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Economics

# **Transition Pathways towards a Sustainable and Carbon- Neutral Economy in Finland by 2035**

Futures Studies

Master's thesis

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### **Abstract**

The planet is warming at an unprecedented rate, primarily due to increasing atmospheric carbon dioxide (CO<sub>2</sub>) concentrations from anthropogenic activities that adversely impact the climate system. Climate change has severe manifestations, affecting human populations, ecosystems, and economies worldwide. Hence, pursuing alternative transition pathways for achieving carbon neutrality should be viewed not merely as a future goal but as a critical necessity to protect planetary health and ensure humanity's survival.

The aims of this study are twofold. First, to conceptualise a carbon-neutral, sustainable economy in Finland by 2035, reflecting the preferences of economically focused green political actors; and second, to develop alternative transition pathways to guide future outcomes toward this preferred vision. Employing a critical and normative framework, the study uses Backcasting through Futures workshops to engage participants in envisioning preferred futures and viable transition pathways. It simultaneously cultivates future-oriented thinking skills among society, fulfilling one of the responsibilities of the futurist.

The research identifies key findings, including four distinct preferred future scenarios of a carbon-neutral economy: '*Silver Bullet*', a technology-driven model; '*Progression*', emphasising resource conservation; '*Sustainable Dream World*', advocating for degrowth and social responsibility; and '*Back to Nature*', promoting nature-based self-sufficiency. Furthermore, the findings indicate that the proposed transition pathways with policy measures do not adhere to a singular or linear trajectory; rather, they encompass a range of synergistic and interactive policy bundles, including basic income, resource taxation, and educational reforms.

The discussion reviews the findings through scenario archetypes and transition archetypes in the literature, insights gained from Dator's generic futures and Multi-Level Perspective (MLP) framework. The scenario archetypes establish a linkage to concepts such as "Transformation," "Collapse," and "Disciplined Society," asserting that these preferred visions pose a challenge to the dominant growth-centric paradigm while advocating for a fundamental reorientation beyond conventional economic growth notions. Additionally, the theoretical framework of transition archetypes, drawn from the MLP, illustrates the relevance of a "Mixing Pathways" approach, characterised by the co-evolution of "Transformation," "Reconfiguration," "Technological Substitution," and "De-alignment/Re-alignment." This reflects the need for multiple pathways, emphasising the complex realities inherent in the pursuit of transitioning towards a carbon-neutral economy.

**Key words:** Carbon neutral economy, preferred scenarios, transition pathways, Multi-Level Perspective, Backcasting, Futures Workshops

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# 1 Introduction

“The Earth system is under assault- the oceans, the forests, the soils, every ecosystem, the cryosphere- the world’s ice and snow. We [stand] on the edge of the sixth great Earth systems collapse unless we radically change course...The five mass extinctions of the past echo as a warning. The most extreme of predictions, once seen as unlikely, now seem all too real. And the most unlikely scenario is that nothing [catastrophic] happens. This is humanity’s greatest crisis.” (Dyke & Monbiot, 2024, 4.)

## 1.1 Background

Since the Industrial Revolution, significant changes have occurred in the climate system, resulting in global warming compared to pre-industrial levels. This change is predominantly attributed to the ongoing increase in carbon dioxide (CO<sub>2</sub>) concentrations in the atmosphere (Delbeke & Vis, 2019; Madurai Elavarasan et al. 2022; Zitscher & Kaltschmitt, 2024.) Decades of scientific research and climate data indicate that the planet is warming at an unprecedented rate. The continued excessive consumption of fossil fuels and various human activities have adversely affected the natural climate system, leading to elevated concentrations of greenhouse gases (GHGs) in the atmosphere (Delbeke & Vis, 2019.)

Climate change is currently manifesting through a range of severe impacts worldwide, as revealed by Delbeke & Vis (2019, 3). These impacts adversely affect human populations, natural ecosystems, and economic systems. Notable consequences of climate change include increased flooding, altered precipitation patterns, prolonged droughts, threats to water and food security (Melkonyan et al. 2019, 145) and an increase in the frequency and intensity of forest fires. While it is widely believed that developing nations are particularly vulnerable to the devastating effects of climate change, scholars argue that Europe is also facing significant repercussions, further exacerbated by heightened migration pressures resulting from the climate crisis in developing regions (Delbeke & Vis, 2019; Firoiu et al. 2022).

Stemming from the adverse consequences of climate change, to address its associated adverse effects, the Intergovernmental Panel on Climate Change (IPCC) has underscored the necessity of stabilising CO<sub>2</sub> concentrations and other greenhouse gas emissions at sustainable levels (Zitscher & Kaltschmitt, 2024, 1.) In response, countries around the globe have committed to collaborative efforts under the United Nations Framework Convention on Climate Change, established during the World Summit in 1992. Following this pivotal agreement, a series of initiatives and international accords have been instituted. The Kyoto Protocol, adopted in 1997 and applicable to European Union (EU) member states, emphasises the importance of reducing greenhouse gas emissions (Delbeke & Vis, 2019;

Onofrei et al. 2022). The Paris Climate Agreement, established in 2015 and implemented in 2016, aims to limit the global temperature increase to no more than 1.5°C or 2°C (Delbeke & Vis, 2019; Kainuma et al. 2024; Onofrei et al. 2022). Moreover, the European Climate Law, enacted in 2021, reinforces the goals outlined in the European Green Deal, targeting climate neutrality by 2050 and a 40% reduction of CO<sub>2</sub> emissions by 2030 compared to 1990 levels (Eurofound & EEA, 2023; Onofrei et al. 2022).

Some scholars have argued that, despite the presence of global initiatives aimed at promoting a transition towards carbon neutrality, progress towards achieving this goal by 2050 remains inadequate (Madurai Elavarasan et al. 2022; Maksymova et al. 2024). Another line of research indicates that, while the European Union (EU) has made significant strides in positioning its member states as leaders in environmental sustainability (Maksymova et al. 2024; Onofrei et al. 2022), these nations continue to be substantial contributors to greenhouse gas (GHG) emissions (Onofrei et al. 2022, 6) mainly due to excessive consumption and generation of energy in which results in significant levels of CO<sub>2</sub> emissions per capita (Larsen & Alslund-Lanthén, 2017, 10-13). To address this conflict of interest, as several scholars suggest, the pursuit of carbon neutrality should not be regarded merely as a future ambition but as a critical requirement for global survival (Firoiu et al. 2022; Maksymova et al. 2024). Moreover, this ongoing challenge arises from fragmented and insufficient engagement across various sectors. Therefore, it is essential to pursue climate neutrality targets through a comprehensive transformation of the economy.

Of particular significance is the fact that Climate change represents a significant global challenge, as greenhouse gas emissions cross national boundaries and contribute to global warming. As scholars argue, while the rise in emissions presents a global dilemma, the development of effective climate policies designed at the global level has demonstrated great complexity. Accordingly, addressing climate change requires not only global strategies but also the implementation of national and local policies (Sivonen, 2023, 2247). In this study, Finland is considered with deliberation, reflecting the client's requirements and the constraints of time and scope for expanding the research to the European context. Notably, Finland serves as an intriguing case study in terms of climate policy outcomes (Hoysniemi & Salonen, 2019, 2), exhibiting both strengths and weaknesses. On one hand, it has the distinction of being the first country to implement a carbon tax in 1990 (Honkatukia, 1999, 4). Conversely, it currently faces challenges with significant per capita emissions that remain at unsustainable levels (Larsen & Alslund-Lanthén, 2017, 10), making the execution of sufficiently effective climate policies a persistent priority (Sivonen, 2023, 2248).

To address key imminent disputes, foresight reports are prepared once per parliamentary term by the Finnish government since the 1990s. The themes of the field of inquiry diverge depending on what is deemed critical for the prospect of the country at any given time (Heinonen & Lautamäki, 2012, 304) and explore potential solutions to the identified concerns. Between 2008 and 2009, the Finnish Prime Minister's Office spearheaded the development of a foresight report specifically focused on climate and energy policy, according to the Prime Minister's Office (2009), underscoring the criticality of this concern in the current global context. A scenario process was a key element of this project, aimed at exploring various possibilities for achieving a sustainable future and promoting dialogue on the relative desirability of different developmental paths (Heinonen & Lautamäki, 2012, 305), demonstrating the value of this approach in the given context.

As further asserted by Nygrén (2019, 30), the foresight approach of scenarios has become particularly well-suited to generate relevant insights for complex, multifaceted wicked problems. Consequently, Backcasting scenarios were employed as the primary foresight tool for this study to create a desirable vision for the transition. This approach transcends purely quantitative analysis, such as econometric or forecasting methods (Eurofound & EEA, 2023, 5), as it allows for the assessment of a broader range of insights regarding alternative future possibilities related to climate change, given its complex nature. The qualitative aspect of this approach does not directly support forecasting or predicting specific future events. Instead, it evaluates different potential futures, providing better opportunities to prepare for identified alternative futures (Borjeson et al. 2006; Mannermaa, 1991; Robinson, 1990), ultimately aiding in the resolution of complicated and multi-dimensional challenges. Moreover, it can be beneficial for proactive futurists to engage in shaping the future with deliberate actions (Svenfelt et al. 2019; Vähäkari et al. 2020) in pursuit of a green transition, rather than waiting passively for future developments to unfold.

Given the gravity of this concern, for a smoother transition towards carbon neutrality, gaining support from the local community is essential, which necessitates sharing expertise with them, though this can often be challenging. As Lauttamäki (2016, 156) suggests, including the people in society in the process of knowledge formulation is one of the most effective ways to address this challenge. Hence, Futures Workshops serve as an excellent participatory approach that bridges the gap between experts and participants. This tool not only facilitates the sharing of knowledge among participants but also integrates diverse insights while fostering co-learning (Armanto, 2024; Quist & Vergragt, 2006). Consequently, this study adopts Futures Workshops, as they align with the core objectives of this research and simultaneously fulfil one of the responsibilities of the futurist, cultivating future-oriented thinking skills among society.

## 1.2 Research Aim and Research Questions

This thesis was commissioned by TalousVihreät (EconomyGreens), who sought a research project focused on developing and visualising potential futures for a sustainable economy. The EconomyGreens in Finland aimed to utilise Futures research methods centred on sustainable economic practices. In my effort to outline a vision for a sustainable economy, I was granted the liberty to define the scope of the study. Accordingly, in consultation with the client, the scope of the research was determined.

In particular, Finland, as an integral member of the European Union (EU), has responsibility for the ambitious objective of achieving a climate-neutral EU region by 2050, following the EU Green Deal. Within this overarching framework, Finland has articulated its own national strategic target of attaining carbon neutrality by 2035, wherein emissions of carbon dioxide (CO<sub>2</sub>) are to be minimized to levels that are at least equivalent to CO<sub>2</sub> removals (Hoysniemi & Salonen, 2019; Lipiäinen & Vakkilainen, 2021; Ministry of Economic Affairs and Employment of Finland, 2022; Ministry of the Environment, 2020). Accordingly, in alignment with Finland's national climate strategy, the year 2035 is claimed as a critical temporal milestone for this study.

To ensure that Finland is making substantive progress toward the EU's 2050 carbon neutrality goal, establishing an interim checkpoint by 2035 is deemed essential. This checkpoint serves a dual function: it facilitates the acceleration of progress towards the climate neutrality target and allows for timely reassessments of strategies, potentially altering the trajectory if necessary to ensure goal attainment. This strategic juncture is particularly significant, given that it is positioned in 10 years hence, affording sufficient time for necessary reversals or enhancements in policy measures while concurrently supporting strategic national binding targets by 2035.

Accordingly, the primary aim of this study is to envision a carbon-neutral, sustainable economy in Finland by the year 2035, reflecting the preferences and priorities of key stakeholders. In collaboration with TalousVihreät, this study particularly focuses on the envisioned futures of green political actors committed to economic viability, thereby introducing a novel perspective to this field of research. Consequently, rather than merely forecasting future outcomes, it adopts a critical and normative approach that explores alternative preferred futures by this particular set of actors, challenging future possibilities. In addition to this primary aim, a secondary aim is to develop transition pathways with policy measures that can actively influence future outcomes toward the desired state, thereby facilitating a seamless transition to carbon neutrality by the specified year.

