented framework extending to 2050. The analysis focuses on institutional, economic, and knowledge-based governance structures, as well as the actor-specific interpretations connected to them, which either sustain or dismantle production-centred systemic lock-ins.

The literature review indicates that research on biodiversity in Finnish commercial forests has predominantly focused on individual policy instruments and assessments of the current state. Systems-level and future-oriented analyses of the governance system's capacity for change within the context of planetary boundaries are less common. This study addresses this gap by examining the governance system as a multi-actor and normatively charged entity, whose development is not merely a technical process but also a political and institutional one.

The research strategy selected for this study is a qualitative, interpretive, and future-oriented systemic approach. Soft Systems Methodology (SSM) is employed as the methodological framework, applied in conjunction with the Futures Images approach. This methodological combination enables the examination of the governance system as a dynamic whole and supports the analysis of long-term systemic change within the context of planetary boundaries.

The empirical data for this study consist of semi-structured expert interviews representing key actor groups involved in governance, education, advocacy, research and non-governmental organizations. The sampling is purposive and does not aim for statistical representativeness; rather, it focuses on perspectives relevant to examining the governance system. The interviews provide contextual information on the functioning of governance systems, conflicts, and institutional lock-ins that cannot be captured through quantitative methods.

3.2 Soft System Methodology (SSM)

The goal of Soft Systems Methodology (SSM) is to promote understanding and learning between stakeholders about a problem situation, rather than trying to solve a predefined problem. The complexity of organizational and societal problem situations makes problem definition difficult: often the real problem is what the problem is in the first place. SSM distinguishes two main modes of action: real-world action and systems thinking in the real world. In the initial phase, the problem situation is structured through interviews and meetings, and understanding is described using so-called rich pictures.

Systems thinking utilizes the concepts of communication, control, emergent properties, and hierarchy to identify "relevant systems." These are defined using root definitions, after which conceptual models of the selected systems are constructed. Models representing different perspectives serve as the basis for discussion, and through an appreciative process, possible and desirable changes can be identified, as well as concrete measures (Brenton 2007, 12; Checkland 2000).

SSM is particularly suitable for examining phenomena that are difficult to define in a broad social environment where people play a central role. Problems can be conceptualized as subsystems and treated systematically, which enables the examination of complex and dynamic processes without the need to define all actors mathematically (Rubin 2004; Suomi 2022, 82, 84). The method is particularly useful in understanding hierarchical organizations and in forming a holistic picture. Systems methodology supports the handling of real-world problem situations, especially in soft systems, where interaction with the environment is continuous, definitions are imprecise, and predictability is limited (Checkland 1985a, 763; Checkland 2000; Checkland & Poulter 2010, 234–236; Rubin 2023).

When building a systemic model, subsystems are first defined and the interactions between the actors, processes, system functions, and control systems operating within them are defined. In addition, the exchange of energy and external information is examined. The more interactions that form between subsystems, the more likely they are to be selected as objects of analysis. The challenge is to distinguish meaningful interactions from irrelevant ones (Proches & Bodhanya 2015, 6–7; Rubin 2004).

Soft System Methodology (SSM) has developed over decades, and the problem situation is examined through seven stages (Checkland 1985a, 763; Checkland 2000; Checkland & Poulter, 2010, 234–236).

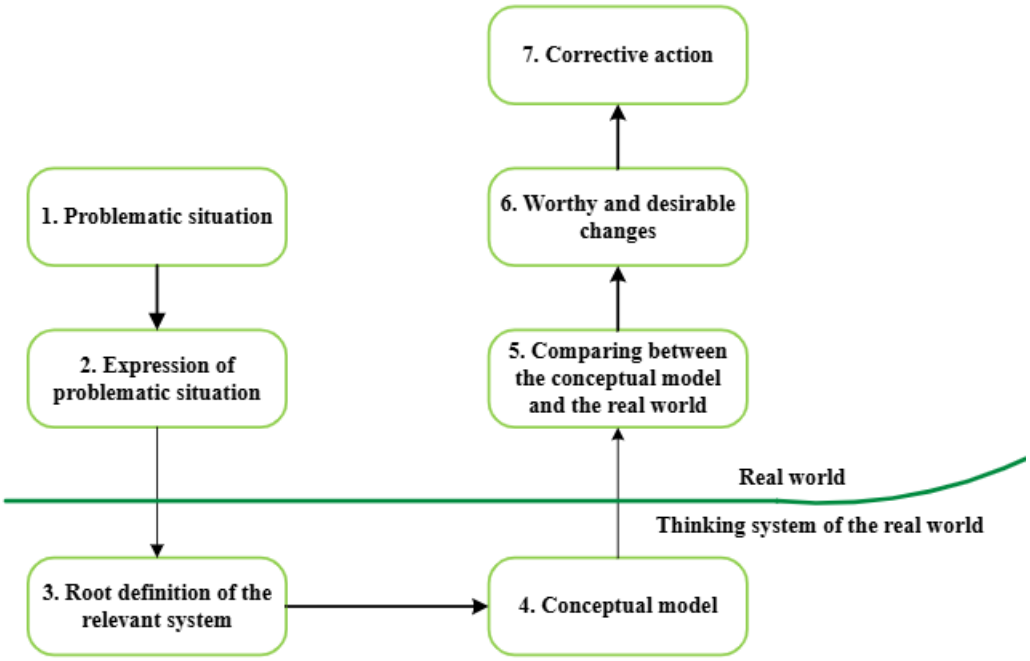

Figure 2 SSM main step (Checkland & Poulter 2010, 234-236)

In phases 1 and 2, the situation is identified and action models based on the worldview are developed. In phase 3, root definitions are formed, which outline the central purpose of the action system being modelled. The root definition is supplemented by the PQR formula (P = what, Q = how, R = why), in which intentional action is presented as a transformation (Checkland & Poulter 2006, 39). In phase 4, a conceptual model is created, which is further supplemented by a CATWOE analysis, which consists of six components. Customers (C), who benefit or suffer from the activity; Actors (A), who implement the activity; Transformation (T), which describes the transformation of inputs into results; Worldview (W), which gives meaning to the activity; Owners (O), who have the power to change or prevent the activity; and Environmental constraints, which affect the implementation of the activity. In steps 5 and 6, the conceptual model is compared to reality, and the functionality is assessed using three criteria (effectiveness, efficiency and effectiveness). In the final, seventh step, the model is compared to practice through interviews, and suggestions for changes are presented to improve the situation. (Checkland & Poulter, 2010, 234–236.)

A review of the biodiversity of commercial forests illustrates the application of SSM (Tikkanen et al 2015). The current state analysis highlights the minimum requirements for degraded biodiversity, periodic harvesting-oriented management and control, and the diversifying objectives of forest owners. Structures include legislation, certification systems, and timber markets, while processes include, for example, harvesting planning and the implementation of conservation programs. Based on these tensions, several future imagines can be formed, such as an ecologically diverse commercial

forest, an intensive bioeconomy or a hybrid model of these. A comparison of the future models and the current state shows shortcomings, especially in control systems, certification criteria and information flow. The identified change needs can be compiled into a strategic program that guides structural, procedural and attitudinal changes towards strengthening biodiversity. In this way, SSM provides a systematic framework that combines analytical future thinking and the change structuring needed to support decision-making.

The step-by-step nature of SSM supports an adaptive management strategy, where incremental improvements are implemented and lessons learned are reviewed in successive methodological cycles. SSM also provides a means for continuous evaluation and adjustment of the project scope based on actual performance. In terms of assumptions related to natural resource projects, SSM appears to offer a practical method for addressing this challenge (Hjortsø et al. 2005, p. 27).

The environmental situation refers to the current state of the environment, which has arisen because of human actions, and these are often unresolved and complex. By expressing different values, norms and intentions, one can guide the development and structuring of problematic situations, which enables the processing of complex issues (Bunch 2003, 187).

In the Finnish context, the stakeholders involved in this study faced some limitations based on status, gender or lack of authority, so it has not been possible to completely avoid conflicts. It can also be stated that in Finnish society, various stakeholder participatory methods have been widely adopted in different sectors over the past decade. However, this is not the case everywhere in the world. For example, in India, administrative processes are not participatory, but rather mechanistic in nature due to the hierarchical structure of the society (Bunch 2003, 187).

3.3 The Future-oriented Soft System Methodology

Mannermaa (1987) expanded SSM into a future-oriented foresight methodology, in which, alongside the present, possible, desirable, and threatening futures are examined through scenarios, weak signals, and alternative development paths. This shifts the focus from improving the current state to the strategic question of which futures we are heading toward and what actions should be taken already today.

SSM focuses on analysing complex, “soft” systems, especially within organizations and decision-making processes, aiming to connect decision-makers’ objectives, envisioned futures, and the current state. In this approach, management actively participates in the process, while an external expert

facilitates and guides it, ensuring effectiveness. Soft systems methodology thus supports understanding change processes and anticipating diverse futures imagines (Mannermaa 1987, 281).

In futures studies, implementing change is structured as a development program based on systems research insights regarding desired changes, their objectives and priorities, and the assessment of system components. Successful implementation relies on motivation, interaction skills, and steering group coordination. Most importantly, all stakeholders' commitment through shared understanding, acceptance, and willingness to act enables tangible actions to transform reality. (Mannermaa 1987, 291.)

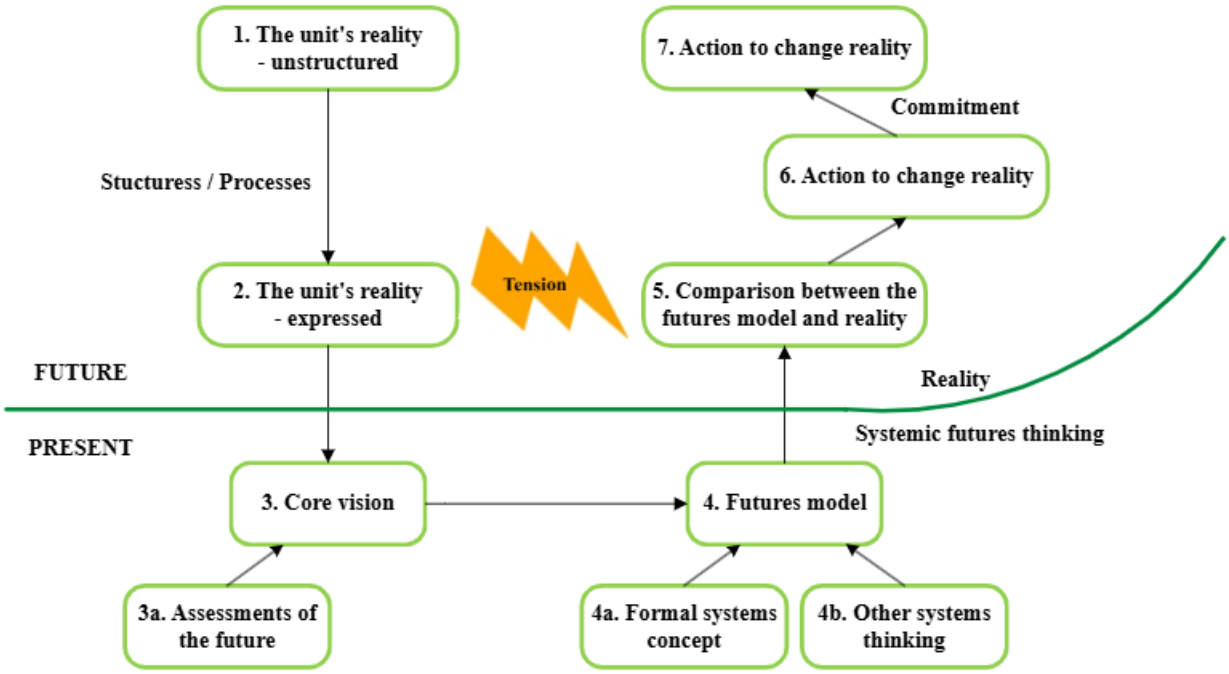

Figure 3 The Future-oriented Soft Systems Methodology (Mannermaa 1987, 287)

The aim of Phases 1 and 2 is to develop an understanding of the current state of the decision-making unit under examination. Since there are multiple interpretations of a human system, different perspectives are collected, and based on these, the perspective or perspectives most suitable for analysis are selected. Subsequently, one or more systems relevant to futures analysis are defined as part of a system hierarchy.

The objective of Phase 3 is to define the core visions of the systems relevant to futures analysis, that is, concise descriptions of what kinds of future systems might exist. The core visions function as hypotheses of possible, desirable, or undesirable futures and help to clarify both the present state and

future development trajectories. The process also incorporates assessments of the future development of the system and its operating environment.

The aim of Phase 4 is to construct future models that describe what functions the system should perform to realize the core vision. The models present the logical structure of the required functions and do not seek to depict an existing reality. From the same core vision, several future models may be derived, each supported to varying degrees; their evaluation is based on plausibility rather than empirical testing.

In Phase 5, the objective of comparing future models with present reality is to identify opportunities for change together with the system's actors. The comparison highlights the complexity of reality and provides a foundation for new ideas, but it also generates tensions and resistance to change, which lead to reflection on the systems and the organization's fundamental needs and purpose.

In Phases 6 and 7, the identified opportunities for change are divided into structural, procedural, and attitudinal changes. Structural and procedural changes concern relatively stable structures and the activities carried out within them and are easier to implement than changes in attitudes. All changes must be both systemically justified and culturally acceptable, considering participants' experiences and the operating environment. (Mannermaa 1987, 287–291.)