Moreover, a complementary goal of this study is to enhance participants' understanding of Futures approaches that can address complex challenges such as climate change. Engaging stakeholders in the co-creation of a vision that resonates with their desired futures is recognised as an effective strategy for fostering agency, ultimately leading to a more effective transition. Thus, this process can yield mutual benefits, offering reciprocal advantages for both participants and me.

Therefore, in alignment with the aforementioned study aims, two central research questions emerge as pivotal to guiding this inquiry.

- What could be the preferred future scenarios for economically concerned green political actors in Finland to achieve a carbon-neutral sustainable economy by 2035?
- How can alternative pathways align with the preferred future scenarios to support the transition towards a carbon-neutral sustainable Economy?

Significantly, the involvement of TalousVihreät was essential at every stage of the research process, from inception to completion. While there was flexibility in defining the study's scope, other elements, including objectives, research questions, methodologies, and timelines, were collaboratively discussed and agreed upon with them before the commencement of research activities. Accordingly, this collaborative approach ensured that TalousVihreät's perspectives and expertise were reflected throughout the study.

### **1.3 Chapter Summary**

To address the overarching research questions, the following chapter will focus on a theoretical framework comprising Dator's generic futures and the Multi-Level Perspective (MLP), specifically examining preferred future alternatives and transition pathways toward the desired future state. In addition to that, understanding what constitutes a carbon-neutral economy is crucial, as the objective is to achieve carbon neutrality. Thus, the concept of a carbon-neutral economy will be clarified in the next chapter alongside the role of Backcasting scenarios in envisioning preferred futures utilised in this study.

After establishing the theoretical perspective, the next step involves detailing the methodological approach employed in this research. Given that Backcasting scenarios have been discussed previously, this third chapter concentrates predominantly on the Futures Workshop, outlining the procedure from data collection to data presentation. It will provide an in-depth description of the series of futures workshops, encompassing four distinct phases, including preparation and the mental

time-travelling exercise. Research integrity within the context of the study and the responsibilities of a futurist will also be addressed, emphasising the importance of ethical values in our lives as futurists.

Subsequently, Chapter Four presents the findings derived from the series of futures workshops, including 13 future images, highlighting four detailed preferred images. The chapter exhibits one preferred scenario for a carbon-neutral economy in Finland, accompanied by development pathways that outline important policy measures necessary to achieve the desired future scenario.

Finally, Chapter Five offers significant findings that respond to the overarching research questions, contributing to the overall aim of the thesis through the theoretical lenses explained in previous chapters. This chapter also serves to validate the research methods employed in the study, reflecting on the preferred futures while identifying any limitations, suggestions and concluding with a summative remark.

## 2 Theoretical Framework and Concepts

The theoretical foundation of the thesis is delineated in this chapter, establishing the key concepts and theoretical framework relevant to the study. It offers a comprehensive explanation of the theoretical framework, emphasising its interconnections with other concepts and providing the contextual background for the study. This chapter commences with an exploration of the sustainable and carbon-neutral economy concept, examining the drivers essential for achieving such an economy, utilising a critical approach. Following this, it defines the futures approach of Backcasting scenarios, underscoring the normative approach employed within the study, and proceeds to introduce Dator's generic futures as a means to analyse alternative futures. Finally, the chapter discusses the dynamics of the systemic transition of the economy, incorporating the Multi-Level Perspective (MLP) framework to elucidate the necessary transition pathways needed, which pave the way for attaining the envisioned preferred future state.

### 2.1 Sustainable and Carbon-Neutral Economy

To establish a robust foundation for the study, it is imperative to develop a comprehensive understanding of a sustainable and carbon-neutral economy, which is embedded in the central objective of the research. The European Climate Law, adopted by the EU, encompass various dimensions of the region, including societal, human, and economic factors (Eurofound & EEA, 2023). As Maksymova et al. (2024, 335) argue, to facilitate a seamless green transition towards climate neutrality, simultaneously developing policies which address these multi-faceted aspects is crucial. Ultimately, a green transition must strike a symmetry between the Earth's ecological capacities and the pressures exerted by the global market. Accordingly, recognising the interrelation of environmental sustainability and economic viability is essential, particularly from a perspective of sustainable development. Consequently, establishing a cohesive vision that integrates ecological and economic interests while fostering awareness among local communities and businesses is vital for the achievement of climate neutrality.

However, insights drawn from prior research highlight various patterns concerning the relationship between economic growth and environmental pollution, particularly CO<sub>2</sub> emissions. One perspective indicates a positive correlation between higher per capita income (or economic growth) and increased environmental degradation as consumption levels rise with the level of income (Madurai Elavarasan et al. 2022; Oerlemans et al.1972; Onofrei et al. 2022). Conversely, another perspective indicates that the correct type of economic growth can enhance the capacity to manage climate vulnerabilities

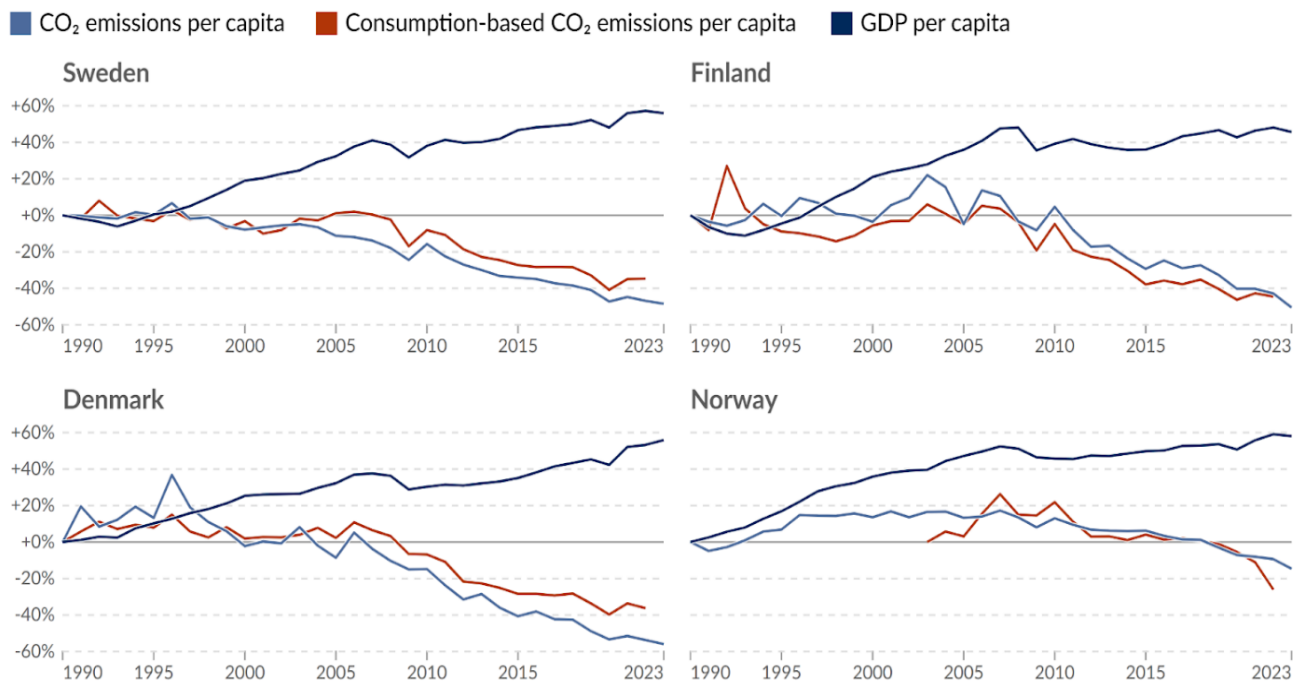
through well-designed systems and standards (Ang 2006; Onofrei et al. 2022). Synthesising these two arguments, Tapio (2005, 138) asserts that initial economic growth often comes at the expense of the environment. However, he contends that as development progresses, it can result in reduced environmental degradation through improved technological advancements and economic efficiency driven by investments.

Nevertheless, Tapio et al. (2011, 23) argue that economic growth does not solely drive or mitigate the rise in CO<sub>2</sub> emissions. In particular, countries such as Sweden, Finland, Denmark, and Norway exemplify a scenario where GDP growth is accompanied by a decrease in CO<sub>2</sub> emissions (see Figure 1). This phenomenon, where economic expansion occurs alongside a reduction in emissions, underscores the concept of absolute or strong decarbonization (Tapio et al. 2011, 3), which has persistently attracted scholarly scepticism (Delbeke and Vis, 2019; Jackson, 2017; Victor & Rosenbluth, 2007).

## Change in per capita CO<sub>2</sub> emissions and GDP

Our World  
in Data

Consumption-based emissions<sup>1</sup> include those from fossil fuels and industry<sup>2</sup>. Land-use change emissions are not included. GDP per capita is adjusted for inflation and for differences in living costs between countries.



Data source: Data compiled from multiple sources by World Bank (2025); Global Carbon Budget (2024); Population based on various sources (2024)

Figure 1: Change in per capita CO<sub>2</sub> emissions and GDP (Ritchie et al. 2023)

Accordingly, it is sometimes argued that this decoupling is overly praised due to the accounting methods used, and this approach is based on the “direct” emissions methodology, as adopted by the UN Framework Convention on Climate Change (UNFCCC) and reaffirmed in the Paris Agreement. An alternative would be the “indirect” method with embedded emissions, which accounts for emissions concerning a country’s consumption of goods, whether they are imported or domestically produced. The core argument is that the EU is simply boosting its imports of carbon-intensive products, effectively “exporting” its carbon emissions to other parts of the world (Delbeke and Vis, 2019, 8-9.). This practice merely exaggerates the issue at the global scale, as climate change transcends national boundaries.

In light of the various perspectives on the relationship between economic growth and emissions, which often overlook embedded emissions, critically assessing the potential of suitable economic strategies is essential. As Onfrei et al. (2022, 8) highlight, economic growth alone does not inherently reduce climate vulnerability, making it crucial to approach this matter with careful consideration.

Accordingly, Victor (2010, 370) suggested how economies can thoughtfully adapt to the biophysical boundaries of the planet, outlining three feasible options. The first option is to continue pursuing the growth of the economy in developed countries, simultaneously working to mitigate its adverse effects, and the second alternative is to promote growth in sectors that rely on lesser quantity of resources, such as the service industry and finally, to consider limitations on growth itself as the third option. The first two options advocate for a green economy or green growth (Madurai Elavarasan et al. 2022), emphasising consumption and activities that facilitate decoupling. Each of these options presents an opportunity to shift perspectives toward a framework where ecological sustainability is an essential prerequisite, whereas the economy is viewed as a tool to achieve these objectives.

As demonstrated by Svenfelt et al. (2019, 2), a compelling response to the third option is the notion of a “steady state” or a “degrowth.” A degrowth is not merely a matter of doing less of the same, it invites us to reevaluate and transform our approach. This encompasses a wide array of innovative practices, diverse energy sources and applications, and reimagined relationships with the non-human world. In societies that adopt the principles of degrowth, the persistent pressure to “grow or die” would be replaced by a commitment to sufficiency, allowing for a more sustainable existence.

Regardless of whether we lean towards a steady state, degrowth, or an a-growth perspective, it is crucial to explore alternative futures that free us from existing continuous economic growth that excludes aspects of sustainability. The pressing question then becomes, how can society navigate a transition that deviates from its existing paradigm? Dreborg (1996, 814) suggests that when faced

with multifaceted problems that span multiple sectors and societal levels, it necessitates significant transformation, which is exacerbated by dominant trends, and permits a long enough timeframe for intentional decisions. Accordingly, our attention can be moved from the path we are on now to the path we genuinely wish to follow, along with how we could achieve that desired path.

There is a vital need to evolve from surface-level criticisms and the mere identification of sustainability challenges to a deep exploration of what it means to pursue values that are truly desirable, irrespective of economic growth (Svenfelt et al. 2019, 2). The aim is to delve into alternatives that transcend the obsession with GDP growth. Such conversations could be invaluable, whether low or negative growth is viewed as a threat arising from ineffective growth strategies or economic crises or as a remarkable opportunity for intentional degrowth or a steady-state economy to realise sustainability goals.