Next, it will be presented how the perspective shifts from presenting the general model to applying the model in this study. In the original research plan, an online workshop was planned after the analysis of the interview data, in which stakeholder representatives would have compared future model with present reality in Phase 5 and subsequently proceeded to Phases 6–7. However, the collection and analysis of the interview data proved more time- and resource-intensive than anticipated, which limited the available resources and led to the omission of the planned participatory workshops.

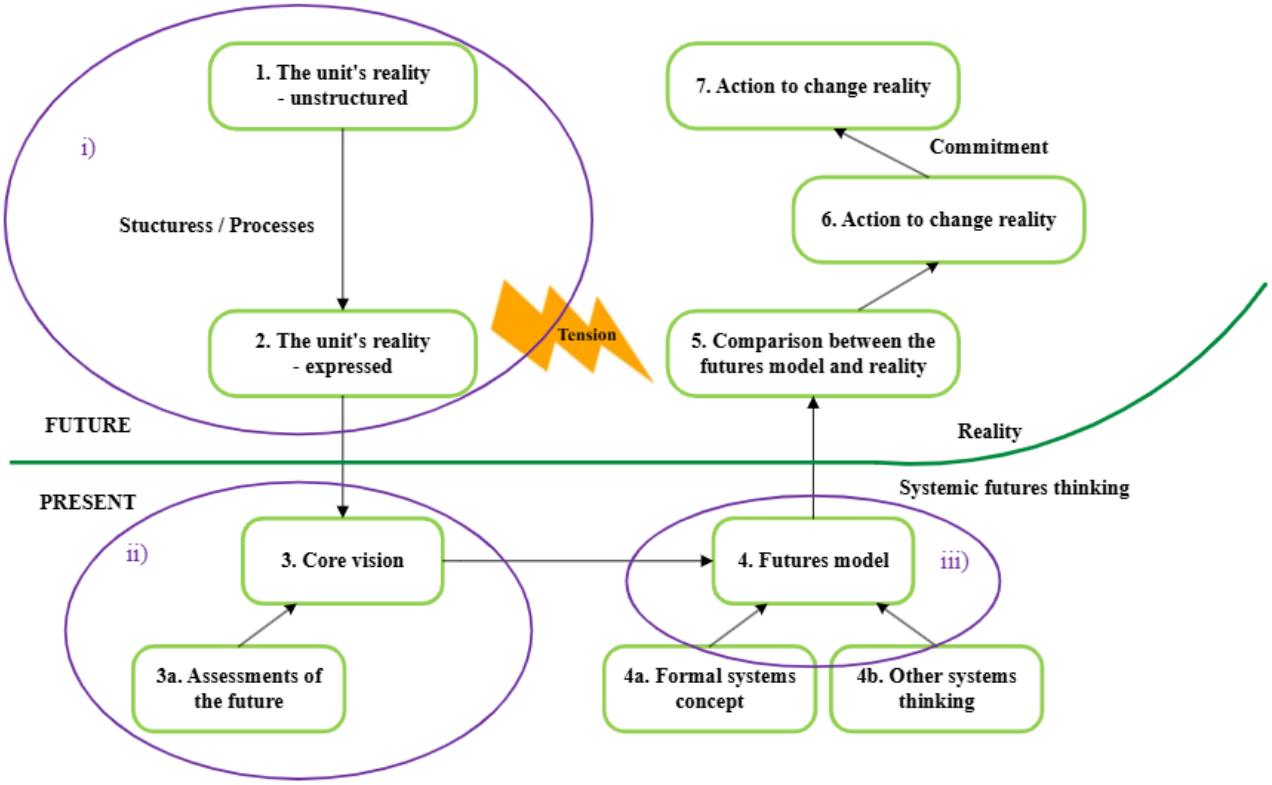

Figure 4 the Future-oriented SSM process applied in the study (i-iii)

In the study process description (Figure 4), in Phase i), descriptions of the current state and the future were collected from interviewees according to the research questions. In Phase ii), the interview data were analysed (see Section 3.5, Empirical Content Analysis), and core visions (11 main themes) were developed. In Phase iii) (see Chapter 4, Empirical observations and Futures Images), alternative Futures Images were created. In total, nine futures images (A–C × 3) were developed based on eleven thematic reflections (Sections 4.1.2, 4.1.4, 4.1.6, 4.1.8, 4.1.10, 4.2.2, 4.2.4, 4.2.6, 4.3.2, 4.3.4, and 4.3.6). Futures Images A and C were first created for each research question based on reflections on each theme. The reflections clearly revealed tensions that emerged from the results. Futures Image B was created separately in between these two very opposing Future Images, to avoid confrontation.

3.4 Alternative Futures Images

In future studies, it is essential to understand how individuals and communities perceive the future and how these perceptions guide action and decision-making. The concept of future images encompasses several approaches, ranging from present-based expectations to broad imagination-based images of the future. Next, we will examine studies by Bazzani (2023), Moore and Milkoreitin (2020), and Mäkelä, Parkkinen, Lyytimäki & Nygrén (2020), in which future images have been defined in different ways. The aim of the review is to present the key features, similarities, and differences of the concepts.

These studies emphasize the roles of future anticipation and meaning making future images guide action, decision-making, and strategic planning. Imagination and normative goals are central to imaginaries and narratives, and various studies recognize the coexistence of multiple futures. Differences occur especially in terms of time span, consideration of realism, and guiding influence. Expectations are based on the present and are realistic, mental images expand possibilities over a long-time span, future narratives connect mental images with concrete action and causal relationships, and future images focus on predictability and supporting decision-making through assessments.

3.4.1 The Futures Images

Mäkelä et al. (2020, 3) use the concept of future images to refer to expectations about a future state, focusing on the outcome rather than development paths. Images can involve probable, possible or desirable futures (Amara, 1991). Future images are created through assessments and assumptions, and their study is central to understanding how they shape societal change through individual and collective action (Bell & Mau, 1971, 12–28; Rubin, 2013). As a practical example, Mäkelä et al. (2020, 12) analyse the use of wood chips in energy production in Finland, where different actors and international regulation shaped the content of future images.

The Futures Images were selected for the study because they have been used previously in futures research and in the Finnish forestry context (Mäkelä et al 2020). The Futures Images serve as both an analysis tool and a planning and discussion tool. They help to identify beliefs tied to the present, describe alternative and desirable futures, and build concrete paths that can help promote biodiversity goals in commercial forests by 2050. In addition, the above-mentioned concepts of future images provide versatile tools for understanding and guiding the future. Expectations limit the present, mental images expand possibilities, future narratives connect mental images to action options, and Futures Images support strategic decision-making and evaluation. Combining these concepts gives researchers and decision-makers tools to analyse and guide societal change over different time spans and levels.

3.4.2 Expectations

Bazzani (2023, 385–386) defines expectations as beliefs about future states of the system, regardless of the actors' influence. Expectations can be unconscious, such as practical awareness, or conscious reflections and plans. They guide action within the present, and actors orient their decisions and actions in accordance with their expectations. Expectations emphasize assessment based on the

present and realistic resource constraints, which distinguishes them from imaginative images of the future.

3.4.3 Imaginaries

Imaginations allow us to imagine future states that cannot be inferred from the current context or expected developments. They include desirable or frightening futures in which elements of the present are combined with normative values. (Bazzani, 2023, 387.) Imaginations can guide action in three ways: by breaking down routines, managing uncertainty, and moving from an ethics of probability to an ethics of possibility (Appadurai, 2013).

Moore & Milkoreit (2020) extend the concept to a social ecological perspective, emphasizing the importance of imagination as a cognitive and social process that enables the visualization of alternative, sustainable futures. Thus, imagination is not only a personal, but also a collective capacity that supports public debate and decision-making at the individual and community levels.

3.4.4 Narratives of the future

Bazzani (2023, 388) presents future narratives as a project-oriented phase of future imagery, in which imagery is combined with hypothetical action options and causal relationships between actions and expected consequences. Future narratives are built on expectations and imagery and guide planning, but they can underestimate the realistic assessment of available resources and obstacles (Tuckett, 2018).

3.5 Empirical content analysis

The aim of content analysis is to produce a verbal and clear description of the phenomenon under study, whereby the data provide a view into that phenomenon. In the analysis, the data are organized into a coherent and concise form in a manner that preserves the information they contain. This involves a gradual transition from the concrete expressions found in the data toward increasingly abstract concepts. Ultimately, the analysis may result in an interpretation in which the entire dataset is captured by a single shared conceptual expression.

Coding the data constitutes the first working phase of the analysis, and the description of data content produced at this stage does not yet qualify as analysis. The purpose is to draw conclusions from the contents of the data that reveal something of broader research interest. At the core of this approach lies the idea that human beings both live in and interpret their world through language. Thus, textual expressions are understood as meaning-making practices through which experiences become

accessible to analysis. Qualitative content analysis proceeds through systematic abstraction, moving from codes to categories and finally to themes. (Tuomi & Sarajärvi 2018, 103–145.)

The research material consisted of 11 expert interviews. The interviews were conducted online (via Google Meet) between 21 March and 8 May 2024 and were recorded for the purposes of transcription. The total volume of the transcribed material was 241 pages (Calibri, 12 cpi, 1.5-line spacing), comprising 71,052 words.

The data were largely homogeneous in terms of thematic coverage due to the use of a pre-distributed, semi-structured interview guide (Appendix 3). At the same time, the interviews varied in style, narrative structure, and length, ranging from brief responses to extended, reflective accounts lasting several minutes. The longest interview lasted 1 hour and 50 minutes, while a typical interview lasted approximately one hour.

In addition to consent for data archiving, respondents were asked to provide background information regarding their employer, job role, length of professional experience, and educational background. Providing background information was voluntary.

Clear differences in perspectives among interviewees were observed during the interview phase. For example, some participants viewed existing approaches to biodiversity governance as largely sufficient, while others articulated fundamentally opposing assessments. Rather than being treated as inconsistencies, these tensions were understood as reflecting the contested and value-laden nature of the research topic. Attending to such divergent perspectives contributed to the credibility and trustworthiness of the analysis by making visible the range of interpretations present within the field and by preventing the privileging of a single dominant viewpoint.

The data were analysed using qualitative content analysis (Tuomi & Sarajärvi 2018, 103–145). The methodological choice was based on its suitability for examining the phenomenon under study. The concepts employed, the research design, and the methods used are inherently defined by the researcher and therefore influence the resulting interpretations.

The analysis proceeded through an iterative process in which close engagement with the data was combined with familiarization with the selected theoretical frameworks, namely Future-oriented Soft Systems Methodology and discussions related to planetary boundaries. This interaction between empirical material and theory guided the analytical focus and the development of interpretations. Attending systematically to both data and theory in this way supports analytic transparency and

enhances the trustworthiness of the findings by making the research process and reasoning visible to the reader.

The content analysis was conducted in a systematic, iterative process to ensure both analytical rigor and traceability. First, all transcribed interviews were read multiple times to gain an understanding of each narrative. The interviews were then condensed to their essential expressions. These condensed expressions were grouped by clustering related excerpts, resulting in 97 subcategories. Many subcategories emerged because opposing perspectives were classified separately, preserving divergent viewpoints.

The subcategories were subsequently combined by coding them according to the three research questions, resulting in 11 main themes (categories). A total of five iterative coding rounds were conducted, allowing for refinement and cross-checking of categories. In the results, subcategories were presented under headings corresponding to the main categories (Tuomi & Sarajärvi 2018, 122–127).

Microsoft Excel was used as a working platform. Color-coding was applied during the coding process to ensure that each unit of analysis could be traced back to the original interview, supporting both transparency and auditability. The units of analysis consisted of responses collected during the interviews, typically sentences or sentence fragments; individual words were not coded. This approach ensured that the analysis preserved the richness of the data while allowing systematic identification of patterns and themes, enhancing the trustworthiness of the findings.

3.6 Expertise matrix

The central idea of this thesis was to bring together representatives of different stakeholders who had worked for at least three years on biodiversity issues related to commercial forests. The interview is a resource-intensive method of collecting data, so the number of interviewees was limited to a maximum of 12 people. The interviewees were selected through the presentation texts on the websites of the organizations they represented. Interview invitations were sent by email to 14 people, of whom three could not be reached. Representatives of the indigenous people, the Sámi, and of the research could not be reached.

An expertise matrix was created to ensure that the research included a sufficiently diverse group of different areas of expertise and backgrounds, such as work experience, education, organizational background, and gender. Expertise was understood broadly so that perspectives would not be narrowed to those within a single field of study or sector. The matrix makes the selection process

transparent and helps demonstrate that no key area of expertise is entirely unrepresented, even if some categories may be emphasized more. Examining complex phenomena requires comprehensive expertise and the combination of perspectives that are not traditionally associated with a single field of study. Experts act as knowledge mediators, guided by both personal viewpoints and professional experience gained in the workplace. (Kuusi, 1999, 187–202; Kiviluoto, Tapio, Tuominen, Lyytimäki, Ahokas, Silonsaari & Schwanen 2022, 1–3; Varho & Tapio, 2013, 615–616.)