One of the aims of this study is to identify transition pathways towards a carbon-neutral economy. To begin with, it is essential to recognise the key variables associated with achieving carbon neutrality. For Finland to meet its climate neutrality target by 2035, it is necessary for CO<sub>2</sub> removals to equal emissions. To support this goal, a dual approach is required: first, reducing carbon emissions through various strategies is crucial; second, enhancing CO<sub>2</sub> removals is imperative, as reaching zero emissions within the designated timeframe is a challenging target. Therefore, while focusing on minimising carbon emission sources, it is equally important for Finland to implement measures that increase carbon sinks to boost CO<sub>2</sub> removals.

In Finland, since 2005, net emissions have shown fluctuations despite a 40% reduction in emissions, primarily due to a significant decline in the carbon sink from the land use, land use change, and forestry (LULUCF) sectors (Jensen, 2024, 1). Yearly variations in the carbon sink are influenced by factors such as levels of harvesting, wood demand, and forest growth, given that forests play a crucial role in land use (The Ministry of Agriculture and Forestry, 2023, 11). While growing forests serve as carbon sinks, approximately 20% of global emissions stem from deforestation (Siljander & Ekholm, 2018, 783). This raises an important debate, as noted by Lipiäinen & Vakkilainen (2021, 2), regarding whether forests should be preserved in their natural state, free from exploitation by other sectors. However, adopting active and sustainable forest management practices can reverse this declining trend and enhance the carbon sink without compromising forest utility (Jensen, 2024; Madurai Elavarasan et al. 2022). Nevertheless, findings by Siljander & Ekholm (2018, 798) suggest that the most cost-effective mitigation strategy would involve enhancing the forest carbon sink rather than prioritising other forest uses for emissions reduction.

Apart from carbon removal, to achieve a carbon-neutral economy, a range of factors play a crucial role in reducing carbon emissions. Key drivers identified by different studies include digitalisation (Carlsson-Kanyama, 2008; Firoiu et al. 2022; Madurai Elavarasan et al. 2022), community empowerment, green investments, equitable access to resources and information, and the development of ecosystems based on the 3R approach: Reduce, Reuse, and Recycle (Carlsson-Kanyama, 2008). Additionally, natural patterns and landscape restoration (Maksymova et al. 2024, 335-336) are also counted as vital components. Investment in education, equality, and a shift towards sufficiency within circular economy principles are deemed essential by various studies (Eurofound and EEA, 2023; Firoiu et al. 2022). Furthermore, local-level requirements for a transition include energy-efficient buildings (Carlsson-Kanyama, 2008, 40), innovations (Kainuma et al. 2024, 2), green spaces in urban areas (Carlsson-Kanyama, 2008), and limited consumption (Madurai Elavarasan et al. 2022, 4).

Other significant determinants of a carbon-neutral economy encompass renewable energy sources, the electrification of transportation (Geels, 2018, 225), regulations, carbon taxes requiring emitters to pay fees for their emissions (Carlsson-Kanyama, 2008; Geels, 2018; Onfrei et al. 2022), clean energy incentives with tax flexibilities (Onfrei et al. 2022), carbon labelling schemes, sustainable forest management, nature-inclusive practices, circular agriculture and promotion of plant-based diets and reducing food waste (Carlsson-Kanyama, 2008, 40) have been highlighted as essential (Madurai Elavarasan et al. 2022, 4-22). Additionally, lifestyle changes (Kainuma et al. 2024, 2), accessible and affordable public transportation, and the incorporation of values and ethics (Carlsson-Kanyama, 2008, 40) were noted in several preceding studies.

Despite the variety of theoretical findings regarding a carbon-neutral economy, it has been a demanding task to understand how each aspect interrelates to create a coherent vision of what such an economy entails. Therefore, I have sought to accept the diverse perspectives on this concept, rather than asserting a singular, precise answer to the query, “What is a carbon-neutral economy?” Consequently, this extensive list of concepts and standpoints that contribute to the notion of a carbon-neutral economy will help elucidate how different concepts mutually reinforce while preserving some areas of divergence. Furthermore, this analysis will assist in determining whether the desired carbon-neutral economy proposed by green political actors shares similarities or differs from the existing literature by offering a foundational basis of interpretation.

## 2.2 Backcasting for Preferred Futures

Considering the various perspectives in the literature regarding what constitutes a carbon-neutral economy, as discussed in the previous subchapter, this study seeks to identify the envisioned attributes of a carbon-neutral economy. Additionally, alternative pathways to reach the desired future state are also a part of the study, from the viewpoints of specific stakeholders, particularly green political actors. To accomplish these study objectives, this chapter will explore the future approach of scenarios, with a particular emphasis on the Backcasting scenario method, which underlies the methodological framework of this study. This futures research technique is instrumental in identifying alternative desired futures for a carbon-neutral economy, along with possible development paths, aligning effectively with the study's key objectives.

To expand the possibilities of what can be achieved within the current framework, envisioning a desired future serves as a powerful tool that enables consideration of a broader range of solutions at present (Svenfelt et al. 2019, 10). In support of this notion, Boulding (1988, 21) argued that positive actions can be inspired by positive images. Consequently, to create a preferred vision for the future and outline a development pathway, a scenario approach is utilised, as my intention was not to predict the future but instead discover preferred possibilities (Börjeson et al. 2006, 724).

Scenarios are internally consistent narratives about the future and represent more than just a single technique; they encompass a broader approach that integrates various tools and techniques to examine the future from different perspectives (Heinonen & Lautamäki, 2012; Järvi et al. 2015; Rikkonen et al. 2021; Tuominen et al. 2014). Given that there are distinct categories within this scenario approach, each scenario type should be driven by a specific purpose. Hence, Börjeson et al. (2006, 725-730) distinguished between three categories: Predictive, Explorative, and Normative scenarios, corresponding to the questions “what will happen?”, “What could happen?”, and “what should happen?” respectively.

### 2.2.1 The Backcasting Scenario Approach

In my exploration of achieving carbon neutrality in Finland, I have determined that normative scenarios are the most suitable approach, as they focus on specific targets rather than projections or vague explorations. As defined by Börjeson et al. (2006, 725-730), normative scenarios can be categorised into two types: “Preserving Normative scenarios” and “Transformative Normative scenarios.” The primary distinction between these two categories lies in the extent to which the existing structure can accomplish the desired goals. If no structural changes are necessary to meet the

targets, then “Preserving Normative scenarios” will suffice. However, if structural changes are essential, “Transformative Normative scenarios” should be employed. Notably, Backcasting scenarios fall under the category of “Transformative Normative scenarios,” as they are particularly effective when existing structures or trends impede the achievement of a desirable goal (Börjeson et al. 2006; Dreborg, 1996; Höjer et al. 2011; Robinson, 1990), as in the case of the study.

Many scenarios typically present a trajectory from the present to the future (Rikkonen et al. 2021, 10). In contrast, the Backcasting approach employed in this study takes a reverse path, starting from a desired future (Heinonen & Lautamäki, 2012; Robinson, 1990; Tuominen et al. 2014) and aiming to outline how to achieve that envisioned future. This method illustrates a logical and internally consistent route toward the desired state by conceptualising a preferred future (Höjer et al. 2011, 820). As highlighted by Höjer et al. (2011, 820), Backcasting has some key characteristics: it is more target-oriented as it begins with a specific objective, adopts a long-term standpoint, and seeks alternative pathways, all while considering options beyond current trends.

Therefore, in contrast to forecasting, Backcasting scenarios are particularly well-suited for this study, as they address complex, long-term challenges that require significant changes (Dreborg, 1996; Heinonen & Lautamäki, 2012; Höjer et al. 2011). Consequently, this study is grounded in the Backcasting approach, which was developed by Robinson’s (1990) concept of functioning backwards from a desired endpoint to the present and determining the necessary policy measures to accomplish that goal, as demonstrated in previous research (Järvi et al. 2015; Tuominen et al. 2014). Furthermore, Participatory Backcasting has gained prominence in prior studies (Carlsson-Kanyama et al. 2008; Höjer et al. 2011; Robinson, 2011) due to its unique advantages, including the enhancement of scenarios, better learning among participants, and the democratizing aspect of allowing participants to influence the outcomes. Consequently, this study implements Backcasting scenarios through a participatory approach, utilising Futures workshops.

### 2.2.2 Scenario Archetypes

This subchapter is devoted to the exploration of theoretical notions regarding alternative preferred futures, drawing inspiration from Jim Dator’s (1998) insights. His idea resonates with the key aim of this study, which intends to identify preferred scenarios for a carbon-neutral economy, offering scenario archetypes serves as the base for the interpretation of alternative futures.

As Dator (2019, 42) asserts, the purpose of future studies extends beyond mere prediction; it involves comprehending the myriad alternatives, primarily through various images of the future. He contends

that an extensive array of images can be constructed by combining different potential future scenarios. Moreover, Dator (2019) highlights that many of these images can be naturally classified into four distinct alternative futures (Dator et al. 1998; Dator, 2019), with some overlaps existing among them. These four futures are termed "generic" due to their specific versions or sometimes as "scenario archetypes," which share common theoretical, methodological, and database characteristics, setting them apart from the other alternatives. Each scenario possesses both advantages and disadvantages, indicating the absence of definitive best- or worst-case outcomes. Importantly, all images carry an equal probability of realisation, necessitating substantial and equal consideration. Thus, a key insight regarding these generic alternative futures is to anticipate, prepare for, and strive toward a preferred future, allowing us to flourish regardless of the circumstances (Dator, 2019, 49). The "four generic alternative futures" comprise Continuation, Collapse, Discipline, and Transformation (Dator et al. 1998; Dator, 2019). The rationale for each of these futures is outlined as follows.

In the "Continued Growth," the primary objective from all perspectives is to enhance individuals, institutions, and technologies to sustain an ever-expanding economy. This approach is often referred to as "Continued Economic Growth." Conversely, when the economy is in decline or stagnation, it is described as "Renewed Economic Growth" (Dator et al. 1998; Dator, 2019). Nevertheless, research by Rikkonen et al. (2021, 10) indicates that the "business as usual" scenario mirrors a trajectory closely aligned with "Continued Growth," as it perpetuates recent trends without scrutiny. However, Fergnani (2019, 5-6) argues that the "techno-optimism" scenario, driven by exceptional technological innovations, characterises "Continued Growth" while aligning with the notion of sustaining current trends.

A "Collapse" can occur for a variety of reasons, including economic instability, depletion of environmental resources, moral or ideological decline, as well as external, internal, or outer space attacks. Consequently, a collapse may result from a single cause or a combination of factors, potentially leading to extinction or a reduction in development levels compared to the existing state. However, this does not necessarily indicate a "worst-case scenario," as a desire for a simpler lifestyle can allow people to appreciate the end of the relentless economic competition or the so-called "rat race" (Dator et al. 1998; Dator, 2019). In alignment with Dator's framework of generic futures, the findings from Rikkonen et al. (2021, 10) present the "degrowth" scenario which rejects the growth model, resulting in reduced economic undertakings and significantly lower energy consumption than to the existing levels, are directly classified under the "Collapse" future, as the system under consideration is inevitably face collapse.

The “Discipline” or “Discipline Society” emerges when individuals perceive continuous economic growth as unsustainable or unfavourable. In this context, the preservation or restoration of cherished places, processes, and values takes precedence, as these elements are deemed far more significant to humanity. It further believes that continuous economic expansion can jeopardise these vital resources. Despite advancements in technology that allow us to transcend and enjoy life beyond what natural resources can provide, a reckoning is inevitable due to the finite nature of our planet, which faces rapidly depleting resources and environmental pollution. Thus, the fundamental focus of both the economy and society should shift from the pursuit of economic growth to ensuring fair dissemination and survival. Additionally, society should be guided by a core set of values, be they spiritual, natural, political, religious or cultural, that encourage a deeper understanding of life beyond the mere acquisition of infinite wealth and consumerism. (Dator et al. 1998; Dator, 2019.) The “Energy saving and decarbonisation” scenario proposed by Rikkonen et al. (2021), which promotes a favourable direction for the energy scheme, resonates with Dator’s vision of a “Discipline society,” where development is strongly regulated by society.

The “Transformation” or “Transformational Society” signifies the emergence of a dream society poised to fundamentally alter the current information society, primarily driven by the profound advancements in technologies such as Artificial Intelligence (AI), Robotics, Nanotechnology, and Space exploration. This transformation encompasses all facets of life, involving humanity evolving into a distinctly advanced “posthuman” state, potentially inhabiting artificial environments (Dator, 2019; Dator et al. 1998). According to the research conducted by Rikkonen et al. (2021, 10), two scenarios are classified under “Transformation,” where significant technological changes emerge as pivotal forces. The first is the “green growth” scenario, which represents a profound shift from the current energy framework to a renewable system, facilitated by advanced technologies. In contrast, the “climate-friendly transformation” scenario illustrates a transition away from the growth paradigm toward a climate-friendly approach, categorised as a “Transformation” scenario. Interestingly, this shift does not rely on radical technological advancements but instead emphasises a fundamental change in welfare growth. Supporting this notion, Fergnani (2019, 5-6) asserts that “Transformation” entails a radical rethinking of our assumptions rather than merely technological innovations as specified by Dator.

This theoretical framework will aid in analysing the key findings of the study, particularly in exploring alternative preferred future scenarios. The focus will be on whether these scenarios align with the characteristics of scenario archetypes proposed by Jim Dator or diverge from existing

literature, potentially introducing entirely new traits. Therefore, this theoretical lens is well-suited for the objectives of this thesis, which seeks to identify and present alternative preferred futures.

### **2.3 Transition Pathways and Multi-Level Perspective (MLP) Framework**

This subchapter focuses on exploring the theoretical framework and concepts related to transition pathways, drawing insight from the Multi-Level Perspective (MLP) framework. The MLP framework is well-suited to the context of this study, as it provides a flexible approach to addressing the second research question aimed at identifying transition pathways for achieving a carbon-neutral economy. This could provide a suitable framework for a comprehensive analysis of long-term socio-technical transitions.

The complexities associated with climate change challenges have intensified, highlighting the need for a transdisciplinary approach to achieve a comprehensive understanding rather than relying solely on one perspective. Accordingly, Kainuma et al. (2024, 2) argue that a simple step-by-step method is insufficient for effectively addressing global warming. Instead, it requires a thorough transformation of systems to tackle the intricacies of the issue. Aligning with that, Vähäkari et al. (2020, 3) portray that a sustainability transition is propelled by multiple innovations (Geels, 2018, 224) across various spheres, supported by a diverse array of actors. Additionally, Geels and Schot (2007, 399) characterise transitions as transformations that take place between distinct socio-technical regimes, emphasising the dynamic processes involved in moving from one established system to another. This transition process is inherently non-linear and is influenced by interactions with the surrounding environment. Furthermore, it should be noted that such a shift is not possible to happen overnight.

Thus, given the established infrastructure, tailored components, institutions, and socio-technical systems, transformation occurs at a gradual pace, with radical transitions being exceptionally rare. Consequently, these systems evolve over extended periods, often spanning decades, where the alignment of various elements fosters path dependency and stimulates resistance to change, as strong incumbent actors strive to uphold and defend existing stable systems (Geels, 2018, 224). This phenomenon poses a significant barrier to achieving meaningful sustainability transitions. It is also notable that even sudden changes are frequently perceived as short-term rather than lasting. Promoting the long-term actualisation of sustainability remains a daunting challenge, largely due to a predominant prioritisation of short-term benefits (Vähäkari et al. 2020, 3).

As suggested by Geels (2018, 226), scholars engaged in transition studies should prioritise multiple innovations as the focal point of their analysis rather than solely concentrating on singular disruptive

events. Both disruptive and gradual changes can act as catalysts for transformation or improvement, emphasising the notion that transformation can emerge from a series of incremental modifications rather than solely through revolutionary disruptions. This leads to a critical distinction between the speed of change, whether it be disruptive or gradual, and the magnitude of the outcome, whether a minor or significant change occurs within socio-technical systems. It should be noted that the emphasis here is not on radical shifts in existing systems; rather, the objective is to address climate change challenges through a systemic lens. Change is considered the result of a complex, non-linear web of interactions. While precise predictions regarding future developments may be unrealistic, it remains evident that future transitions will be shaped by present decisions and actions, thereby allowing for active influence over future paths (Vähäkari et al. 2020; Persson et al. 2025).

In seeking to shape innovation processes, Transition Theory analyses various facets of socio-technical change and presents frameworks that can effectively assist policymakers and other stakeholders (Persson et al. 2025, 2). Among the esteemed frameworks available for an in-depth analysis of long-term socio-technical transition processes, the Multi-Level Perspective (MLP) was selected for this study due to its explorative nature, flexibility, and capacity to map complex, non-linear developments over time (Vähäkari et al. 2020, 2) considering the nature of the climate change challenges.

The MLP framework, continually refined by Geels, was initially introduced by Rip and Kemp (Persson et al. 2025, 3). This framework can be understood as a system model consisting of three distinct analytical levels: niche, regime, and landscape (see Figure 2). These levels are interconnected and can significantly influence the development process (Lauttamäki, 2023; Persson et al. 2025; Vähäkari et al. 2020). In support of this, Geels and Schot (2007, 399) argue that the alignment of advancements across these multiple levels facilitates systemic transitions. The MLP framework elucidates processes of change through the interconnected configurations of technologies, policies, markets, user practices, infrastructures, regulations, and cultural meanings (Geels, 2018, 224), along with the actors, resources, and institutions that foster stability and create opportunities for change (Geels and Schot, 2007; Vähäkari et al. 2020). As highlighted by Geels (2018, 224), the MLP expands the analytical perspective from merely technological products to encompass socio-technical systems,

demonstrating how transitions arise from the interconnections among factors at the niche, regime, and landscape levels (see Figure 2), which resonates with the objectives of the thesis.

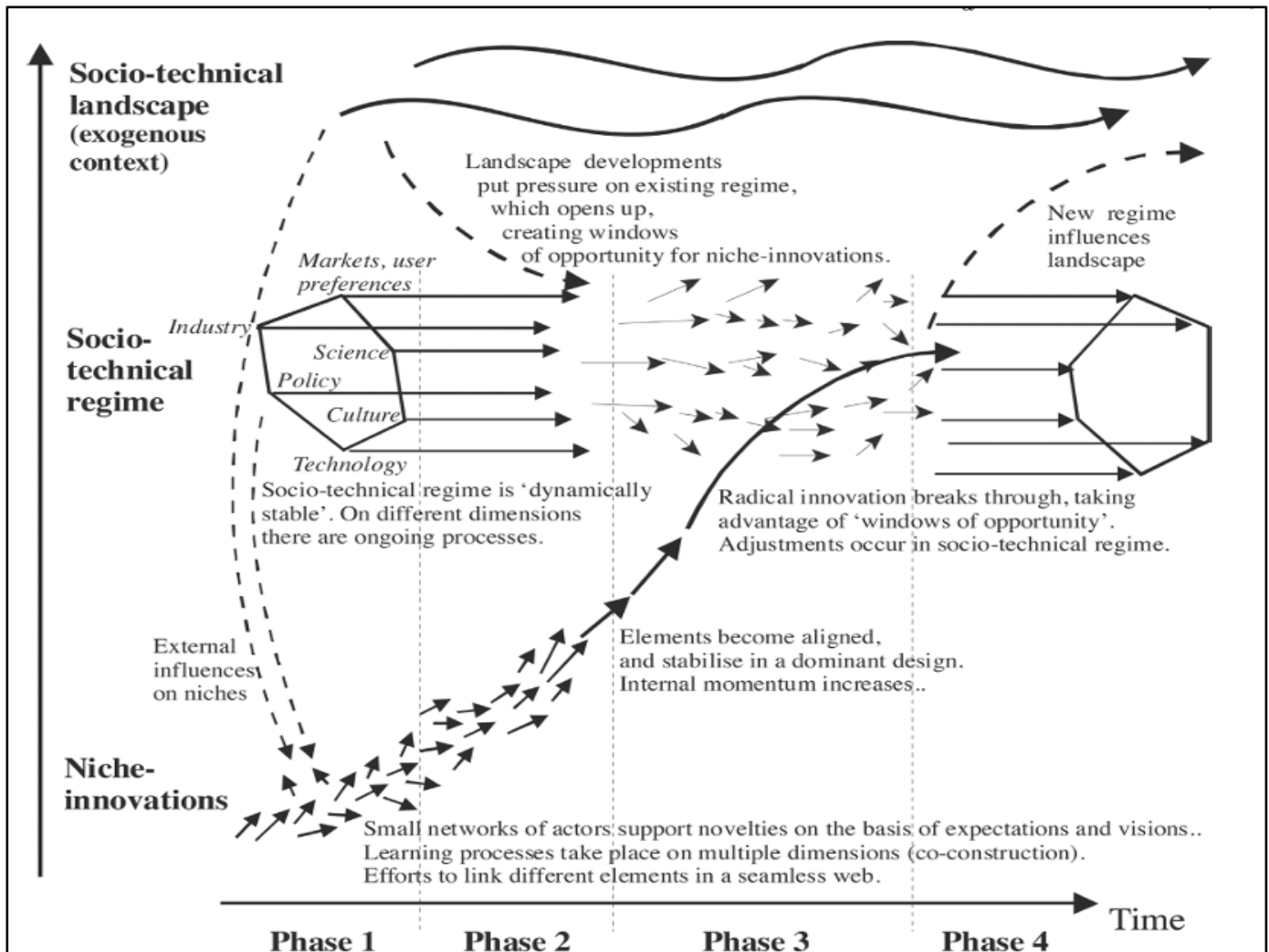


Figure 2: Multilevel perspective on sociotechnical transitions (Geels & Schot, 2007, 401)

### 2.3.1 Three Levels in MLP: Niche, Regime, and Landscape

Niche is where social and technical novelties emerge that distinctly set themselves apart from existing socio-technical systems (Geels and Schot, 2007; Geels, 2018). The predictability and stability of niche functions are notably lower than those at the regime level (Vähäkari et al. 2020, 4), resulting in these initial micro-level novelties being perceived as unstable socio-technical configurations. Geels and Schot (2007, 400) and Smith et al. (2010, 440) claim that niches operate as "incubation rooms" to safeguard innovations from the forces of mass-market focus. These innovations are driven forward by a selected group of actors, including entrepreneurs and innovators, willing to embrace risk. Therefore, as further suggests, continuous engagement from these actors is crucial for the existence

and establishment of robust networks for knowledge dissemination (Smith et al. 2010, 440). Furthermore, the enhancement of innovations through iterative learning practices and the communication and alignment of visions and expectations in the relevant domains are demanded.

As Persson et al. (2025, 3) argue, the alternative socio-technical configurations at the micro level, which are considered niches, have not yet achieved the scale needed to influence established regimes. Hence, over time, these innovations may either thrive, persist in their current form, or fail to materialise (Smith et al. 2010; Vähäkari et al. 2020). However, several critical factors have been identified by Geels and Schot (2007) that could facilitate a breakthrough, such as a strengthened focus on a major innovation, the steadiness of actor networks, and the high-pitched popularity of innovations within particular market sectors, etc (Vähäkari et al. 2020, 4).

The concept of socio-technical regimes is an expanded version of the technological regime concept initially proposed by Nelson and Winter in 1982. It refers to cognitive procedures distributed by the engineering society (Geels and Schot, 2007; Grin et al. 2010). The notion of regimes was further broadened by Rip and Kemp in 1998, who integrated sociological rules alongside cognitive procedures (Grin et al. 2010, 20), thereby encompassing a more extensive social community (Geels and Schot, 2007, 400). This regime structure consists of dominant technologies, established standards, and guiding directions that foster stability in the transition framework (Lauttamäki & Hyysalo, 2019; Vähäkari et al. 2020).