In the study, experts were guaranteed anonymity so that they could freely express their views on the future of biodiversity in Finnish commercial forests. The study included representatives from public governance, non-governmental organizations, education, research, and advocacy organizations. The public governance encompassed both the enforcement of the law and the promotion of business. Among the advocacy organizations were representatives of forest owners, the forest industry, and forestry machine entrepreneurs. Participants were placed in an expert matrix based on their expertise and backgrounds, which helped to identify potential gaps in the coverage of knowledge.

Figure 5 The expertise matrix (Kiviluoto et al 2022,3)

The interviewees had at least three years of work experience related to biodiversity in commercial forests, and the longest experience someone had in the field was over 30 years, with an average of

about 15 years of work experience. Eighty-two percent had a higher education degree, whereas on average in Finland, about 42% of people aged 25–64 have a higher education degree (OECD 2025).

4 Empirical observations and Futures Images

The Finnish Forest debate has long been dominated by two strong voices, namely the interests of the forest industry and the goals of nature conservation, which leads to confrontation and makes it difficult to find compromises (Pitzén, Assmuth, Ojanen, Saarikoski & Soini 2025, 1–13). The conflict of interest was also clear in this study, where opposing views emerged during the data collection phase, i.e. during the interviews.

This psychological phenomenon may be due to cognitive dissonance. According to Festinger (1957), the inconsistency between behaviour and beliefs creates an uncomfortable state of tension that people try to relieve by restoring cognitive consistency. This process can lead to permanent changes in people's attitudes and ways of perceiving the world. If one's actions do not match one's beliefs, the inconsistency can be reduced by changing attitudes to match behaviour (Stone & Fernandez, 2008). Cognitive dissonance explains why individuals may shift environmental responsibility to others: the conflict between one's own actions and values is mitigated by explaining that the responsibility belongs to someone else. This perspective naturally leads to an examination of the EMMI phenomenon. Käppi, Tuunanen, Näyhä & Kotiaho (2021, 136–142) examine the EMMI phenomenon in their article (“En minä, mutta muut”, “Not me but others, NOMBO”). It describes a way of thinking in which environmental responsibility is transferred from oneself or one's own group to others. It is felt that one's own actions are not a central part of solving climate or environmental problems, but that responsibility belongs to others. The phenomenon can be conscious or unconscious and is seen in both everyday attitudes and political debate. EMMI is closely related to whataboutism, in which the debate is deliberately misled by irrelevant comparisons. Whataboutism is partly a transfer of responsibility and can occur simultaneously with the EMMI phenomenon, for example in the efforts of the climate action countermovement to delay or weaken climate policy.

According to Käppi et al (2021), the transfer of responsibility for environmental problems is common when both individuals and institutions seek to avoid changes in their own operations. The direction of responsibility is often arbitrary and reflects a desire to be free from responsibility. Individuals have responsibility for environmental problems because they participate in the creation of the problem. However, responsibility should be directed especially to those who have the most power and resources to influence the situation. The imbalance of wealth and power must be considered, and the role of influential institutions is to enable sustainable choices by providing structures, examples and regulation.

Based on the results, the boundary spanner role emerges as a key mechanism for change, which can be interpreted as a systemic change agent. Boundary spanner refers to a bridge builder a person who connects different groups, organizations, or fields and facilitates collaboration across boundaries.

In the Future-oriented SSM process, the boundary spanner not only transmits information, but also challenges established meanings, translates expert language into a common form and supports actors to break away from their own silos. This role enables a shift from defending positions towards reflexive learning and collective future-building.

Chapters 4.1–4.3 describe the themes that emerged from the data in general, by research question. The direct quotes are from the interviewees on the theme in question. Interviewees were promised absolute anonymity. For this reason, identifiable details have been removed from the quotes. The role of the interviewees is described at a level relevant to the analysis so that the reader can assess the context of the interpretations without risk of identification.

Observations and reflections on the results are presented in separate subchapters for each theme, as there are quite a few themes and they are very different from each other. Each theme ends with its own reflections (Reflections). In the analysis phase (Section 3.5 Empirical content analysis), 97 subcategories were later combined by coding them according to the three research questions, which led to 11 main themes (4.1.1, 4.1.3, 4.1.5, 4.1.7, 4.1.9, 4.2.1, 4.2.3, 4.2.5, 4.3.1, 4.3.3, and 4.3.5). The key content of the themes is presented, and then in the Reflections (4.1.2, 4.1.4, 4.1.6, 4.1.8, 4.1.10, 4.2.2, 4.2.4, 4.2.6, 4.3.2, 4.3.4, and 4.3.6) these 97 subcategories are discussed.

Futures Images were formed based on the data, where 97 subcategories were combined into 11 main themes according to the research questions. The reflection of each theme includes the subcategories it contains. Based on the analysis results, for each research question, two Futures Images representing desirable and undesirable futures (A and C) were first created. Between these, a possible Future Image (B) was created as a synthesis.
Thus, three alternative Futures Images were produced for each of the three research questions, resulting in a total of nine Futures Images. They are coded so that numbers (1–3) refer to the research questions and letters (A–C) indicate the type of alternative Futures Images (extremes and the synthesis between them).

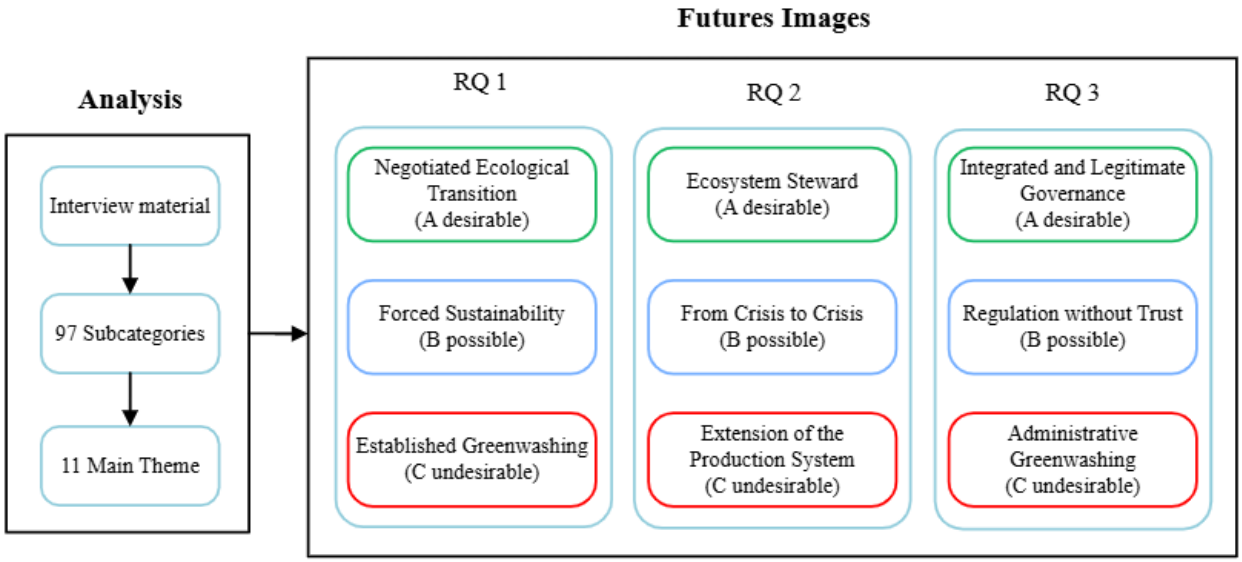

Figure 6 The process of forming images of the future

4.1 RQ 1 Current state of biodiversity in Finnish commercial forests

4.1.1 Theme: Organizational culture, competence, and interaction

The theme encompasses the actors' operating culture, expertise, practical implementation, and the importance of interaction and trust in changes.

Many forest owners have misconceptions about solutions that are good for nature, especially the older generations, and some operators are active and aware by following research information and updated recommendations.

> And yet, in my experience, from the numerous groups I've been in, both regionally and nationally, advocacy organizations always talk about how education and advice are enough. It hasn't been enough so far, because they've been too slow to put into practice. I'm afraid this may seem a bit crazy that something is happening that will collapse that ecosystem. (Governance 3, 21.3.2024)

In addition, people don't dare to intervene or report errors, the culture is towards silence, and at the same time, various working groups and strategies are discussing and trying to develop things.

> In my opinion, I understand quite well that our industry must of course survive and exist and thrive. But I don't like the kind of lying culture that has become somewhat entrenched in this sector. And so, in my opinion, it's not in anyone's interest. (NGO 2, 30.4.2024)

For some reason, forestry professionals find it difficult to raise issues, especially negative ones. The answers did not reveal where any caution or avoidance comes from.

> This is also information received from the operators in that field, that is, the designers, that there is a culture there that does not report certificate violations. And they don't dare to tell that forest owner that by the way; you are committed to PEFC and here is what should be left here. It is said that it is difficult. (Governance 2, 8.5.2024)

4.1.2 Reflections

The results show that the forest industry's operating culture is characterized by caution, hierarchy and a culture of silence, which limit the realization of open interaction and critical discussion. This prevents the handling of deviations and errors and slows down the adoption of new operating methods. Lack of trust and fear of consequences weaken the dialogue and visibility of responsibility needed in the industry.

There are significant differences in the level of knowledge and skills between different groups of actors. Although some forest professionals actively utilize the latest research information and updated recommendations, some forest owners, especially in older age groups, still have outdated or incorrect ideas about sustainable solutions for nature. Information dissemination through education and advice has not been effective enough, as the gap between knowledge and practical implementation is still significant.

The implementation of changes is slowed down by structural and cultural rigidity. Development is discussed at the strategic level, but in practice change progresses slowly, which increases the risk of escalating sustainability challenges. Achieving sustainability goals requires a renewal of the operating culture so that openness, trust and learning from mistakes become the norms of operations.

From a continuous development perspective, it is essential to strengthen internal interaction within the forest sector, create structures for sharing information, and emphasize ethically sustainable operations. Strengthening these prerequisites supports both the credibility of the sector and the achievement of ecological sustainability goals in the long term.

4.1.3 Theme: Policy and regulation

The theme deals with regulation, governance, the distribution of responsibilities and resources, as well as the balance and limits of governance. Regulation and politics contribute to increasing tensions. European Union governance, such as the Restoration Regulation, has attracted strong public criticism. National sovereignty and local decision-making are on a collision course with EU-level objectives. Many feel that regulation is being made too far from everyday life and without sufficient understanding of local circumstances. At the same time, regulation is required due to the decline in

biodiversity and climate change mitigation. This contradictory role of regulation makes the debate even more sensitive.

> What is the real meaning of that law [Forest Act]? Is it intended to be a pseudo-law that protects sites that are not protected in practice, when you get an exemption permit for those loggings anyway? Somehow, it is always justified that we have a certificate and the Forest Act, and they protect the diversity of commercial forests, but in practice, both have very little significance, do they protect them? (NGO 2, 30.4.2024)

Some of the interviewees believed that the measures taken so far are insufficient, that the threat continues, that development is not stopping the decline in biodiversity, and that legislation and certification are not enough, but that more targeted and effective measures are needed. The current administration relies on existing guidelines, although in practice they are not enough and there are also too few resources to implement monitoring. According to the administration, everyone should be treated equally, and no one should be given special treatment.

> So yes, we are being lobbied a lot, both from the conservation and forestry sides, but I must not let that discussion affect my own work, because my job is to interpret the law and the authority is obliged to act impartially. (Governance 1, 4.4.2024)

More than half of the interviewed questioned the practical significance of the current legislation for the biodiversity of commercial forests and considered it to be greenwashing.

> In my opinion, the worst thing is the administrative greenwashing, because people think that things are okay in a country like Finland, because we have such laws and Finns follow the law. Isn't it a bit... We are a terribly conscientious people, that if there are any rules, they are supposedly followed. (Governance 2, 8.5.2024)

> It doesn't really increase confidence that forest law enforcement is committed to all the goals of the law. However, the law also aims to achieve sustainable forestry from a biodiversity perspective. (Governance 1, 4.4.2024)

Some interviewed stated that forestry is long-term, with the effects only becoming visible decades later.

> I don't see the current situation or the expected development of legislation as rosy in terms of safeguarding diversity, even though the EU has at least had some goals. But I do feel that there are still a lot of shortcomings and things to fix. (NGO 20.3.2024)

> So, in summary, we could say that Finland explains that it is capable of sustainable forestry and explains that it does not need EU regulation for this but does not show in any way that it can do so with its own contribution. After all, we in Finland do not have, we have not had any additional obligations due to any EU legislation, and we have not had any restrictions. On the contrary, we are now allowed to cut down forest areas that were previously covered by the Forest Act. (Governance 2, 8.5.2024)

4.1.4 Reflections

The evidence shows that there are significant tensions between different levels of governance in the forest sector regulation, governance and responsibility allocation. European Union governance, such as the Restoration Regulation [EU 2024/1991] (European Parliament & Council of the European Union, 2024) has highlighted the conflict between national sovereignty, local decision-making and EU-level commitments. This situation has undermined trust in the legitimacy of regulation: many interviewed actors experience that decisions are made far from local conditions, and their practical impact is not sufficiently known. At the same time, regulation is seen as a necessary tool to mitigate biodiversity loss and climate change, reflecting the dual role of regulation as a tool of control.