Supporting this view, Grin et al. (2010, 18) suggest that socio-technical regimes exhibit greater stability due to their expansive social networks, markets, infrastructure, and clear regulations, which yield more defined outcomes. Changes within these regimes are trivial and typically supported by the involved parties, despite the continuing variations that may occur at this level (Vähäkari et al. 2020, 4). Nevertheless, the role of regime-level actors is crucial for transition, as the interconnections and collaboration among various elements are vital for achieving a transformation that, while feasible, is also challenging (Persson et al. 2025; Vähäkari et al. 2020).

The broader contextual framework that governs the regime, while the regime itself exerts minimal or negligible influence, is referred to as the Socio-Technical Landscape. This landscape encompasses slow-moving trends, such as population dynamics and geopolitics, which undergo gradual changes over decades, as well as external disturbances like economic collapses, wars, or significant disasters. (Geels, 2018, 225.) It also includes fast-moving trends, such as digitalisation (Geels and Schot, 2007; Vähäkari et al. 2020). Consequently, the landscape can be categorised into three types: slow or non-moving factors, gradual changes that evolve over the long term, and rapid external disturbances

(Geels and Schot, 2007, 403). In alignment with this structure, various fluctuations occur in the operating background based on key dimensions of frequency, amplitude, speed, and scope (Vähäkari et al. 2020, 4). Furthermore, as Grin et al. (2019, 19) point out, the Landscape provides a structural backdrop that catalyses activities.

### 2.3.2 Archetypes of Possible Transition Pathways

A transition occurs through the interactions among all three levels, where niche innovations foster internal momentum. Conversely, the landscape level exerts pressure on the regime, leading to its deterioration and creating a window of opportunity for niches (Geels and Schot, 2007; Luttamäki & Hyysalo, 2019; Vähäkari et al. 2020). The varying timing of interactions across these levels can have distinct impacts, making it a crucial factor in the transition process. The pressure exerted by the landscape is ineffective if niche innovations are unprepared to capitalise on the opportunities that arise. Another key factor influencing the transition is the nature of the relationships, whether they are reinforcing or disruptive, between the distinct levels in the MLP (Geels and Schot, 2007; Luttamäki, 2023).

Building on these two factors, MLP studies have established typologies of various pathways that illustrate how transitions can occur (Geels & Schot, 2007; Vähäkari et al. 2020). In some cases, the type of landscape change is also considered a third factor (Luttamäki & Hyysalo, 2019, 84). These transition pathways in MLP closely resemble Backcasting scenarios (Vähäkari et al. 2020, 7), which were introduced in subchapter 2.2 and represent alternative routes toward a desired future. The six potential scenario pathways identified (Geels and Schot, 2007; Luttamäki & Hyysalo, 2019; Luttamäki, 2023; Vähäkari et al. 2020) are as follows. These archetypes offer a suitable framework for the analysis of the study, particularly in addressing the second research question.

- **Reproduction process:** The system remains stable, with changes occurring only within its internal logic (reproducing) due to a lack of pressure from the landscape.
- **Transformation pathway:** The regime gradually alters its development direction under modest pressure from the landscape, as the maturity of niche innovations is insufficient to gain control over the existing system.
- **De-alignment and re-alignment pathway:** Significant and sudden landscape pressures can lead to a loss of faith in the regime, resulting in changed rules and the de-alignment of the regime. At this point, due to the insufficient maturity of niche innovations, competition arises among

multiple potential niches. Ultimately, the dominance of one of these niches lays the groundwork for re-alignment.

- Technological substitution pathway: When niche innovations reach adequate development, they can seize the opportunity created by substantial landscape pressure to replace the existing regime.
- Reconfiguration pathway: Regime actors willing to change with mutually beneficial innovations, developed by niches, to solve the local problems. Both landscape pressures on the regime and opportunities for niches remain present, with the key feature being the interactions between niche innovations and the regime.
- Mixing pathways: Development involves multiple sequences. As landscape pressures increase, regime actors may respond in various ways, leading to different development paths. This makes it challenging to portray a general model; however, a fundamental insight is that development can progress from one composition to another in pursuit of evolving phases. This sequence of transition pathways likely begins with transformation, contributing to reconfiguration, and, as landscape pressures continue to rise, could lead to either substitution or de-alignment and re-alignment.

The theoretical concepts and frameworks unwrapped in this chapter will serve as the groundwork for evaluating the study outcomes. However, this theoretical discourse offers guidance for the analysis while allowing for flexibility, as it is not confined merely to the specified theoretical frameworks or concepts. Consequently, the analysis may yield innovative or additional insights that extend beyond the theoretical discourse in Chapter Two.

### **3 Methodology**

This chapter outlines how the aforementioned research questions were addressed with the application of future research methods to achieve the desired outcomes of the thesis. Thus, it includes futures research methods and tools utilised throughout the research process for answering the research questions. This chapter begins with a clarification of the context of the study and subsequently moves on to the research design, emphasising the qualitative methodological approach utilised in the thesis. It further explains the reasoning behind choosing this approach and illustrates how it aligns with and enhances the study's objectives. Subsequently, the chapter presents the entire process of the series of Futures workshops, before addressing the ethical considerations at the end of the section.

#### **3.1 Context of Study**

As indicated earlier in subchapter 1.2, this is a commissioned thesis with TalousVihreät, who sought a research project aimed at creating and visualising alternative futures for a sustainable economy. The EconomyGreens in Finland (TalousVihreät) needed to utilise Futures research approaches focusing on sustainable economy, policies, responsible entrepreneurship and investment as they intend to create a world where a sustainable and profitable economy serves society.

In light of the instruction to develop a vision for a sustainable economy, I had the flexibility to define my thesis's scope, focus, and timeline. Scenarios are an effective participatory tool that brings together stakeholders and researchers to collaboratively shape this vision; thus, the primary outcome expected from the study was the formulation of these scenarios. The focus was specifically on Finland, as discussed in subchapter 1.2. Additionally, the study encompassed the necessary policy measures to implement the vision with transition pathways.

Participants intended to actively engage in the process of creating these scenarios, enabling them to learn about future-oriented approaches and gain valuable insights. Consequently, they took part in a series of Futures workshops, contributing from data collection through to the drafting of future scenarios. The findings of this study are intended to inform and enhance policymaking, while concurrently utilizing these insights to strengthen electoral strategies. Thus, EconomyGreens served as the main organizer of the Futures Workshop series, with Visiotuki providing support for the project.

### 3.2 Research Design

The selection of an appropriate research method is influenced by multiple factors, making it a complex process. As Popper (2008, 82) asserts, the choice of a futures research method is primarily guided by three key elements: intuition, insight, and impulsiveness, although these may not be applicable in every situation. It is essential to carefully consider the purpose and contextual conditions of the study before selecting a method. In addition, one should rationally choose a method or a combination of methods to address the limitations inherent in any single approach, ensuring that the selected methods effectively address the specific research questions.

Furthermore, the characteristics and capabilities of foresight methods are regarded as two fundamental aspects. As Popper (2008, 64-65) claims, methods are classified as Qualitative, Quantitative, and Semi-quantitative based on their "nature." Qualitative methods provide interpretations grounded in subjective and creative perspectives, such as opinions, beliefs, and attitudes, which can make validation challenging. Conversely, methods are also categorised based on their "capabilities," which refers to their capacity to collect and process information through evidence, expertise, interaction, or creativity.

In line with this understanding, the study adopted a qualitative approach, as it facilitates the exploration of the complexities inherent in wicked problems, issues that are difficult to quantify and necessitate innovative problem-solving strategies. The primary methods selected for this research were scenarios and Futures Workshops. According to Popper (2008, 65), scenario classification is not fixed; rather, it is influenced by the approach used in its creation. This implies that the context and approach employed in developing each scenario contribute to defining their nature, whether qualitative or quantitative; accordingly, the Backcasting scenario is classified as a qualitative method.

I adopted this qualitative methodology, utilising the scenarios method to offer deeper insights and a comprehensive understanding of this complex issue. Given that this study commenced with a vision, the scenarios developed herein can be classified as a form of "Backcasting" (Heinonen & Lautamäki, 2012, 305) as detailed in subchapter 2.2. Correspondingly, this approach allows for a systematic exploration of potential futures by considering desirable outcomes and working backwards to identify necessary steps and strategies.

The Futures workshop was classified as a qualitative method, reflecting the participatory nature and creativity in collecting and processing information (Popper, 2008, 65). Moreover, Futures Workshops are used for the collection of data, secondarily support the organisation of data, and additionally aid

in data representation, making them an effective method for realising the objectives of this study (Lauttamäki, 2016,156).

One of the primary reasons for selecting the Futures Workshop is the wicked nature of the problem being addressed in this study. Given the complex and multifaceted nature of the problem, a diverse range of perspectives and voices is essential to comprehend the range of factors contributing to the issue and to facilitate the process of identifying and implementing potential solutions (Nygrén, 2019, 30). Ralston and Wilson (2006, ref. Nygrén, 2019, 31) emphasise that greater involvement leads to more effective outcomes. It was supported by Peterson et al. (2003, 362), who highlight that engagement stimulates a broader perspective of the future and enhances understanding of how individual actions influence system change, resonating with the objectives of the study.

Moreover, in pursuit of another objective, engaging stakeholders eager to learn about futures thinking and scenario planning was a fundamental reason for adopting this participatory approach. The advantages of this objective are twofold. As Armanto (2024, 1) highlights, stakeholders can benefit from enhanced learning opportunities, improved decision-making and policy development, a considerable influence over outcomes, and a sense of active involvement in the research process. Conversely, collaborative learning of stakeholders provides researchers with numerous benefits, including access to high-quality and diverse data sets, support for the study, and more effective dissemination of findings (Nygrén, 2019, 31). Additionally, Patel et al. (2007, 551) point out that selecting participatory scenario processes can help leverage local and specialised knowledge, encourage acceptance of results, develop ambassadors for the topic, and influence shifts in perspective among key stakeholders.

Given the benefits of a participatory approach, a series of Futures workshops was conducted over three sessions from June to October 2024, with appropriate intervals allocated for analysis. The structure of these workshops primarily adhered to a blend of phases recommended by Jungk & Müllert (1987, according to Vidal, 2006, 5), Schwartz (1991), and Lauttamäki (2016). However, these phases were adapted and customised to suit the specific needs of the client and to address the research questions of the study, while also considering available resources and time constraints.

### **3.3 Phases of Futures Workshops (FW)**

As outlined previously, the phases of the workshops were customised to align with the requirements of the study, which resulted in three primary phases: drivers and elements of a sustainable economy (FW1), Images of alternative carbon-neutral futures (FW2) and co-creating the vision (FW3). The

primary phases were supported by an essential preparation phase at the beginning of the workshop series.

### 3.3.1 The Preparation Phase

The first phase was crucial (Vidal, 2006, 5), as a failure at this stage could jeopardise the workshops' success and prevent the achievement of desired outcomes. Therefore, during this phase, the initial planning and organising tasks were carefully executed. All tasks commenced with detailed communication with the research client. In response to their request to engage in the envisioning and learning process, the workshops were planned through collaborative discussions, ensuring a schedule which was both practical and effective with the available resources. The workshop dates were finalised as the 10th of June, 27th of August and 22nd of October in 2024 during the initial stage, as it was necessary to secure a venue for the workshops and to facilitate participant recruitment for the workshop series through targeted advertising.

The venue was provided by the client, along with the refreshments for the workshops, which significantly reduced my logistics responsibilities as a facilitator. Furthermore, the recruitment advertisement was managed and published by Visio with my initial support, leveraging their expertise to target people who are keen on learning futures study approaches and willing to contribute to carbon neutrality and sustainability efforts. All participant communications were managed by Visio, resulting in the successful registration of 12 participants for the workshop series before starting the workshops. The only criterion for participant selection was their genuine interest and willingness to voluntarily engage in the series of workshops.