Several interviewees indicated that existing legislation and certification systems are inadequate to ensure the protection of biodiversity in commercial forests. At the level of administration and political guidance, the idea of formal equity and compliance with existing regulations is emphasized, but at the practical level, resource shortages, lack of supervision and conflicting objectives limit the effectiveness of the system. The credibility of the legislation is being criticized, as it is perceived in some places as functioning as a pseudo-mechanism that maintains the image of responsibility without any real ecological impact. The field of regulation and guidance is also characterized by a lack of trust and a climate of blame-based interaction. Criticisms about administrative greenwashing and the symbolic nature of the law reflect the need to reassess the relationship between regulatory objectives and practical implementation. The inadequacy of biodiversity measures and the lack of visibility of long-term impacts increase uncertainty and reinforce the perception of administrative inefficiency.

In a broader view, the key challenge is the multidimensional balance between regulation and governance: how to combine EU-level obligations, national decision-making power and local implementation in a way that ensures that regulation is both legitimate and effective. This requires a critical assessment of both regulatory structures and administrative practices, strengthening resources, and increasing interaction and trust between levels of actors. Only through these conditions can long-term sustainable forestry and the safeguarding of biodiversity be promoted.

4.1.5 Theme: Economics, resources, and ecology

The theme highlights the conflicts between economic and ecological goals, resource use and economic constraints. Forest owners are reluctant to pay the costs of increasing biodiversity, and therefore society is expected to participate more in them.

> Yes, society must contribute to those costs, especially for drainage, but in my opinion also for buffer strips. It is unfair that if landowners have acted according to instructions and according to society's wishes, then they don't have to pay for them at all. (NGO 2, 30.4.2024)

For example, in the protection of architectural heritage, the costs remain with the owner, and a similar policy in the field of biodiversity is perceived as unfair.

> The owners of the heritage buildings are not paid anything for protecting them, but are told that it's a shame that you have a listed building, that you have to maintain it and that repairing it costs much more than an ordinary building, but you don't get any support from the state for it, because according to the constitution, the protection of the heritage buildings belongs to everyone, so you have to pay for it yourself. (Governance 1, 4.4.2024)

The economic use of forests is seen as vital to the national economy. At the same time, conservation measures are not targeted at the most ecologically valuable sites and are seen as ineffective.

> When there are so many actors, so many owners, and so many forest industry actors, it is in a way quite a challenging field to carry out, so to speak, attitude education on a large scale. (Governance 4, 27.3.2024)

4.1.6 Reflections

Based on the data, the central tension in the forest sector is the conflict between economic and ecological goals and how the costs of protecting biodiversity are distributed between private landowners and society. Forest owners perceive obligations as unjust if they cause economic loss without adequate social compensation. This reflects a broader debate on just transition and responsibility sharing in ecological change.

Criticism regarding cost sharing also applies to other conservation areas, such as the preservation of architectural heritage, where obligations are imposed on owners without financial support. A similar logic is seen as problematic in securing forest biodiversity: although environmental responsibility is seen as a shared obligation, its economic consequences are allocated asymmetrically. This situation reinforces the perception that economic constraints limit the practical realization of ecological goals.

The use of commercial forests is still considered by interviewees to be a key part of the national economy and regional economic well-being. For this reason, ecological goals are easily perceived as threatening economic continuity, especially at the local level. At the same time, the effectiveness of conservation measures is questioned, as their targeting is not seen as sufficiently supporting the protection of the most ecologically valuable sites. This makes it difficult to find a sustainable balance between economic benefit sharing and biodiversity objectives.

Overall, the results suggest that promoting ecological sustainability in forestry requires clearer compensation mechanisms, strengthening economic incentives, and policy measures that recognize local constraints and experiences of fairness. The acceptability and implementation of sustainable solutions largely depend on how society manages to reconcile economic realities with the demands of ecological responsibility.

4.1.7 Theme: Knowledge, research, and communication

The theme emphasizes the role of knowledge, research, communication and understanding, as well as the application and significance of knowledge in decision-making. Much research information is used in the forest debate, but the information is not always unambiguous. Different parties emphasize different research and emphasize perspectives that support their own position. In this case, the role of information and the trust associated with it increase confrontation and can lead to a situation where the parties to the discussion no longer share a common understanding of the facts. The plurality of voices of information is a positive phenomenon, but when it is combined with distrust of institutions, the discussion becomes fragmented and suspicious.

> It takes guts and a lot of courage to even dare to open your mouth, because anything can happen. It's not easy to work in the forest sector, and it's especially not easy to speak based on research. It really takes guts. (NGO 2, 30.4.2024)

The forestry sector was seen as conservative and stifling discussion.

> How have research results been manipulated in Finland to make them look good? In other words, our research institutes have also been directed in such a way that they did not want to accept the research that was obtained, so observations have been removed from it to obtain meaningful research. (Governance 2, 8.5.2024)

Freedom of speech was also touched upon in the interviews.

> Why is such a restriction of freedom of speech accepted in Finland? And it is not just a restriction of freedom of speech when it is directed at researchers who are doing research. However, there is a certain morality behind it. (NGO 2, 30.4.2024)

In addition, the media, and especially social media, influence the form of discussion. Complex and contradictory issues are easily reduced to exaggerations and slogans. Algorithms favour strong opinions and emotionally arousing content, which increases siloing and reduces understanding of other perspectives. The atmosphere of discussion becomes harsher, making room for decreasingly constructive interaction.

> It's the attitude that people with terribly little knowledge are spouting on social media and, unfortunately, in the media in general. They think they know about the diversity of forest nature. (Advocacy 1, 25.3.2024)

The following was suggested regarding the increase in diversity talk through communications.

> If we had 10 special reporters in every national newspaper. There is probably an environmental reporter in every newspaper, but there is no forestry reporter. If there were people like that, it would bring a completely different balance to the media. (Advocacy 1, 25.3.2024)

4.1.8 Reflections

The results show that information, research and communication play a central, yet contradictory role in forest sector decision-making and public debate. The use of research information is not neutral, but different actors select and emphasize research results according to how they support their own goals and values. Such selective use of information weakens the shared meaning base of information and can lead to a situation where the parties to the discussion no longer share a common understanding of facts or reality.

Growing distrust of information and doubts about the independence of research institutions highlight the tension at the interface between science and politics. The data suggests that some of those interviewed have experience with the steering of research and interpretive manipulation, which has weakened faith in the autonomy of science. Such developments endanger the usefulness of scientific knowledge in decision-making and increase disagreements about forest policy goals.

The climate of discussion in the forest sector appears conservative and at times stifling, making it difficult for researchers and experts to participate in public dialogue. Experiences of restrictions on freedom of speech and fear of social stigmatization weaken science-based discussion and can crowd out constructive criticism. This reinforces polarization, where argumentation based on knowledge is replaced by debate based on opinions, emotions, and identities.

The influence of the media, and especially social media, is central. The exaggerations and emotional content favoured by algorithms narrow the range of perspectives and encourage simplifications of complex phenomena. This development deepens silos and reduces understanding between different parties, while challenging both researchers and policymakers to communicate about diversity in a way that is both accessible and informed.

Overall, it is emphasized that promoting a sustainable and democratic forest debate requires trust-building communication, a diverse but responsible media, and a visible strengthening of scientific independence. Science-based decision-making in the forest sector requires more open interaction between science, politics and civil society, as well as communication practices that support understanding and critical thinking rather than confrontation.

4.1.9 Theme: Greenwashing

The theme highlights the dynamics of development, social tensions and the challenges of changing mindsets and change processes. The responses felt that the minimum requirements of the certificates were not sufficient, their monitoring was inadequate and the effectiveness of the measures taken was considered questionable, mainly as a hobby.

> So, the certificate is not even known. We do know that the PEFC requirements are not under the control of the forest sector, because we have organized training for them on the subject. And we have also been on those committees. (Governance 2, 8.5.2024)

The current PEFC certification divided interviewed into completely opposite camps.

> Of the certification systems, PEFC is of course, all in all, a very good experience in the field of forest management associations. (Advocacy 1, 25.3.2024)

> That the certification criteria are lax, especially on the PEFC side. Even if you knowingly violate them, there will be no consequences. In my opinion, it is one of the most spectacular greenwashing campaigns that this country has managed to carry out. I think PEFC is a joke. FSC is a bit more ambitious now, because they are from a completely different world. I think it is quite incredible that no matter what you do, you never lose your certificate. (Governance 1, 4.4.2024)

Some interviewed believe that certificates create a foundation and provide an opportunity to influence forest management practices.

> Somehow, the idea should be moved from the minimum certification to the recommendations for forest management, so that they are followed, and not always talking about certification and minimum certification. (NGO 2, 30.4.2024)

Overall, the quality and effectiveness of implementation suffer from a lack of resources and insufficient supervision.

> There are those who are aware of everything, environmental problems, and those who are not aware of anything. And there are those who do wrong on purpose. And those who always try to do the right thing. The spectrum is quite huge. (NGO 2, 30.4.2024)

In addition, self-monitoring in the forestry sector was considered inadequate.

> It is at least a little bit about what certification violations are brought up. The [] is almost the only one that then brings them up. The forestry sector itself does not do it, although now in certification this self-monitoring or other things are great, but at least it does not come to the attention of these regional certification groups. At least we have not. Yes, they are mainly reports from outsiders, as far as we are concerned, the [] and we go and check them to see if this is correct. (Governance 2, 8.5.2024)

> And when there is so little supervision in general. How can you supervise a certificate that has been deliberately made so vague? What does it mean that the protection zone is a minimum of five, on average over 10? Starting from that, just that. And then,

> however, with 10 percent of the protection zone, you can act contrary to it. What does that mean? And all that vagueness in them, which is quite intentional. There was very often in the standards working group that since there have been deviations here, we see the need to change. (NGO 2, 30.4.2024)

4.1.10 Reflections

The evidence highlights that forest certification schemes, especially PEFC and FSC, reflect a broader tension between economic, ecological and social objectives regarding change. Certifications are simultaneously seen as both an opportunity to promote sustainable forest management practices and as inadequate or even misleading guidance tools. This dichotomy speaks to the slow progress of change processes and the difficulty of finding a commonly accepted direction for the development of the sector.

The credibility of certifications is undermined by the experience of their low minimum requirements, inadequate supervision and vague criteria, the interpretation of which is left to the discretion of supervisory authorities and operators. Several interviewed consider the PEFC system to be an example of administrative greenwashing, where the image of responsibility replaces real effectiveness. This criticism reflects a deeper distrust of systems that are intended to act as a guarantee of sustainability, but whose structural and operational shortcomings make them vulnerable.

The differing views on the significance of certification also reflect a shift in mindset and internal divisions within the industry. Some see certifications as a useful starting point that provides a minimum framework for responsible forest management, while others emphasize the need to move towards more effective and recommendation-based practices. This reflects the dynamics of development, where some actors move forward proactively, while others stick to traditional operating models, a phenomenon that maintains tensions and slows down the development of common standards.

Scarcity of resources, limited supervision and weak self-regulation constitute key institutional bottlenecks for the progress of change. The impact of certifications thus remains partly symbolic: they provide a formal structure for accountability but are not sufficient to fix systemic problems. The role of external oversight and civil society is emphasized in such an environment, which supports the credibility of oversight, but also reveals the weaknesses of the sector's internal control.

In summary, the social tensions surrounding forest certification reflect a broader shift towards more transparent, effective and inclusive governance. Strengthening sustainability requires clarifying

certification structures, increasing the independence of oversight, and ongoing dialogue between stakeholder groups so that trust, commitment and real impact can be strengthened simultaneously.

4.1.11 Futures Images

Futures Image 1A: Negotiated ecological transition

In 2050, the biodiversity of commercial forests has turned to a moderate recovery. The ecological imperative has been widely recognized, and the control systems have been reformed to support genuine ecological effectiveness. Forest management practices are based on regionally applied but nationally consistent principles, where continuous cover, the addition of deadwood and ecological networking are commonplace. The key point has been that the changes have been implemented through joint consultation. Forest owners perceive biodiversity measures as fair because financial incentives and compensations are transparent and predictable. The operating culture has become more learning and open, which has strengthened social acceptability and reduced confrontation.

Futures Image 2B: Forced Sustainability

Biodiversity decline has continued well into the 2030s, until international and EU-level pressure has forced Finland to adopt strict regulatory solutions. In 2050, biodiversity has stabilized in places, but the measures are widely perceived as externally directed and unfair. The management systems are technically efficient but socially fragile. The commitment of forest owners is weak, and the system relies on strong monitoring and sanctions. The ecological outcome is partial, but the lack of acceptability creates ongoing political and legal friction.

Futures Image 1C: Established greenwashing

Biodiversity is still in a weak state in 2050. Governance systems have been reformed mostly nominally, and economic incentives have been inadequate. The operating culture has remained cautious and hierarchical, and no real systemic change has taken place. Diversity measures are largely symbolic, and trust in governance has further eroded. Planetary boundaries are acknowledged in rhetoric, but they do not guide practical forestry.

4.2 RQ 2 Future forest and nature management in 2050

4.2.1 Theme: Nature, climate and environmental issues

The theme encompasses biodiversity, climate impacts, practical forest management, environmental change factors, and the interaction between the economy and nature, emphasizing sustainability and ecosystem well-being.

Most responses stated that climate change poses risks and weakens biodiversity.

> Climate change will cause such significant insect damage to our forests that it will increase the pressure to cut down even more extensively and increase the pressure not to protect forests in Finland, because wood resources are decreasing. And that is known in the field. And now that I have interviewed those stakeholders, my point of view is even stronger that there is a risk that nature management will even weaken in the future because climate change will cause a slowdown in tree growth and pest risks, which cannot even be properly considered in the models yet. (NGO 2, 30.4.2024)

It is hoped that forest management will continue to develop and nature management should be integrated naturally into forest management.

> On the other hand, there are some completely different practices that can be brought in from there. Even though we now act quite closely to the recommendations for forest management, which have such jointly agreed and developed principles, there could be something different there. That is one of those that I see as a possible wild card for the future. (Advocacy 2, 27.3.2024)

Other suggestions for promoting diversity were also made.

> There could be METSO areas that would receive a carbon price in addition to the METSO price. They have assessed how they would make the assessment that if they received a euro bonus for carbon. That would be great. METSO sites would start to sell better if there was a carbon bonus. But of course, there is opposition to this in Finland, because then there would be many more METSO deals. (NGO 2, 30.4.2024)

A lighter version of the current Metso program was proposed with a forward-looking biodiversity and climate increase as follows.

> When many landowners voluntarily leave their forests uncut, there should be some Teeri program that would provide 30–50 percent of the METSO protection compensation level, so you can protect any forest, even a logging hole, and with your own decision. Well, it could be the decision of the ELY Centre to protect it. And the decision could include how it will be managed in the future or whether it will be managed at all and then let it develop into such a biodiversity and climate destination. (Governance 2, 8.5.2024)

Forestry organizations that use wood are expected to take a proactive approach in the future, meaning that measures would be taken in accordance with the biodiversity roadmaps that have been prepared.

> That this issue is taken up by the management of companies, put into action, that's the only way, because the individual professional won't be able to sufficiently advance the issue if the organization doesn't take it from there that we all do it the same way. (Governance 3, 21.3.2024)

4.2.2 Reflections

Based on the data, the key challenges for the future of the forest sector are the impacts of climate change, the decline in biodiversity, and their combined effects on forest management, economic activity, and ecosystem sustainability. Climate change is estimated to increase the risk of forest damage, especially insect damage, and to weaken tree growth, which may lead to increased logging pressure and further weakening of nature management implementation. Such developments pose a risk that the goals of climate change management and biodiversity conservation will conflict.

The data highlights the need to strengthen a holistic approach that integrates nature management into forest management practices as part of a sustainable interaction between economy and ecology.

Interviewed emphasize that developing forest management requires innovative solutions and alternative operating models that go beyond traditional forest management recommendations. Such “wild cards” reflect the need to renew thinking and practices in a way that enables more flexible and diverse ecosystem service management models.

Considering the combined effects of biodiversity and climate benefits is becoming a key policy approach. Proposed measures, such as the carbon price linked to the METSO programme or the lighter, voluntary "Teeri programme", demonstrate the effort to find economically incentivising and administratively light instruments that support biodiversity and climate goals simultaneously. Such mechanisms reflect a shift towards integrated management, where the interaction between nature and the economy is seen as an opportunity, not just a constraint.

At the organizational level, there is a need for stronger commitment and guidance. Companies and other forest sector actors are expected to implement sustainability goals, such as the guidelines of biodiversity roadmaps, as part of their operational activities. This requires consistent strategic guidance and a cultural shift towards shared responsibility across the entire network of actors.

Overall, the material highlights that promoting sustainability and ecosystem well-being requires systemic change, in which forest use, the economy and nature conservation are linked in a balanced way. The ability to reconcile climate and biodiversity goals in a way that supports each other and does not pit ecological and economic sustainability against each other is crucial for future forest policy.

4.2.3 Theme: Economy and resources

The theme deals with the use of resources, economic impacts, and the development of forest and nature management and the forest industry.

> When we are going to have a shortage of wood, what will happen to the level of nature management and protection? The clear message has now been that continuous cultivation cannot be increased, because it would lead to a decrease in cubic meter wood production. It is quite difficult in this operating environment to see that simply leaving wider protection zones is seen as conflicting with wood production, even though it should be a basic requirement that if you produce wood, you must also manage the environmental impacts and only produce as much wood as you can sustainably produce. And that regulation is completely missing in Finland. (Governance 2, 8.5.2024)

> Ecosystem-based thinking will certainly deepen further, so that things are not thought about solely based on a single block or pattern, but rather broader issues are considered. (Research 1, 4.4.2024)

> And yet the sector that is most dependent on them, namely the natural resources sector, in practice now forestry and agriculture, is the one that opposes these actions the most. That's where my own brain is somehow going into a knot, wondering if we really can't look any further than tomorrow or below the line of this year's financial year. (Governance 1, 4.4.2024)

4.2.4 Reflections

The data highlights the growing tensions between economic objectives, resource use and ecological sustainability in forest and nature management. The growing demand for wood raw materials and the shortage of anticipated wood resources are increasing the pressure to use forests more efficiently, which at the same time threatens to weaken the level of nature management and protection. This development highlights a structural problem where economic shortsightedness drives decision-making at the expense of ecological sustainability.

The data conveys the view that maximizing wood production still dominates the thinking of Finnish forest policy and industry. The basic principle of sustainable forestry; a balance between production and environmental impacts, is not realized in practice because regulations do not oblige to take ecological limits into account. In this case, for example, leaving wider protection zones or increasing continuous cultivation are overshadowed by economic efficiency requirements, even though they are prerequisites for maintaining the vitality of ecosystems.

According to the data, a shift is needed towards a broader, ecosystem-based forest management model, in which planning and assessment are not limited to individual blocks or patterns, but rather examine entire landscapes and watersheds. This perspective enables the long-term coordination of

resource use with nature's carrying capacity. At the same time, it requires policy reforms that ensure that regulation and economic management meet the requirements of ecological sustainability.

In summary, the future of forestry depends on the ability to break the tight link between resource use and economic growth. Economic activity should be built on ecological boundary conditions, so that the interaction between nature and the economy is based on renewal, not consumption. This requires both a structural and a mindset change in the entire forest sector. In practice, it means a shift towards a model where sustainability is not a constraint on operations, but rather its foundation.

4.2.5 Theme: Societal and international context

The theme highlights societal and international factors that influence forest management and forest use.

> It may be more sustainable than in many other countries, but that doesn't make it ecologically sustainable just because it's less harmful than forestry elsewhere. The market economy guides the forest industry's operations. And these natural values aren't yet included in that whole. (Governance 2, 8.5.2024)

The current geopolitical situation was seen as slowing down the implementation of climate and biodiversity goals.

> In a way, now would be the critical moment when there is something to be saved and action should be taken now at the latest, but given the current global political situation, climate change and climate issues are not on the list of important issues, even though they should of course be there. (Governance 1, 4.4.2024)

> Generally, in the forestry sector, when there are needs for change, whether it's new bioproducts or taking biodiversity into account, whatever, it feels like it takes 20–30 years before they start to become mainstream and are properly included in decision-making. The change there seems to be very slow, very rigid and conservative. (NGO 2, 30.4.2024)

4.2.6 Reflections

Based on the data, forestry and forest use are deeply connected to broader societal and international developments that shape the limits and possibilities of sustainability. Forestry operations are primarily driven by a market economy, in whose structures nature values do not yet form an integrated part of economic decision-making. This leads to a situation where Finnish forestry operations can be considered relatively more sustainable than in many other countries, but in absolute terms its ecological sustainability remains deficient. Sustainability is therefore not based on comparison but on the overall ecological impact, which requires a new set of indicators and control logic.

The development of the forest sector is also affected by geopolitical and economic instability. The current international situation slows down the promotion of climate and biodiversity goals, as political attention and resources are directed towards short-term crises. This threatens the credibility of long-term environmental goals and relegates sustainability issues to the background. The concern highlights the need to ensure that the promotion of biodiversity and climate resilience remains at the heart of policy, even in uncertain circumstances.

The data also points to the cultural and institutional inertia that characterizes the change processes in the forest sector. The adoption of new practices, such as bio-based innovations or diversity-sensitive management models, is slow and often takes decades before they become part of decision-making and everyday practices. This delay indicates the resistance to change built into the organization, i.e. structural inertia and conservatism of the operating culture, which limit the sector's ability to adapt to the changing social and ecological context.

Overall, the results highlight that the ecological and economic sustainability of the forest sector is increasingly defined as part of a global system. The future of sustainable forest management requires a stronger connection of national forest policy to international climate, biodiversity and trade policy objectives. This means a shift from a market-driven logic towards a governance model in which social and ecological values are part of economic structures rather than external corrective mechanisms.

4.2.7 Futures Images

Futures Image 2A: Ecosystem Steward

In 2050, forest and nature management will be part of a broader societal system, where economy, well-being and ecology are interconnected. Forest management is based on ecosystem resilience, not maximum timber production. Management practices are adaptive and regionally tailored. Decision-making is based on continuous monitoring and learning, and forest use is guided by clear planetary boundary conditions. Forests are seen as long-term societal infrastructure.

Futures Image 2B: From Crisis to Crisis

The impacts of climate change have intensified faster than expected. Forest management in 2050 will be largely reactive: responding to disasters, droughts and species loss on a case-by-case basis. Ecosystem-based approaches are recognised as an objective, but in practice decision-making focuses on managing short-term risks. Forest management is a constant balancing act between economic, ecological and social crises.

Futures Image 2C: Extension of the Production System

Forest and nature management in 2050 will still be primarily an economic production system. Ecological goals are subordinate to competitiveness and security of supply. Climate and biodiversity limits are exceeded locally and periodically, which weakens the functioning of ecosystems. Nature management is seen as a cost item rather than a social investment.

4.3 RQ 3 Future forest legislation and certification schemes in 2050

4.3.1 Theme: Forest patrols as law enforces

The theme includes the role, levels and effectiveness of legislation, regulation, supervision and control measures, as well as the development of norms and rules of the game. The responses stated that binding legislation and regulation are needed to achieve the goals.

> But the legislation and certificates will remain, and market-based financing models are the most important. And if you ask me, the Metso and Helmi programs should be made permanent, and not in such a way that they end in 2030. (Advocacy 1, 25.3.2024)

However, expectations regarding the future effectiveness of legislation were low, as both the legal framework and its enforcement were viewed as inadequate.

> Even though we have legislation, its sanctions are completely non-existent, so there is no interest in following the law. And often these are not even investigated, because the violations of the law only come to the attention of the authorities several years later. By then, it is already outdated. (NGO 2, 30.4.2024)

Due to the supervision debt, legal violations and certification deviations that occur in forests often go unnoticed. In addition, the judgments and warnings issued for them are often so minor or mild that they are not enough to deter people from doing things in accordance with the rules and recommendations. To remedy this shortcoming, it was proposed that the authority supervising operations be given the right to impose fines.

> In my opinion, environmental authorities should have the right to issue fines, just like speeding, so that when you speed, even if you haven't caused any harm, the police will issue a fine. So, you've caused harm, but you haven't caused any accidents. It would reduce this kind of illegal activity if there was a direct right to issue fines, so that you get one like this. It doesn't have to be a large sum. But when something is clearly illegal, there should also be the ability to file a request for an investigation. This would be quite radical. It would be a bit like having parking lot patrols, then having forest patrols. (Governance 2, 8.5.2024)

4.3.2 Reflections

Based on the data, the effectiveness of forest legislation and regulation appears to be insufficient in many places, which weakens the credibility of promoting sustainability and biodiversity. Interviewees emphasized that achieving social and ecological goals requires binding regulatory measures and a long-term legislative basis. In particular, the establishment of the METSO and Helmi programs as part of a permanent conservation policy was considered necessary, as fixed-term programs do not ensure continuity or build trust within the network of actors.

At the same time, the current state of the legislation is considered weak in terms of both sanctions and supervision. The fact that violations of the law and certification deviations receive little attention in practice undermines the guiding power of the law and creates the impression that violations of the rules do not lead to concrete sanctions. This lack of supervision narrows the legitimacy of the legislation and reduces the incentives for responsible forest management. The problems are also exacerbated by the fact that violations often only come to the attention of the authorities with a delay, when legal measures are not taken due to the statute of limitations.

The material presented concrete proposals to enhance enforcement and ensure compliance with the law. The proposed direct right to impose fines on environmental authorities was seen to strengthen the effectiveness of the law and create an immediate consequence mechanism for illegal activities. Such a model, when compared to traffic enforcement, reflects the need to increase the direct deterrent effect of regulation and make compliance with the law more meaningful on a practical level.

The results highlight the need for a more coherent regulatory architecture in the forest sector, where the levels of law, supervision and guidance are clearly coordinated. The legitimacy and effectiveness of regulation are because the consequences for violating the law are proportionate and immediately enforceable. At the same time, the guidance instruments should encourage proactive and responsible action, not just punish deviations.

Overall, the conclusions support the view that sustainable forest management cannot rely solely on voluntary and self-directed approaches. Strengthening the ecological and economic credibility of the forest sector requires reforming regulatory mechanisms so that standards, monitoring and sanctions form a coherent, effective and transparent system.

4.3.3 Theme: Responsibilities, roles, and agency

The theme encompasses the responsibilities and rights of actors, practical implementation and division of roles, as well as the challenges of agency and responsibility.