Each workshop was scheduled for four hours daily, running from 4 p.m. to 8 p.m. to accommodate participants' availability after work, as agreed upon with the organisers. The agenda for each session (see Appendix 1) was distributed to the organisers well in advance of the workshop dates. Additionally, presentations were prepared with detailed instructions and pertinent information to ensure clarity and comprehension. The workshop series also employed a digital format, enabling all participant contributions to be clearly visible and easily recorded for subsequent analysis. As a result, physical stationery was deemed unnecessary; instead, participants were encouraged to bring their own digital devices, such as laptops, tablets, or smartphones. Given the choice of digital tools, I selected the Flinga Board for its user-friendliness and accessibility across various devices. To facilitate smooth collaboration for participants, the necessary instructions, stages, and team setups were pre-constructed on the Flinga Board before the workshops.

### 3.3.2 Drivers and Elements of a Sustainable Economy (FW1)

This was the inaugural workshop of the series, focusing on identifying the drivers and elements of a sustainable economy. The aim was to deepen the understanding of the theme and its associated challenges as suggested by Vidal (2006, 6). Although 12 participants registered for the workshop series, only 6 attended the first session. As a result, participants were divided into two groups, each consisting of three participants. The workshop began with a brief introduction to the thesis work, outlining the objectives and providing contextual background. All participants signed a consent form (See Appendix 2), which was reviewed and explained by the facilitator. Since the only eligibility criterion for participation was an expressed interest, everyone had the opportunity to introduce themselves and share their motivations for joining the workshop series.

An inspiring speech was given by the guest speaker, followed by a presentation from Visio outlining the guidelines for creating a safer space. As mentioned earlier, Flinga was selected as the digital platform for the discussions. Consequently, I conducted an introductory session to familiarise participants with how to navigate the platform, including its features and essential details for the tasks. I made sure that all participants could access the platform smoothly and without interruptions from the outset.

The first workshop had a threefold structure. The initial phase, known as the Applauding Phase, encouraged participants to identify positive aspects of the economy that contribute to carbon-neutral sustainability. This phase began with individual brainstorming, which then transitioned into group discussions. Following this was the Problem Phase, which concentrated on the critical challenges hindering the path to carbon neutrality. Similar to the previous phase, individual brainstorming generated valuable input for group work. Due to the volume of ideas produced, the groups were tasked with organising similar problems and prioritising only three key issues for further exploration. If consensus could not be reached through discussion, participants were encouraged to utilise a simple voting system as suggested in previous studies (Vidal, 2006, 6) on the Flinga board to determine the priority problems. After the second phase, each group presented their results from both phases. Only the group presentations were audio recorded with the prior consent of all participants. A coffee break with refreshments was provided to stimulate and recharge for continuing the remainder of the agenda.

Immediately following the break, a mental time-travel, which was originally developed by Oliver Markley in 1970 (Markley, 2008, 17), was incorporated into the workshop to enhance the participants' creativity (Borjeson et al. 2006, 731). This exercise involves a guided journey into a future, facilitated through a narrative that describes a picture of a world where sustainability has

already been realised (Cuhls, 2017; Jensen et al. 2022; Slaughter, 1991). This approach encourages participants to broaden their perspective on the future, improving creativity and disruptive thinking in formulating alternative futures (Borjeson et al. 2006; Cuhls, 2017; Jensen et al. 2022; Markley, 2008) rather than extrapolating past trends, which perfectly aligns with the study's objectives. As Cuhls (2017, 120) suggests, there are different occasions where mental time travel can be applied, and within this study, it was used to pitch the future thinking of participants with broader possibilities after the break.

This mental time-travelling script is adapted from Jensen et al. (2022, 342-344) and has been further refined in collaboration with a colleague at FFRC who is well-versed in this approach. Consequently, I have crafted a comprehensive script (See Appendix 3) designed to inspire the creativity of participants. To ensure that the pauses integrated into the script provide sufficient time for participants to imagine, as indicated by Cuhls (2017, 123), I assessed the pacing and tone of voice and tested the effectiveness of this technique through a pre-test with a few friends. Fortunately, the feedback was overwhelmingly positive; participants found it instrumental in stimulating their imagination, in line with previous research findings (Cuhls, 2017; Markley, 2008). They also identified areas for improvement, particularly regarding the duration of cycles, especially during the transition from home to society. As Cuhls (2017, 119) notes, this testing was essential for enhancing my awareness of the cycles, thereby encouraging all participants to engage in mental travel within the designated time limit of the workshop. Consequently, I facilitated a 10-minute mental time travel exercise to inspire participants' imaginations. I made a concerted effort to remain objective and neutral throughout this task, as advised by Cuhls (2017, 133). The participants' positive responses were evident in the insightful reflections they shared afterwards, displaying their journeys to various intriguing locations and highlighting the effectiveness of this exercise.

The final phase of the workshop was the Futures Signal phase, during which participants were tasked with identifying the drivers that could enhance or address the identified issues. These drivers were intended to be categorised into Futures Signals, encompassing Mega Trends, Trends, Weak Signals, and Wildcards. However, the extensive time needed for participants to pinpoint the drivers prevented the completion of the categorisation during the workshop. As a result, the groups presented the drivers they had identified, and the session concluded with a discussion of the next steps and a brief reflection.

### 3.3.3 Images of Alternative Carbon-Neutral Futures (FW2)

The second workshop was executed a couple of months after the initial Futures Workshop, primarily aimed at developing alternative future images. To build on the discussions from the previous

workshop, I began with a thematic qualitative content analysis, recognised as a flexible method for analysing text data according to Hsieh & Shannon (2005, 1277). I utilised NVivo software for this analysis, which allowed for a comprehensive review of all text data materials, including repeated readings of transcriptions from recorded audio files and contributions from the Flinga Board. The coding process involved systematic classification (Hsieh & Shannon, 2005, 1278) to identify prevalent themes and driving factors from the data analysis. Adhering to the guidance of Hsieh & Shannon (2005, 1286), this study employed conventional content analysis, beginning with observations and allowing codes to emerge naturally from the data during the analysis. This method enhanced the understanding of the context, as categories were derived directly from the data throughout the analytical phase, consistent with the findings of Hsieh & Shannon (2005, 1279).

The workshop commenced with a brief overview of the study's context, particularly for a new participant who had not attended the previous session. All the necessary instructions were provided at the beginning, and a consent form was signed by the new participant. Each participant was able to introduce themselves and share their motivations for joining the workshop series, and finally formed three groups for the second workshop. A concise recap of where we stopped in the last session was presented, which was beneficial as the time gap may have led some to forget key details. Participants were also informed about the next steps planned for the workshop, providing them with a clear understanding of the agenda for the day and the activities ahead.

The initial step involved introducing the Futures Table to the participants, serving as the foundation for the second workshop. A Futures Table is a widely utilised tool in Futures research, specifically designed to systematically gather alternative future states of qualitative variables and sometimes include quantitative variables (Lauttamäki, 2016; Varho & Tapio, 2013). This tool facilitates the creation of alternative future scenarios by integrating consistent states (Järvi et al. 2015; Nygrén, 2019). The scenario development process is fundamentally anchored in the Futures Table (Varho & Tapio, 2013), allowing participants to analyse the topic in a more structured manner. By presenting multiple future states across various variables, the Futures Table enables the generation of a plethora of alternative future images that combine different components (Nygrén, 2019; Lauttamäki, 2016; Varho & Tapio, 2013). Given this characteristic, Varho and Tapio (2013) recommend that the final number of images or scenarios be kept to a manageable level. Lauttamäki (2016) suggests that ideally, constructing three to five distinct images would be preferable. However, considering a minimum of four images ensures a degree of novelty, as three images would typically be confined to a dystopian, utopian, and neutral state.

All participants were provided with an explanation of what a Futures Table is and how to utilise it for creating future scenarios. In preparation for the workshop, I developed a Futures Table that incorporated all the drivers identified through the conventional content analysis based on inputs gained from the first workshop, aiming to save time and effort for the second session. Participants were encouraged to add more drivers or variables of interest, provided they did not overlap with the existing ones. The initial task involved supplementing the table with additional drivers or variables for the identified drivers and generating alternative future values for all included variables. Following this activity, each group presented their Futures Table, showcasing the identified future scenarios. This presentation phase was audio recorded for future reference, with prior consent obtained from the participants. Afterwards, a coffee break was offered to refresh and energise everyone as they prepared to create vivid images of the future.

Since creating four images was deemed an optimal approach, all participants were asked to produce a minimum of four images, or more if they wished, by combining internally consistent future states. Ultimately, each group shared their vibrant future images, resulting in a total of 13 distinct future images.

#### 3.3.4 Co-creating the Vision (FW3)

The last workshop was designed to co-create a desired vision, focusing on proposing transition pathways along with policy measures to achieve the envisioned future. It began with a summary of our progress thus far and the upcoming steps necessary to reach the objectives of the Futures Workshop series. Participation was notably lower compared to the previous two workshops, resulting in the formation of a single group that combined all attendees, which was four.

The workshop commenced with a brief theoretical explanation distinguishing between scenarios and future images. Given that 13 distinct future images had been developed during the second session, the objective was to utilise these images as a foundation for formulating a desirable Future scenario. Participants were encouraged to select one preferred and realistically attainable Future Image with participants' opinions and to outline developmental pathways leading to the desired end state. Additionally, the years 2025, 2030, and 2035 were designated as the immediate future, the mid-point of the journey, and the desired future state, respectively. Participants were advised to construct pathways at both the national and local levels for the given timeline. Once the development paths were established, participants were assigned to write a scenario narrative, suggest required policy measures to achieve the desired future state and present their findings. This presentation was audio recorded with the prior consent of those involved for further analysis. Following this phase, a coffee

break was provided to refresh and energise everyone in preparation for the final step of the workshop series.

To conclude the workshop series, there was a brief reflective discussion during which participants shared their thoughts on the workshops. I expressed my appreciation as the facilitator for the participants' and organisers' dedication to achieving the study's objectives. The series wrapped up with a request for participants to complete a feedback form to gather insights to enhance the facilitator's skills and improve the overall experience for future projects.

### **3.4 Ethical Consideration**

To achieve the objectives of this study, it is crucial to consider ethical aspects that the researcher must address. To maintain the integrity of the research, ethical guidelines were meticulously followed per the Finnish National Board on Research Integrity. The Finnish National Board on Research Integrity (TENK 2012, 30) underscores the necessity of adhering to responsible conduct in research to uphold its credibility and reliability. Moreover, as this study involved human participants, it was essential to comply with the ethical principles disclosed by TENK (2019, 6). Informed consent, a fundamental principle in research involving human subjects (*ibid.*, 9), was secured before commencing the workshops. Participants were allowed to review and sign a consent form (see Appendix 2) after it was thoroughly explained to them by the facilitator. They were informed of their right to withdraw from the study at any time and without justification, emphasising that participation was entirely voluntary. Further, I ensured that Participants' anonymity was protected throughout the process according to the guidelines given for protecting privacy in Research publications by TENK (2019, 14). Accordingly, group presentations from discussion rounds were recorded, transcribed, and promptly deleted to retain only anonymised transcriptions. These materials were accessible only to the researcher and her supervisors. Additionally, quotes included in the study findings were coded to safeguard the privacy of the workshop participants (See Appendix 4). The research was conducted with a strong emphasis on voluntary participation and ethical practices, ensuring transparency, confidentiality, and respect for the participants at every stage.

#### **3.4.1 Responsibility as a Futurist**

Apart from the above ethical responsibilities in the standards and guidelines specified for research purposes, the following subchapter will delve into the ethical responsibility of a Futurist considering this field of study from a more humanised and futuristic perspective. Given that humans and nature are deeply interconnected, I believe that the most crucial condition for sustainable development lies

in integrating environmental and economic considerations into decision-making processes. Unfortunately, the economic and environmental systems often remain largely disconnected from our concerns, as we typically do not perceive them as a comprehensive integrated system. This limited perspective can hinder our efforts toward creating a sustainable future, as essential factors may be overlooked in critical decision-making. Pursuing value in one domain, such as increasing profits, while inadvertently compromising value elsewhere, like through contributing to environmental pollution, can ultimately undermine any progress made toward a more sustainable world.