> I do believe that these things are moving forward very slowly. And the more fuss is made about them, the more they will have an impact, that at least the weakening development will be stopped. The goal would be to get it to turn on an improving track, but I don't know if it will be able to turn around in the next decade. That would probably require even more significant measures than are being taken today, but then they are being put on hold precisely on the grounds that changes are slowly becoming visible, that there are already enough things being done. (NGO 2, 30.4.2024)

4.3.4 Reflections

Based on the data, the responsibilities, rights and practical roles of forest sector actors form a multi-level and partly tense whole, where the boundaries of responsibility and agency are not clearly defined. The responses revealed, on the one hand, a belief in gradual development and slow change, but on the other hand, uncertainty about whether current actions are sufficient to stop the decline in biodiversity or to initiate ecological recovery. This dual attitude: the tension between optimism and criticism, reflects the nature of change processes in the forest sector, where progress occurs gradually and resistance maintains structural inertia.

The roles and responsibilities of actors are unevenly distributed between the administration, the forest industry and individual forest owners. The interviewees views highlight the experience that the responsibility for promoting nature management and sustainability is not shared fairly but is concentrated on those who have the least resources to influence the quality or scope of change. This situation can lead to responsibility fatigue (frustration) and a weakening of participation, which in turn slows down the implementation of common goals.

The challenges of agency are also related to the dimension of time: changes in biodiversity and climate impacts are visible with a delay, which makes it difficult to assess effectiveness and reduces motivation for further action. The slow response between developments and measures creates the basis for defensive attitudes, in which changes are perceived as sufficient before their effects have actually been measured. Such a situation maintains stagnation and weakens strategic commitment to long-term responsibility.

Overall, the theme highlights that sustainability challenges in the forest sector are not only due to a lack of resources or regulation, but also to structural ambiguity in agency and responsibility. Sustainable change requires clearer divisions of responsibility, shared goals and more transparent mechanisms that support the opportunities and obligations of different actors to participate in ecological and social renewal. In addition, systematic monitoring and impact assessment are needed to demonstrate the real effects of actions and to develop future decision-making based on them.

For long-term sustainability, it is crucial that agency is understood as a shared project, not as the sum of separate responsibilities. Only in this way can a system based on trust, reciprocity and continuous improvement be built that can respond to the ecological and societal challenges of our time.

4.3.5 Theme: Enhancing legal frameworks

The theme describes the implementation of climate and environmental objectives, the level and adequacy of protection, and the integration of the climate perspective. The Climate Act has not been integrated into the more significant laws concerning the forest sector, i.e. the Forest, Nature Conservation and Water Acts, and this was seen by the respondents as a worrying shortcoming.

> And we have a climate law that obliges authorities to take those climate goals into account in all their activities. However, the climate law has not been written into the water law or the forest law, so that they should be considered. This has led to the fact that, for example, when processing drainage notifications, the goals of the climate law cannot be considered or are not considered. (Governance 2, 8.5.2024)

> Or when we always talk about replacing fossil fuels, the carbon produced by trees into the atmosphere is no cleaner than carbon from somewhere else. From the point of view of the atmosphere, it doesn't matter where the carbon comes from, if it's removed from the atmosphere. This carbon recycling can't explain anything. And it's not a climate measure at all that we recycle through trees. (NGO 2, 30.4.2024)

> Hopefully there will be pressure from somewhere, even from the market, to move in a better direction. That's probably the only way. I don't know how to get Finnish politicians interested in this, to really develop nature management and METKA. METKA is significant. It should receive nature and climate action subsidies that encourage only nature measures. And completely stop those basic forest management measures related to profitability. That's quite clear. (Governance 2, 8.5.2024)

No improvements were seen in the effectiveness of measures to preserve diversity.

> One challenge in this whole thing is also the monitoring of the Forest Act, for example, or also partly, the monitoring of those certificates. In practice, it can be a situation where you can basically do whatever you want there, and there won't necessarily be any consequences. That there wouldn't be any consequences at all for violating the Forest Act. The same with those certificates, how well are the resources to monitor them, and then if they aren't monitored, how much does it create a culture that is committed to it, but then in practice those actions aren't followed in the field, and then there won't necessarily ever be any consequences or getting caught. (Governance 3, 21.3.2024)

4.3.6 Reflections

Based on the data, the implementation of climate and environmental objectives in the forest sector is currently poorly integrated into legislation and practical control systems. It is particularly noteworthy that the obligations of the Climate Act do not extend to key laws regulating the forest sector, such as the Forest Act, the Nature Conservation Act and the Water Act. This creates clear interface gaps and

weakens the effectiveness of the law. This normative discontinuity prevents the systematic consideration of climate objectives in decision-making, for example in the handling of drainage or forestry permit procedures, where climate impacts play a secondary role.

The criticism of current climate policy in the material reflects a broader frustration with the apparent logic of climate action. There is a conceptual contradiction associated with replacing fossil fuels with wood-based products: the release of biocarbon into the atmosphere is no different from fossil-based emissions from a climate perspective, raising questions about the real climate benefit of using biomass. This shows the need to look at climate policy more holistically and base it on a long-term balance of carbon sequestration, storage and emission reductions, not just on material circulation.

Interviewers' views also suggest that the achievement of climate and nature goals is hindered by weak political guidance and inadequately resourced supervision. The ineffective monitoring of the Forest Act and certification systems creates an operating environment where violations of the rules do not result in concrete sanctions. This weakens trust in the legitimacy of regulation and produces a culture where formal commitment does not lead to practical change.

In addition, the data highlights the need for new policy instruments, such as market-based incentives that support climate and nature measures simultaneously. For example, the proposed separation of nature and climate action subsidies from the current financially focused forest management subsidies proposed in the METKA programme was seen to allocate public resources more efficiently to ecologically impactful measures. This reflects a shift where incentives should be directed towards truly sustainable and long-term goals, not towards maintaining the profitability of traditional forestry.

Overall, the results show that the climate and environmental objectives of the Finnish forest sector require structural reform, with better integration of legislation and governance systems at its core. Sustainable climate policy cannot be based on sectoral intransigence, but requires a unified normative framework, effective supervision and policy coherence. Only when these conditions are met can we talk about the genuine inclusion of a climate perspective in decision-making concerning forests and natural resources.

4.3.7 Futures Images

Futures Image 3A: Integrated and Legitimate Governance

In 2050, forest legislation and certification form a coherent and clear whole. Legislation sets binding ecological minimum limits, and certification complements them by demonstrating best practices. Climate and biodiversity impacts are integrated into all key forest laws. Monitoring is credible, and

responsibilities are clear. The system enjoys broad legitimacy because it combines legal bindingness, economic incentives and ecological necessity.

Futures Image 3B: Regulation without trust

Regulation has become significantly stricter, but the lack of clarity about responsibilities and oversight undermines the acceptability of the system. Certification has lost some of its credibility and is seen mainly as an administrative obligation. Planetary boundaries guide legislation, but the interaction and learning required by the SSM are lacking. The result is a rigid and conflict-prone governance model.

Futures Image 3C: Administrative Greenwashing

Forest legislation and certification will formally exist in 2050, but their steering effect is weak. Control is insufficient and sanctions are few. Ecological goals remain rhetorical, and planetary boundaries continue to be exceeded. Certification mainly functions as a marketing tool without real ecological impact.

5 Conclusions

This study contributes to the discussion on the biodiversity of Finnish commercial forests by examining how institutional structures, administrative practices, and actor-level interpretations shape the realization of the research phenomenon in practice. In previous studies, the phenomenon has often been approached either from the perspective of macro-level control systems or individual actors, with less attention paid to the dynamic interaction between these levels. In this study, the phenomenon is analysed as a multi-level social process, where policy-level goals, institutional frameworks, and everyday practices are intertwined.

The main scientific contribution of the study is threefold. First, it produces empirically contextualized information about how the phenomenon is constructed and negotiated in practical administrative and organizational settings. Second, the study refines conceptual understanding by showing how institutional control is transformed at the implementation level through interpretation, adaptation and practical decision-making. Third, the work builds an explanatory link between theoretical and empirical analysis that helps to understand the tension between policy objectives and practical implementation as a broader societal phenomenon.

Next, interpretations of the results (5.1, 5.2 and 5.3) are presented by research question in relation to the research question and the framework, which is built on planetary boundaries and Future-oriented Soft Systems Methodology.

5.1 RQ 1 Current state of biodiversity in Finnish commercial forests

5.1.1 Crucial steps to reinforce biodiversity

Based on the research results, strengthening the biodiversity of commercial forests requires, above all, structural and cultural changes in the forestry operating environment. Necessary measures include measures that break down the institutional locks that maintain forestry and make securing biodiversity a key boundary condition of the system. The current hierarchical and cautious operating culture limits learning, experimentation and critical reflection, which slows down the adoption of ecologically effective practices and easily leaves actions supporting diversity marginal or symbolic. From the perspective of the planetary boundaries' framework, this is problematic, as the biodiversity loss threshold has already been crossed and the use of commercial forests must be guided within the carrying capacity of the biosphere. Steering mechanisms and management models are therefore essential that make safeguarding biodiversity a normative starting point for forest use, and not a voluntary addition or one subordinate to economic goals.

5.1.2 Acceptable measures for strengthening biodiversity

From a social acceptability perspective, the results show that ecologically necessary actions do not become effective in practice without strengthening justice, legitimacy and inclusion. Forest owners' experience of economic threat and unfair cost sharing weakens their willingness to commit to biodiversity-promoting actions, even if their ecological need is recognized. From the perspective of future-oriented soft systems methodology, acceptable means are therefore not based on solutions imposed from above, but on processes that enable joint problem definition, trust building, and learning management. Acceptability requires economic incentives and compensation mechanisms that recognize the different starting points of forest owners and share the costs of securing biodiversity more broadly across society. In addition, structures are needed that increase interaction, transparency, and equal consideration of different forms of knowledge, scientific, experiential, and local. In this way, the global ecological boundary conditions set by planetary boundaries can be translated into locally legitimate and socially acceptable operating principles.

5.2 RQ 2 Future forest and nature management in 2050

The review is directed towards a normative futurological framework, where attention is not only focused on individual measures but on the change in the basic logic and societal significance of forest management. Based on the results, the management of forests and nature in 2050 appears to be a field of action where ecological boundary conditions, economic adaptation and social legitimacy are inextricably linked. The accelerating impacts of climate change, such as forest destruction, reduced growth and increasing stress on ecosystems, are forcing forest management to become more reactive and adaptive. After which forestry is no longer seen as a stable and predictable production system, but as a continuous balancing act amidst disturbances, risks and uncertainty. This changes the nature of forest management so that the focus shifts from optimizing individual interventions towards maintaining the resilience and adaptive capacity of ecosystems. At the same time, the results show that without a fundamental change in economic and political steering mechanisms, climate pressures may increase logging pressure and weaken the effectiveness of nature management, making forest management in 2050 a conflict between sustainability rhetoric and short-term practices.

Considering the Future-oriented Soft Systems Methodology and planetary boundaries frameworks, forest and nature management is seen as a multi-actor, negotiated and continuously evolving system that cannot be controlled unidirectionally through regulation or market mechanisms. The key

challenge is not a lack of information, but the inability to integrate the worldviews and goals of different stakeholder groups into a coherent whole, which highlights the importance of political coherence, corporate commitment, and genuine connection of research information to decision-making. The planetary boundaries framework sets an absolute ecological boundary condition for this social and institutional process: as climate change and biodiversity loss progress, forest management must be built within the carrying capacity of nature.

In 2050, forest management will thus be increasingly defined as an ecosystem-based entity, where carbon sequestration, biodiversity and ecosystem services form the primary basis for forest use, and where economic activity, ecological necessity and social acceptability are reconciled through learning, participatory and just transition-based management models.

5.3 RQ 3 Future forest legislation and certification in 2050

The results show that development is not a process of individual legal changes or technical solutions, but a transformation of legitimacy and effectiveness, in which regulatory and certification models must respond to tightening ecological constraints and growing societal expectations. The current legislation is not on a sustainable basis: weak supervision, few sanctions and unclear division of responsibilities erode credibility and increase pressure for stricter and more implemented guidance, in which principles are more directly linked to practical forest management activities. The development of certification follows a similar logic: its role will be strengthened if the criteria become stricter, supervision becomes independent and transparency increases, but otherwise it may remain symbolic.

According to soft systems methodology, change is a multi-actor and negotiated process, in which the worldviews, interests and power relations of different groups of actors determine the outcome, and successful development requires making responsibilities visible, accelerating feedback and the system's ability to learn. The planetary boundaries framework sets an absolute ecological boundary condition: climate and nature impacts must be systematically integrated into regulation and certification, and without this development, legislation and certification risk lagging ecological reality, with delayed and cumulative impacts potentially leading to irreversible changes.

6 Discussion

The concepts and methods used by the researcher and the way the research is set up guide the interpretation and are reflected in the results of the research. When processing the data, its richness and scope posed challenges for the chosen analysis method, how to find answers to the research problems. The study was not intended to address multiple issues at once, although new and interesting topics emerged during the study. The planetary boundaries framework serves as a normative starting point, guiding interpretation towards conclusions that emphasize ecological sustainability. This delimitation is a conscious research choice, but it influences what kinds of futures are considered realistic or desirable.

Current Finnish forestry is largely based on technical problem-solving management, where decisions are based on models, metrics and quantitative analyses, and where solutions are primarily technical and objective. Standardized processes and extensive regulation guide operations, while values and the views of local actors often remain formal and have little impact. Future-oriented Soft System Methodology offers a tool to address such complex and value-conflicting problems, but its application is time-consuming and dependent on the participating stakeholders and the skills of the facilitator. Tikkanen et al (2015, 68) have stated that the use of Soft System Methodology (SSM) has proven to be time-consuming and conceptually demanding and requires researchers to have diverse communication skills. Furthermore, the uncertainty of socio-ecological systems and the culture of management of traditional technical frameworks can limit the impact of the method on decision-making, making its large-scale institutionalization challenging.

6.1 Reliability and validity

The reliability of the data is supported by systematic documentation of the analysis, thematic analysis and the use of an expert matrix. The role of the researcher is explicit: the analysis is guided by a theoretical framework and theoretical choices, and semi-structured interviews were conducted in a way that allowed the interviewee's own interpretation and alternative perspectives to emerge. Ethical principles were observed with informed consent and anonymity (see Appendix 1,2 and 3). The interviewees were informed about the aims of the study and the use of the data, and their identifying information was removed, which was necessary due to the sensitive nature of the data. The study is limited by its context: the results are not statistically generalizable, and they do not aim to predict the future. Instead, they provide analytically sound information about the structural tensions, deadlocks, and potential development paths of control systems in the context of planetary boundaries.

The reliability of a study refers to its repeatability, i.e. its ability to give non-random results (Hirsjärvi et al. 2009, 231). No similar study has been conducted before, so repeatability cannot be demonstrated directly. The methods and practices chosen for the study are described in detail, based on which the following study can be compared to this one. When measured again using these methods, the same result will be obtained.

Validity refers to the ability of a research method to measure exactly what it is intended to measure (Hirsjärvi et al. 2009, 231). The aim of the study has been to clarify the futures images in 2050, and the necessary delimitations have been made as transparently as possible, documenting the choices and justifications made. When developing the interview form and testing it, not all possibilities were anticipated. The study answered the original need and questions, meaning the study is valid.

6.2 Results interpreted with references to earlier studies

6.2.1 Soft Systems Methodology (SSM)

The study naturally fits into the continuum of previous Soft Systems Methodology (SSM) literature by demonstrating that complex natural resource issues are primarily social and institutional, not technical. Consistent with previous applications (Kayaga 2008, 283; Proches & Bodhanga 2015, 10; Reid et al. 1999, 349), the results highlight how the worldviews, power relations, and established operating cultures of different groups of actors' shape problem definition and solution paths. Like Luckett and Grossenbacher (2003, 151–159) and Cordoba and Farquharson (2008, 95), the study reinforces the notion that learning occurs through dialogue and shared meaning-making. At the same time, it shows that ecological necessity alone is not sufficient to initiate change without perceived legitimacy, justice, and shared responsibility.

A key similarity with previous SSM studies is the crucial importance of stakeholder participation, but also its structural limitations. Forest owners' experiences of unfair cost sharing weaken commitment to biodiversity-promoting actions, which is in line with Proches and Bodhanga's (2015, 13) observations on the role of power and Tikkanen et al's (2016, 70) criticism of the inadequacy of gradual administrative reforms. The results support the view that without fundamental changes in control systems, SSM processes will easily remain symbolic and not lead to systemic change.

Pitzen et al (2025) complement this picture by showing that both citizens and stakeholders support normative-based measures, such as regulations on the leaving of conservation and deciduous trees and restrictions on ditching, and that voluntary and financial incentives such as the METSO program are widely accepted. The fairness criteria raised by the citizen panel expand the interest-based debate

and support this study's finding that the legitimacy of biodiversity policy is built on fair cost sharing and participatory processes. At the same time, Tikkanen et al (2025) emphasize that participatory methods are resource-intensive and require genuine commitment from decision-makers, an observation that resonates strongly with the SSM literature and the results of this study.

6.2.2 Biodiversity

The current hierarchical and cautious organizational culture restricts learning, experimentation, and reflection, which slows down the adoption of ecologically effective practices. This observation supports previous Finnish biodiversity studies. Despite increasing nature management actions (for example, adding deadwood, leaving retention trees, and controlled burning), the decline in forest biodiversity continues. (Hyvärinen et al. 2019; Mönkkönen et al. 2022). The problem is not only the number of measures, but their systemic position: practices that support diversity easily become subordinated to economic objectives or symbolic.

According to the planetary boundaries' framework, the situation is problematic, as the boundary for biodiversity loss has been globally exceeded. The use of commercial forests cannot be viewed solely as a national issue but as part of the biosphere's carrying capacity. This also explains why mere tree growth, even though it has historically increased in Finland (Korhonen et al. 2024), does not convey the ecological condition of forests (Hyvärinen et al. 2019; Mönkkönen et al. 2022).

In a future-oriented perspective, forest management in 2050 is seen at the intersection of ecological constraints, economic adaptation, and societal legitimacy. The intensifying effects of climate change, such as forest damage, growth decline, and increased disturbances, will change the basic logic of forestry from a stable production system to the management of risks and uncertainty. This observation is in line with previous research, in which the structural simplification and even-aged structure of forests increase vulnerability (Kouki et al. 2018; Mönkkönen et al. 2022).

6.3 Novel contributions of the study

The key theoretical added value of the study is the explicit integration of the planetary boundaries' framework into SSM thinking. Whereas previous SSM literature emphasizes participatory learning and negotiated solutions, this study highlights ecologically non-negotiable boundary conditions for forest use. In this way, Future-oriented SSM appears not only as a tool for building socially acceptable practices, but also as a mechanism through which global ecological boundaries can be translated into locally legitimate practices.

The normative futurological approach extends the SSM literature by including the long-term impacts of climate change and ecological uncertainty. The results suggest that without a reassessment of economic and political governance mechanisms, climate pressures may paradoxically increase logging pressure and weaken the effectiveness of nature management. As Kayaga (2008) and Darmato (2017) argue, the key challenge is not a lack of knowledge but an inability to integrate different worldviews and goals into coherent action.

The results on legislation and certification reflect previous findings of multi-agency and negotiated change but also highlight a legitimacy crisis perpetuated by weak oversight, unclear responsibilities and delayed ecological impacts. From a planetary boundaries perspective, regulatory and certification systems need to move from formal compliance towards impact-based models.

In summary, the study strengthens the applicability of Future-oriented SSM in a complex management system like the Finnish commercial forest but expands its theoretical scope by combining social learning with ecological imperatives. The integration offers a new perspective on how strengthening biodiversity simultaneously requires dismantling institutional locks, participatory management models, and recognizing planetary boundaries as a normative starting point for forest use.

The following chapters (6.4, 6.5 and 6.6) present summarized answers to each research question, key findings, and potential policy and administrative implications.

6.4 Essentials acceptable strategies to strengthen biodiversity commercial forests

Strengthening biodiversity in commercial forests requires systemic change that combines ecological constraints (planetary boundaries) and social acceptability (actor-orientation and fairness). Effective measures are only acceptable if they are perceived as fair, transparent and jointly negotiated.

The key findings are that biodiversity loss is not due to a lack of individual means, but to a mismatch between the governance system, operating culture and incentives. In addition, a hierarchical and cautious operating culture slows down learning and the rooting of new practices. The unfair distribution of economic costs and benefits also weakens commitment. In addition to the above, symbolic actions and weak monitoring erode trust in governance.

Policy and management implications include the need to move from voluntary management towards effectiveness-based and equitable management. In addition, financial incentives (compensations, performance-based support) are needed, which are central to building acceptability. Governance must

also enable co-development and local adaptation, not just setting standards. Biodiversity objectives must be integrated into the core functions of forestry, not as separate additional conditions.

6.5 The future of forest and nature management in 2050

In 2050, forest and nature management will be ecosystem-based, systemically driven, and tightly bound to planetary boundaries. It will be a central part of society's ecological transition, not a separate sectoral policy.

The key point is that climate change and habitat loss increase uncertainty and disruption, which changes the nature of forest management. The focus is seen to shift from optimizing production towards resilience, adaptation and ecosystem services. Forest management requires continuous learning, dialogue and cross-sectoral cooperation. Economic activity is increasingly built on the carrying capacity of nature.

The role of forest policy is seen to expand into climate, nature, economic and welfare policy. Governance models are evolving towards adaptive and learning guidance (monitoring, feedback loops). The time span of decision-making is lengthening short-term profitability no longer guides actions alone. Conflicts related to forest management require new participatory and negotiated solutions.

6.6 Future trends in forest legislation and certification systems for the next 30 years

Forest legislation and certification will evolve towards stricter, more integrated and ecologically normative guidance if they are to maintain their legitimacy in an era of planetary boundaries.

The key point is that the current regulation is poorly implemented and suffers from a legitimacy deficit. In addition, responsibilities are unclear and often unevenly allocated. Climate and nature policies are also not sufficiently integrated into forest legislation. The effectiveness of certification systems has been questioned without stricter criteria and independent supervision.

Legislation is being developed towards more binding standards, stronger supervision and clear sanctions. Certification is either institutionalised as part of regulation or loses its significance. Climate and biodiversity impacts are being systematically integrated into all forest-related laws. Governance is moving towards a combination of legal guidance, economic incentives and results-based monitoring.

6.7 Directions for future research

The Finnish Forest sector is characterized by a deep institutional and epistemic lock-in, where economic and ecological goals are framed as mutually exclusive. The current problem definitions in the forest sector direct the discussion into narrow, predetermined channels. This situation is maintained by both established management practices and forms of knowledge production that favour technical problem-solving logic at the expense of pluralistic and systemic approaches. The result is a continuous binary opposition, where stakeholders defend their own siloed structures and real systemic change remains elusive.

Although participatory processes are increasingly being utilized, they often function more as legitimizing mechanisms than as practices that enable change. The risk is that dialogue becomes instrumentalized: participation creates the impression of joint action, but prevailing frameworks, power relations, and future visions remain intact. In this sense, some of the current participatory practices can be interpreted as dialogue washing.

In this context, the Future-oriented Soft Systems Methodology can be positioned as transformative foresight and systemic intervention. The interpretation developed by Mannermaa (1987) extends SSM in the direction of futures work and explicitly challenges prevailing problem definitions. At the core of the method is the joint construction of alternative futures, making the deep structures of the system; values, assumptions and power relations visible, and accepting uncertainty and diversity as part of decision-making.

Unlike consensus-seeking participatory models, Future-oriented-SSM does not seek to smooth over contradictions but deliberately brings them to the fore. Its goal is to shift the discussion from individual controversial issues towards systemic understanding and to open space for new actors and development paths. In this sense, the method acts as a counterforce to the instrumental rationality management paradigm in the forest sector and provides a tool for breaking down locked-in thinking patterns.

Since Future-oriented SSM has not yet been systematically applied in strategic management or forecasting in the forest sector, it constitutes a significant methodological and societal research gap. Further research could examine whether the method can act as a concrete tool for embedding systemic thinking and what kind of transformation processes it triggers in actors' thinking, interactions and future perceptions.

Empirically, this can be approached by building scenarios from future images in two separate groups, citizen and expert groups. After this, the interpretations produced by the groups can be compared (Pitzén et al 2025). In addition, the interview data can be re-analysed in a theory-based manner (Husso et al. 2025; Tuomi & Sarajärvi 2018, 107–114) for example using dialogue theory, which can then assess whether genuinely transformative learning is generated in the processes or whether they remain at the level of symbolic participation.

The fourth line of further research is related to the greenwashing and dialogue washing that emerged in the data. A literature review can be used to clarify the concepts and based on empirical data, assess the extent to which future-oriented participatory processes produce structural change and the extent to which they act as legitimizers of existing power relations.

6.7.1 What if?

If this study had progressed from the third phase of the Future-oriented SSM method, that is, defining alternative future images, the following describes what could have occurred in phases 4–7.

In phase four, conceptual operating models would be derived from the images of the futures. They describe what kind of operations the system under consideration should perform for the realization of these futures. Individual Futures Images (1–3) (see chapter 4) would constitute, in terms of content, three broader development paths, which can be categorized into a transformative (successful systemic change), crisis-driven (forced and unstable adaptation), and inertial (system continuity without significant change) system. Based on these, three alternative future models could have been constructed, in which the key functions would be presented as logical chains of operations. The models would have described, for example, the production and interpretation of ecological knowledge, the development of control systems, changes in forest management practices, as well as monitoring impacts and learning.

In step five, these conceptual models would have been compared to the current forest sector guidance and operational system. The purpose of the comparison would not have been the empirical testing of the models, but to support discussion and analytical reflection. The key functions of the models would have been examined in relation to current practices by assessing the extent to which these functions are already implemented, where they are implemented inadequately, and where they are completely absent. Such a comparison would have made it possible to identify so-called gaps in change between the current state and alternative future models.

In step six, based on these observations, it would have been possible to identify potential development actions. According to the Future-oriented Soft Systems Methodology approach, the possibilities for change would have been structured into changes related to structure, procedures, and attitudes. Structural changes would concern, for example, the institutional structures and regulation of governance systems, procedural changes, in turn, the practices of decision-making and forest management, while attitude-related changes would relate to stakeholders' perceptions of the objectives of forest use and the significance of ecological constraints.

In step seven, the identified opportunities for change would have been evaluated from the perspectives of their systemic justification and cultural acceptability. The goal would have been to identify development paths that simultaneously strengthen the ecological effectiveness of the system and are realistically feasible from the perspective of the actors.

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Appendices

Appendix 1 Interview invitation

Hei oman alasi asiantuntija,

Otan sinuun yhteyttä Kestävyyden haasteet – metsien ja kalastuksen hallinta Arktisilla alueilla-hankkeesta (ConSust), jonka tavoitteena on arvioida PEFC, FSC ja MSC sertifiointijärjestelmien vaikuttavuutta biodiversiteetin suojelun, ilmastonmuutoksen hillitsemisen ja paikallisyhteisöjen näkökulmasta.