To better comprehend the changes in the interrelations of nature and humans, Masini (2006, 1162) suggests three different approaches for Futures studies. The first one is termed the 'prognosis' approach, which is based on extrapolation. The second one is the 'visions' approach, which seeks the transformation of the present to a desirable future through a future vision. The last one is a combination of both elements, which is thinking based on 'projects,' with the knowledge of both possibility and probability, seeking to achieve the desirable future. Notably, Futures thinking is critical in identifying where we need to go, and not only for recognising where and how we are going, which means not just probable or possible futures, but also preferable futures (Dator et al. 1998; Masini, 2006). Furthermore, as Dator (2019, 3) underscored in his *Laws of the Future*, "Preferred Futures" are possible to envision and should be envisioned, despite "The Future" cannot be predicted. Emphasising the significance of these Preferred futures, facilitating individuals or groups in formulating preferred futures has been recognised as one of the major tasks of futures studies. However, with this position, we may have a critical question as to whose desirable future this is, on what basis and how this is preferable to another future (Poli, 2011, 405). Therefore, ethical values play a critical role in Futurists' lives.

The Futurist is also a part of the world that he tries to change with a future-oriented perspective. As Poli (2011, 404) argues, when a person is concerned about the future, an involvement sense of the future is essential for actions which reflect that the future is a fundamental element of making ethical decisions. Therefore, future thinking should be directly linked with ethical values (Dator et al. 1998; Poli, 2011) and social responsibility. In addition to that, Masini asserts that Futurists have a responsibility to support decision-making with creative thinking, as well as with rational judgment. Thus, the direction of the desirable future vision should be chosen as what we believe is the best (Armanto, 2024; Masini, 2006), reflecting the social interest.

As Masini (2006, 1164-1166) further emphasises, historically, these visions have functioned as the seeds of the process of changes or transformations. Moreover, if the vision has served as the direction

of the future, which is the seed of transformation which simultaneously supports pathways for realising that goal, it could be considered a learning process. This highlights the necessity of actively shaping the future, rather than passively adjusting it, which aims for the betterment of the world. The famous quote of John Schaar, "The future is not just a place we are going to, we create it," further emphasises the idea that the future is not something to passively wait for but rather something which we should actively shape through our actions and decisions. Therefore, futurists must support others in cultivating future-oriented thinking skills and developing their own learning processes to perform their responsibilities meaningfully (Masini, 2006, 1166) while attempting to establish a better world or at least a part of it (Dator, 2019, 14).

### 3.4.2 Responsibility as a Facilitator

As a responsible futures researcher, I conducted this research following the guidelines established by research authorities, placing a strong emphasis on ethical values. I felt a duty to assist others in cultivating future-oriented thinking skills as a facilitator throughout this series of workshops. My approach to facilitation was open and expansive, aiming to promote a participatory process that nurtured the creativity of the participants. While I provided clear instructions to help them understand the intended direction, the outcomes were entirely reliant on the participants' creativity, with guidance limited to fundamental process instructions. By keeping the instructions open-ended and allowing ample time for creative exploration, I aimed to alleviate challenges that can hinder creativity while supporting participants in developing their own learning processes to engage meaningfully in their responsibilities.

I view myself as a democratic facilitator, striving to empower every voice and promote an inclusive environment that encourages collaborative creativity. This, in turn, helped participants build greater self-confidence, as suggested by Vidal (2006, 14). Moreover, as he further asserts, the provided guidelines strike a suitable balance to foster creativity. Aligning with this, as noted by Heino (2021, 9-12), I believe that the facilitation approach could be beneficial in future knowledge creation. Thus, I think that my approach as a facilitator proved effective in cultivating future-oriented thinking skills among participants while enhancing their learning processes and creating future knowledge to fulfil their responsibilities meaningfully (Masini, 2006, 1166).

The subsequent chapter will comprehensively depict the outcomes derived from each of the workshop phases discussed in this chapter. Preferred futures and transition pathways that emerged through this methodological approach will be detailed, along with other insights generated.

## 4 Results

This chapter explores the outcomes of the Futures Workshop series, which results in addressing the research questions. It begins by presenting the results of the first workshop with the key drivers and components of a sustainable economy. The chapter then presents various images of alternative carbon-neutral futures, which were developed by participants during the second workshop, with a focus on their preferred futures. Finally, the chapter concludes by detailing the preferred vision crafted by the participants along with the transition pathways required to achieve that vision, thus addressing both research questions of the study.

### 4.1 Drivers and Elements of a Sustainable Economy (FW1)

The results of the first futures workshop were threefold, as presented below.

#### 4.1.1 The Results of the Applauding Phase

The initial segment of the workshop emphasised the favourable aspects of the current economy in Finland. Two groups identified a diverse array of elements they deemed advantageous for fostering a sustainable economy. One group noted the promotion of circular economy concepts and Finland's robust culture of second-hand shopping as significant positive factors. They also recognised, however, that these elements have not yet realised their full potential.

“...the circular economy and 2nd hand-shopping culture in Finland were good things even if they are not on the level that they could be already...” (A1)

Moreover, the EU's emissions trading system has been acknowledged as both effective and operationally sound. The ambitious regulations established by the EU for its member states, including the Corporate Sustainability Due Diligence Directive (CSDDD), have been viewed as positive advancements that contribute to more sustainable supply chains. In addition, the incentives offered to private institutions are considered vital for fostering a carbon-neutral economy, complemented by the active efforts of various non-governmental organisations (NGOs) working towards sustainability.

The Other group shared viewpoints that underscored the significance of NGOs and the influence of EU regulations. They depicted Finland as the “promised land of NGOs” and commended EU regulations for their leadership in global sustainability initiatives. They argue that other nations could gain from adopting the EU's approach to legislating in support of a sustainable economy. However, this notion of EU leadership is inconsistent with the findings of Onofrei et al. (2022, 6), which indicate

that EU nations remain significant contributors to greenhouse gas emissions due to excessive consumption, despite their claims of leading sustainability initiatives.

Nevertheless, their discussion also highlighted additional elements, grouped into technology and innovation, infrastructure, funding, awareness, and societal impact. One key point raised was the significant level of innovation observed in Nordic countries relative to their population size. The pace of innovation is accelerating, particularly with advancements in Artificial Intelligence (AI). These technological advancements have the potential to address challenges that were previously thought to be impossible, notwithstanding the accompanying complexities and challenges.

In terms of awareness, this group stated a significant increase in understanding regarding the importance of a carbon-neutral economy and sustainable practices. There is a growing recognition of the connection between environmental and economic challenges, which was fundamental to the design and motivation of the study. Participants highlighted that solutions benefiting the environment are often aligned with comprehensive economic practices. An increasing acknowledgement of the fundamental need to consider climate impacts in decision-making and strategy development was also evident.

Regarding funding, it was emphasised that Finland's significant investment in Research and Development (R&D) plays a vital role in advancing sustainability initiatives. The country possesses extensive practical knowledge and engineering expertise, particularly in health-related fields such as biosciences and life sciences. This wealth of knowledge positions Finland well to address several pressing challenges. From a social perspective, the Nordic welfare model provides a robust framework that promotes safety and equality in participation during the transition toward sustainability. Consequently, this supportive environment fosters the potential for individuals to adopt necessary lifestyle changes.

Their discussions indicate a cultural shift in consumption patterns, especially among younger generations, who are increasingly inclined toward positive and affordable sustainable choices, fostering a sense of optimism about the future. Finally, under the infrastructure category, it was noted that green electricity has emerged as a cost-effective energy source, encouraging consumers to make sustainable choices. This trend reinforces a broader commitment to sustainability and presents opportunities for individuals to engage in environmentally responsible behaviours while enjoying utility services without interruption.

#### 4.1.2 The Results of the Problem Phase

The second phase of this futures workshop focused on an in-depth discussion of the critical issues impeding the economy's advancement toward carbon neutrality. One group indicated that while identifying, the numerous challenges were relatively straightforward, rather than the positive aspects currently present in the system, which proved to be more complex. This observation emphasises the significance and timeliness of the theme of this study in addressing the prevailing issues in the economy towards carbon neutrality. They outlined several significant obstacles, such as the inefficiency of existing regulations, a common lack of long-term perspective, insufficient pricing for environmental degradation, and the tendency to prioritise immediate concerns over sustainable future goals.

During the discussions, participants emphasised inefficiency in regulation as a pressing concern, particularly due to poorly designed incentives associated with market mechanisms aimed at encouraging cleaner production methods. The notion of “going green” mentioned by that group, which encompasses a range of sustainable practices, often lacks the necessary financial backing and is frequently undermined by a capitalist framework that does not adequately support optimal regulatory practices. A pointed comment from one of the group participants summarised this dilemma as follows.

“...investors would take their money out if the company did not achieve their short-term goals...” (A1)

The lack of perspective was also a key focus, as participants noted that climate challenges are often downgraded to a lower priority on people's lists of concerns. Many struggle to reconcile the urgency of climate change with their immediate personal needs. One participant from that group expressed this conflict as follows.

“...should I think about my personal needs in 5 years or 15 years, or do I see further in life? So, to achieve short-term goals, can I actually think of future generations...” (A1)

Furthermore, the workshop discussions highlighted the necessity of establishing a price for the environmental harm caused by human activities. Currently, no effective pricing mechanism exists to hold individuals and corporations accountable for their ecological impact. Moreover, participants pointed to the complexity and overlap of various regulations, including an array of standards and reporting systems that govern sustainability efforts, which can often create confusion rather than clarity. Deepening this issue is the inadequacy of some global instruments designed to address these challenges. The conversation also touched upon the uncertainties troubling the market, resulting from

political instability, geopolitical conflicts, and economic dependencies that divert focus away from climate change initiatives. Interestingly, participants identified a sense of stagnation within the EU, where many stakeholders appear to hesitate, waiting for others to take the lead or for regulatory changes to prompt action toward sustainability. This collective inactivity underscores the need for bold leadership and decisive action in the face of urgent climate challenges.

In this phase, the other group also identified similar problematic areas that hinder the sustainability transition, echoing the observations of previous groups but from different perspectives. Key issues include inefficient and slow public regulations, inadequate quality and speed in commercialisation, a mindset driven by fear and uncertainty, biased or one-sided conversations, and a lack of investments.

Inefficient public regulation often emphasises cost efficiency without adequately addressing climate change challenges, subsidies and support directed towards harmful practices in traditional sectors like agriculture, alongside bureaucratic inefficiencies. A fear and uncertainty-driven mindset reveals a tendency towards short-term thinking rather than long-term solutions, influenced by a neoliberal economic agenda. Biased or one-sided discussions encompass the polarisation of knowledge, the erosion of democratic institutions, the tendency of policymakers to underestimate the negative impacts of climate change, and the spread of disinformation and misinformation.

Furthermore, the lack of investments constitutes another critical challenge. This highlights historical structural issues within Finnish investment practices. It was characterised by the adherence to outdated financing and research institutions without the involvement of innovative disruptors. Lack of proper investment is also revealed through a focus primarily on wind power among all renewable energy. Additionally, the lack of quality and expedited commercialisation pertains to the transition of research and development (R&D) and technology, often prioritising opportunistic business models over sustainable long-term benefits. They further argued that this issue is intensified by the isolation of science and technology from other disciplines within the education system.

#### 4.1.3 Strengthening and Solving Drivers

In the third phase of this workshop, participants were tasked with identifying the reinforcing and mitigating factors associated with the key problems identified in the previous activity. One group expressed three primary concerns: the absence of a price for the harm caused by individuals, inefficient regulatory frameworks, and the prioritisation of other challenges at the expense of climate issues. They indicated the lack of consistent global regulation and inadequate measurement of Gross Domestic Product (GDP) as strengthening the dilemma of the price for the harm. Proposed solutions

to this challenge include the establishment of global directives to steer financial investments away from fossil fuels, as well as the implementation of fiscal mechanisms such as tax incentives for companies that meet climate mitigation targets, which is consistent with the findings of Onfrei et al. (2022).