Kutsuisinkin sinut asiantuntijahaastatteluun keskustelemaan kanssani siitä, millaisia kestäviä toimia voitaisiin tehdä biodiversiteetin lisäämiseksi. Tätä aineistomateriaalia käytetään lisäksi pro gradu tutkielmaan, jossa selvitetään suomalaisten talousmetsien biodiversiteetin vaihtoehtoisia tulevaisuuskuvia vuonna 2050 ja tämän pohjalta kirjoitettavaan tieteelliseen artikkeliin.

Uskon sinulla olevan ajatuksia ja ideoita, jotka auttavat meitä hahmottamaan kestävämpään metsän- ja luonnonhoitoon liittyviä toimia sekä tekijöitä, joiden avulla voimme edistää näiden toimien vaikuttavuutta suomalaisissa talousmetsissä.

Haastattelu voidaan toteuttaa Teams-videopalvelun välityksellä tai muulla sovitulla etäyhteydellä ja se kestää noin yhden tunnin. Kestävyyden haasteet – metsien ja kalastuksen hallinta Arktisilla alueilla on Suomen Akatemian rahoittama tutkimushanke. Turun kauppakorkeakoulu vastaa hankkeessa biodiversiteetin tulevaisuuskuvien kartoittamisesta. Lisätietoa tutkimushankkeesta osoitteessa Kestävyyden haasteet MSC FSC PEFC (syke.fi)

Vastaathan ystävällisesti tähän viestiin, jotta voimme sopia ajan haastattelulle.

Ystävällisin terveisin,

Tatjana Eskolin

Turun kauppakorkeakoulu, Turun yliopisto

tatjana.m.eskolin@utu.fi

puh. 040 753 6393

Erikoistutkija, Minna Pappila

Kestävyyden haasteet – metsien ja kalastuksen hallinta arktisilla alueilla -hankkeen projektipäällikkö

Suomen ympäristökeskus

minna.pappila@syke.fi

puh. 050 356 6469

Appendix 2 Consent and privacynotice

	TIETOSUOJAILMOITUS SEKÄ SUOSTUMUS OSALLISTUMISESTA KESTÄVYYDEN HAASTEET – METSIEN JA KALASTUKSEN HALLINTA ARKTISILLA ALUEILLA -HANKKEESEEN LIITTYVÄÄN TIETEELLISEEN TUTKIMUKSEEN
1. Rekisterin nimi	Kestävyyden haasteet - metsien ja kalastuksen hallinta Arktisilla alueilla (Confronting sustainability: governing forests and fisheries in the Arctic) (ConSust)
2. Rekisterinpitäjä	Pappila Minna, 050 356 6469, minna.pappila@syke.fi Suomen ympäristökeskus, Latokartanonkaari 11, 00790 Helsinki
3. Vastuuhenkilön yhteystiedot	Pappila Minna, 050 356 6469, minna.pappila@syke.fi
4. Tietosuojavastaavan yhteystiedot	Pappila Minna, 050 356 6469, minna.pappila@syke.fi
5. Tutkimuksen tarkoitus	Ilmastonmuutoksen hillintä, biodiversiteetin suojelu ja hyvinvoivat paikallisyhteisöt ovat osa globaaleja kestävän kehityksen tavoitteita. Pyrkiessään vastaamaan näihin haasteisiin etujärjestöt ja kansalaisjärjestöt ovat kehittäneet erilaisia sertifiointijärjestelmiä. Tämä on herättänyt kysymyksiä siitä, kenen etua ne palvelevat ja millaisia ovat niiden vaikutukset yhteiskuntaan ja ympäristöön. Tämän projektin tavoitteena on arvioida PEFC, FSC ja MSC sertifiointijärjestelmien vaikuttavuutta biodiversiteetin suojelun, ilmastonmuutoksen hillitsemisen ja paikallisyhteisöjen näkökulmasta.

	Vuonna 2020 käynnistyneen, Suomen Akatemian rahoittaman tutkimushankkeen tarkoituksena on tarkastella sertifiointijärjestelmien toimivuutta Suomessa ja Venäjällä arvioimalla järjestelmien päätöksenteko- ja auditointimenetelmiä, suhdetta kansalliseen lainsäädäntöön sekä sertifiointistandardien sisältöä. Venäjän Ukrainaan kohdistaman hyökkäyssodan vuoksi tutkimushankkeen kohdennus muutettiin koskemaan ensisijaisesti Suomea.
6. Henkilötietojen käsittelyn tarkoitukset ja käsittelyn oikeusperuste	Tutkimuksessa kerätään haastatteluita, joissa kysytään asiantuntijoiden käsityksiä ja kokemuksia suomalaisten talousmetsien biodiversiteettiä koskevista asioista ja arvioita tulevaisuuden tilasta. Sähköpostiosoitteita käytetään haastattelukutsun lähettämiseen. Henkilötietojen EU:n yleisen tietosuoja-asetuksen 6 artiklan mukaisena käsittelyperusteena on ☒ käsittely on tarpeen tieteellistä tutkimusta varten (yleinen etu 6 art. 1 e-kohta) ☐ rekisteröity on antanut suostumuksensa henkilötietojen käsittelyyn (suostumus 6 art. 1 a-kohta) ☐muu mikä _____
7. Käsiteltävät henkilötietoryhmät	Rekisteriin talletetaan rekisteröidystä seuraavia tietoja: työpaikka, työtehtävät, työkokemus vuosina, koulutustaso
8. Henkilötietojen vastaanottajat ja vastaanottajaryhmät	Tietoja ei siirretä eikä luovuteta ConSust-hankkeen ulkopuolelle.
9. Tiedot tietojen siirrosta kolmansiin maihin	Henkilötietoja ei luovuteta EU:n tai Euroopan talousalueen ulkopuolelle.

10. Henkilötietojen säilyttämisaika tai sen määrittämisen kriteerit	Haastattelunauhoitteista kirjoitetaan tekstitiedostot ja nauhoitteet tuhotaan. Samalla tutkimusaineistosta poistetaan suorat tunnistetiedot. Tietoja säilytetään enintään 1.6.2026 asti, jonka jälkeen aineisto kokonaisuudessaan hävitetään tietoturvallisesti.
11. Rekisteröidyn oikeudet	Rekisteröidyllä on oikeus pyytää pääsy häntä itseään koskeviin henkilötietoihin sekä oikeus pyytää tietojensa oikaisemista tai poistamista taikka käsittelyn rajoittamista tai vastustaa niiden käsittelyä. Oikeutta henkilötietojen poistamiseen ei sovelleta tieteellisessä tai historiallisessa tutkimustarkoituksessa silloin, kun poisto-oikeus todennäköisesti estää käsittelyn tai vaikeuttaa sitä suuresti. Poisto-oikeuden toteuttamista arvioidaan tapauskohtaisesti. Rekisteröidyllä on oikeus tehdä valitus valvontaviranomaiselle.
11. Tiedot siitä, mistä henkilötiedot on saatu	Haastattelukutsujen lähettämiseksi pyydetään sähköpostiosoitteita tai viestin välitysmahdollisuutta suoraan haastattelututkimukseen osallistuvilta.
12. Tiedot automaattisen päätöksenteon ml. profiloinnin olemassaolosta	Tietoja ei käytetä automaattiseen päätöksentekoon tai profiloinnin tekemiseen
13. Suostumus	Annan luvan itseäni koskevien tutkimuksen kannalta tarpeellisten tietojen keräämiseen. Haastattelu nauhoitetaan ja kirjataan tekstitiedostoksi, jonka jälkeen äänitiedostot tuhotaan. Kirjaamisen yhteydessä haastateltavien ja haastatteluissa esille tulevien muiden henkilöiden nimet poistetaan. Kaikki minusta tutkimuksen aikana kerättävät tiedot käsitellään luottamuksellisina, ja pääsy aineistoon

	tutkimushankkeen aikana on ainoastaan tutkimuksen tekoon osallistuvilla henkilöillä. Tutkimuksen tulokset raportoidaan anonyymisti niin, ettei niitä voi yhdistää yksittäiseen henkilöön. Hankkeen päätyttyä aineisto voidaan tallentaa anonymisoituna tietoarkistoon. Ymmärrän, että osallistumiseni tähän tutkimukseen on vapaaehtoista. Minulla on oikeus kieltäytyä osallistumasta, keskeyttää osallistuminen tai peruuttaa suostumukseni missä tahansa tutkimuksen vaiheessa ilmoittamalla siitä tutkimushankkeen edustajille. Siinä tapauksessa, että keskeytän osallistumisen, keskeyttämiseen mennessä kerättyjä tietoja voidaan käyttää osana tutkimusaineistoa ja tallentaa tutkimusarkistoon. Vahvistan osallistumiseni tähän tutkimukseen: Kyllä__ Ei__ Annan suostumukseni haastattelujen ja/tai ryhmäkeskustelujen nauhoittamiseen: Kyllä__ Ei__
14. Allekirjoitus	Tutkittavan allekirjoitus

Appendix 3 Interview questions

Työpaikka:

Työtehtävät:

Työkokemus vuosina:

Koulutustaso:

RQ 1: Mitkä ovat tarpeellisia ja hyväksyttäviä tapoja lisätä talousmetsien biodiversiteettiä?

1.1 Millaisia käytännön kokemuksia sinulla on nykyisistä talousmetsien biodiversiteetin lisäämiseen tähtäävistä toimista?

1.2 Miltä osin nykytoimet ovat riittäviä, liiallisia tai puutteellisia?

1.3 Millaisia asenteita ja mielipiteitä sinulla on talousmetsien biodiversiteetin tärkeydestä?

1.4 Kuinka näet viestinnän roolin tarpeellisten ja hyväksyttävien keinojen edistämisessä?

1.5 Millaisia haasteita ja esteitä koet talousmetsien biodiversiteetin lisäämisessä?

1.6 Mitkä ovat mahdolliset pullonkaulat, jotka voivat vaikeuttaa tarpeellisten toimien toteutumista?

1.7 Kuinka näet näiden esteiden vaikuttavan omaan päätöksentekoosi ja käytännön toimintaan?

RQ 2: Miltä metsä- ja luonnonhoito näyttää vuonna 2050?

2.1 Millaisia odotuksia sinulla on metsä- ja luonnonhoidon tulevaisuudesta?

2.2 Miten koet tulevaisuuden metsä- ja luonnonhoidon vaikuttavan ympäristöön ja ekosysteemeihin?

2.3 Miten arvioit ilmastonmuutoksen ja luontokadon vaikuttavan tulevaisuuden metsä- ja luonnonhoitoon?

2.4 Millaisia viestintäkanavia pidät tärkeinä tulevaisuuden metsä- ja luonnonhoidon kommunikoinnissa?

2.5 Millaisia haasteita voisi syntyä metsä- ja luonnonhoidon tulevaisuuden näkymissä?

2.6 Mitkä ovat mahdolliset pullonkaulat, jotka saattavat hidastaa tai vaikeuttaa toivottujen hoitokäytäntöjen toteutumista, ja miten näistä pullonkauloista voitaisiin päästä yli?

2.7 Kuinka näet näiden haasteiden vaikuttavan metsä- ja luonnonhoidon pitkän aikavälin kehitykseen?

RQ 3: Miten metsälainsäädäntö ja metsäsertifiointijärjestelmät PEFC ja FSC kehittyvät seuraavien 30 vuoden aikana?

3.1 Mitkä ovat mielestäsi tärkeimmät sääntelykeinot metsien luonnonhoitoon liittyen?

3.2 Millaisia kokemuksia sinulla on nykyisestä metsälainsäädännöstä ja sertifiointijärjestelmistä?

3.3 Minkä seikkojen arvioit eniten vaikuttavan sääntelyn kehittymiseen seuraavien 30 vuoden aikana?

3.4 Miten arvioit EU:n kautta tulevien päätöksien tulevan vaikuttamaan seuraavien 30 vuoden aikana?

3.5 Millaisia asenteita ja mielipiteitä sinulla on näihin kehityssuuntiin liittyen?

3.6 Millaisia haasteita tai rajoitteita nykyisessä metsälainsäädännössä ja sertifiointijärjestelmissä on, ja miten näistä pullonkauloista voitaisiin päästä yli?

3.7 Mitkä voivat olla mahdollisia pullonkauloja, jotka voivat haitata lainsäädännön ja sertifiointijärjestelmien kehitystä?

3.8 Miten näet näiden haasteiden ja pullonkaulojen vaikuttavan metsäalalla toimivien tahojen kykyyn noudattaa uudistuvaa lainsäädäntöä ja järjestelmiä?

Appendix 4 Explanation of the use of AI

In this thesis, OpenAI ChatGPT-4 & Google Translate AI have been used. The idea, framework, structure, chapters, all textual content, and the implementation of the work are my own creation. Also, the sources appearing in the thesis have been selected and analysed by me. AI has been used as an assisting tool throughout the entire work to improve the language and structure of the text I produced, such as clarifying sentence structures, specifying word choices, and developing the flow of the text. The improvements suggested by AI have further been manually edited and refined, ensuring that the enhancements preserve the content and accuracy of the original work. I am aware that I am fully responsible for the entire content of my thesis, including the parts assisted by AI, and I accept responsibility for any possible violations of ethical guidelines.