Furthermore, the establishment of a global democratic parliament was highlighted as a potential solution, as it could facilitate collective decision-making at a global level. However, participants expressed concerns about the effectiveness of the United Nations (UN) in this context, viewing it as insufficiently strong as a global mechanism. They also acknowledged the possibility that such a democratic framework might potentially disrupt existing regulations, given the uncertainty of its operational arrangements. Radical activism was suggested as a possible opportunity for stimulating change.

Participants considered inefficient regulations to be impaired by the frequent mismeasurement of significant variables. This point was reflected in group discussions, with one of the group participants stating,

“...even the companies that are not performing in climate-friendly areas might receive favourable evaluations from the administration, for instance...” (A1).

Conversely, the role of education, an anti-corruption mindset, and legislation support for innovation emerged as potential solutions to the problems posed by inefficient regulations. It was suggested that educational initiatives could foster the development of effective regulations, as the current issues extend beyond mere inefficiency, however, they also incorporate a lack of political will, as many stakeholders seek to hinder or disrupt ambitious climate objectives. Legislative frameworks that promote innovation, rather than restrain it, were deemed essential to support the sustainable transition.

The final key issue identified was the lack of perspective and the prioritisation of other challenges, leading participants to express concerns that individuals and nations may encounter a worsened version of climate change along with growing geopolitical tensions. This polarisation could further increase unexpected consequences that are not yet fully understood. Concerning the tangible impacts of climate change, such as water scarcity, the severity of future challenges remains difficult to assess. Participants believed that engaging in value conversations from diverse perspectives could yield beneficial insights. They contemplated the necessary actions and the historical role of religion in shaping responses to climate-related issues, recognising its continuing influence in many contexts. As such, the inclusion of broader populations in discussions and decision-making processes was

deemed critical for addressing these pressing challenges, highlighting the tension between democratic engagement and singular perspectives.

In this phase, the other group identified a significant issue: the tendency to think based on fear and uncertainty. They proposed that this issue could be addressed through the implementation of a mission economy, as well as the promotion of literacy and wisdom, alongside innovative collaboration methods. A mission economy can be seen as an objective-driven economic model that leverages resources, techniques, tools, and guidelines from the private sector for public sector use. Furthermore, it embodies a broader framework involving collaboration across all societal sectors, both public and private. Together, these sectors can form alliances dedicated to achieving specific goals, such as enhancing the healthcare system using public assets, which may be realised through entrepreneurial business models. This approach also encourages the identification of best practices across various industries and fields. Furthermore, financial instruments and assets which endorse sustainability can support solving this issue, aligning with green investments reported by Carlsson Kanyama (2008).

Furthermore, the concepts of literacy and wisdom are embedded in meaningful exchange and co-creation of knowledge, with even alternative future thinking considered as a potential solution. However, irresponsible rhetoric, unhealthy economic structures, and flawed information validation were identified as aggravating factors contributing to fear-based and uncertain thinking. Delving deeper into the topic, the lack of science-based knowledge, traditional interaction forums, media fragmentation, and the challenges posed by AI to our perception of reality, sole focus on shareholder interests, which lead to unnecessary exposure to risks, were discussed as negative influences during this phase.

Following the first futures workshop, thematic qualitative content analysis was performed using NVivo. As outlined in the methodology section, I employed a conventional content analysis approach (Hsieh & Shannon, 2005, 1286), starting with observations that allowed codes to emerge naturally from the data during the analysis. The thematic qualitative content analysis identified several common drivers generated from the workshop materials, including awareness, consumption patterns, economic structures, education, goals and priorities, industry practices, investments, laws and regulations, the price of harm, societal values, taxes, technology, and patterns of thinking. Most of the identified drivers corresponded with established findings in the existing literature (Carlsson-Kanyama, 2008; Eurofound and EEA, 2023; Firoiu et al. 2022; Geels, 2018; Kainuma et al. 2024; Madurai Elavarasan et al. 2022; Onfrei et al. 2022), particularly concerning consumption patterns,

economic structures, education, investments, laws and regulations, the price of harm, taxes and technology.

## 4.2 Images of Alternative Carbon-Neutral Futures (FW2)

The second Futures workshop commenced by building upon the insights gathered from the previous session. The drivers identified earlier served as the foundation for the Futures table, facilitating the creation of future images. The initial variables were further categorised into sub-variables, according to group preferences, and additional variables were incorporated, enriching the future images. Furthermore, urban structure, daily consumption, forestry, transportation systems, the energy sector, and agriculture were included to enhance clarity and provide a broader context, as these topics had been notably absent in the first workshop yet are essential for considering a sustainable economy as consistently recognized as critical in the literature (Carlsson-Kanyama, 2008; Geels, 2018; Madurai Elavarasan et al. 2022; Siljander & Ekholm, 2018).

Each group started filling the Futures table with alternative future states, ultimately creating diverse sets of multiple future images for a carbon-neutral economy in Finland by 2035. Consequently, every group successfully generated several distinct future images, encompassing both a preferred and an undesired future, resulting in a total of 13 unique alternative future images.

### 4.2.1 A Spectrum of Futures from Present Policies on Steroids to the Silver Bullet

Group 1, for instance, produced four distinct future images: ‘Present Policies on Steroids’, ‘Silver Bullet’, ‘Era of Protectionism’, and ‘Implosion’ (refer to Table 1). A summary of all the future images generated by group 1 is presented in the table below.

Table 1: Future Images by Group 1

THE YEAR 2035	Present policies on steroids	Silver Bullet	Era of protectionism	Implosion
<b>Investments</b>				
Investment Time Horizon	Perpetual	Long term	Mid term	Short term
Investment Scale	Medium investment	Large investment	EU-led investment policies	Low investment
<b>Economic Structure</b>	Neoliberal market economy	Mission economy	Market economy	Market economy
<b>Laws and Regulations</b>				
Regulations affecting citizens	Too liberal	Liberal enough	Liberal enough	Passivating
Regulation affecting the enterprise	Driving oligopoly	Driving happiness	Too restrictive	Driving economy
<b>Technology/Innovation</b>				

THE YEAR 2035	Present policies on steroids	Silver Bullet	Era of protectionism	Implosion
Innovation investment shortly	Shrinking economy, no investment	New Nokia	Finland prevails with the help of the startup scene	Sweden takes over "Winner takes it all"
Innovation disruptiveness	Protective policies strangle global economic development, status quo	Quantum technologies become a strong economic change factor	Europe is left behind	Value creation is minimal; Finland is the supplier of raw materials
<b>Consumption Pattern</b>	No goods to consume	Consumers should stop consuming too much	Circular economy	Laissez-faire
<b>Goals &amp; Priorities</b>				
Business goals	Short-term optimization	Responsible enterprises	Consolidation of assets "Googleitization"	Business as usual
Price for harm	Disaster recovery mode	Polluter pays	Polluter pays	Taxpayers pay
<b>Industry Practices</b>				
Steel industry practices	Fast impacts by closing traditional business sectors	Steel replaced by synthetics	Holistic circularity as business as usual	Hydrogen and other alternative new industries fail
<b>Social Values</b>				
Security-related social values	Vulnerability	Society of trust	Society of trust	Securitization
<b>Taxes</b>				
Human vs. robot taxes	No income tax, only consumption and harm are taxed	Taxing automation will resolve the welfare state crisis	Humans and robots are taxed equally	Human work is taxed more than robot work
<b>Thinking Pattern</b>				
Ownership of media space	Fragmented isolation	The multitude of voices, literacy and interaction prevail	Science-based information enforcement	False media, disinformation
<b>Urban structure</b>	Keep on building shopping malls, and area segregation increases	Repurposing and recycling of buildings and infrastructure becomes the norm	Shrivelling urban centres	Securitisation and private security agents take to the streets
<b>Daily consumption</b>	Consumption increases: decision-making is based solely on the prices of goods	Conscious consuming becomes the norm	Second and peer to peer as norm	Wealth gap
<b>Forestry</b>	Economic exploitation, loss of diversity	Holistic diverse drivers, an increase in value per unit, and a decrease in volume	Partial change driven by a new generation of private forest owners	Inability to adapt to climate change
<b>Transport system</b>	Privatisation of public transport	Electric public transport for all	Mobility as a service available in urban centres and remote areas keeps using fossil	Transition to biofuels is painfully slow and expensive
<b>Energy sector</b>	Soaring prices	Unlimited sustainable energy resources	Nuclear and increasing wind energy prevail	Lack of investment and available energy resources constrict industry development
<b>Agriculture sector</b>	Consolidation, the import of food increases, and the quality of food is worse	New local and sustainable industrial-scale agricultural production	Traditional industrial food production, imports blocked with tariffs	Ramp down of local agriculture

Among the four distinct future images, the ‘Era of Protectionism’ and ‘Implosion’ images present a more ambiguous outlook (refer to Table 1), remaining stagnated within a market economy framework. The ‘Present Policies on Steroids’ image, however, is the most pessimistic alternative, as it signals a shift toward a neo-liberal market economy with investment directives that significantly

alter the economic structure. This deregulation adversely affects citizens, leading to an oligopolistic environment where a limited number of enterprises dominate the market. The economy is supposed to shrink, resulting in diminished investment and inadequate consumer goods. Business objectives may prioritize short-term optimization, exacerbating vulnerabilities related to security and societal values.

The tax system, devoid of income-based assessments, would rely exclusively on consumption and harm caused by the people. A fragmented media would support increasing individual isolation, while the continuous construction of shopping malls symbolises a relentless drive toward consumerism. Consequently, consumption is expected to expand, positioning the pricing of goods as the primary determinant of market development. Economic exploitation of forests would lead to a loss of diversity. Furthermore, public transportation would be privatized, and the prices of energy would soar. An increased reliance on imported agricultural products may deteriorate quality while inflating food prices, thereby exacerbating existing social inequalities.

#### *4.2.1.1 Preferred Image One: 'Silver Bullet'*

Among the four visual representations analysed, the '**Silver Bullet**' emerges as the most favourable depiction for the future (refer to Table 1). A central element of the 'Silver Bullet' narrative is the emergence of a new technological leader similar to Nokia, with quantum technologies playing a pivotal role in catalysing economic transformation. Urban planning will prioritise the repurposing and recycling of existing buildings and infrastructure. Access to electric public transportation will be universal, alongside an ample supply of sustainable energy sources and innovative, sustainable agricultural practices on an industrial scale.

The investment time horizon directed toward Finland is characterised as long-term, promoting substantial financial commitments. The economic framework is conceptualised as a "mission economy", wherein collaboration between the public and private sectors is essential for the execution of defined missions. Regulatory measures impacting citizens are anticipated to be liberal, while those affecting enterprises are designed to prioritise the enhancement of well-being. Consequently, the promotion of societal happiness is presented as the primary driver for enterprise regulation.

A notable shift in consumer behaviour is expected, as individuals are likely to downsize overconsumption in response to increased levels of happiness with minimalism. In this context, the financial burden of environmental harm is assigned to the polluter. Furthermore, traditional steel production would be supplanted by synthetic alternatives. An environment characterised by mutual

trust regarding security concerns would prevail, cultivating social connections among individuals. The implementation of a substantial tax on automation, rather than on human labour, offers a potential solution to the challenges posed by the welfare state and sustainability crises. Intellectual discourse is expected to be enriched by a diverse array of perspectives with literacy. Meaningful interaction will become a societal norm.

#### 4.2.2 A Spectrum of Futures from Regression to Progression

Group 2 creatively envisioned four distinct future images: ‘Regression’, ‘Progression’, ‘Stale’, and ‘Utopy’ (refer to Table 2). Each of these futures presents a vivid illustration of potential outcomes, reflecting a diverse array of possibilities. The summary of all the futures generated by Group 2 is organised in the table below. These distinct images include a desired and an undesired future.

Table 2: Future Images by Group 2

THE YEAR 2035	Regression	Progression	Stale	Utopy
<b>Investments</b>				
Investment Time Horizon		long		
Investment Scale		EU-scale investment	national	
<b>Economic Structure</b>	industry-intensive, public		service-intensive, public	service-intensive, private
<b>Laws and Regulations</b>				
EU regulation			Increase	Less binding
<b>Technology/Innovation</b>				
Other		Food tech	Electrification	Quantum computing
Energy innovations		Bioenergy	Nuclear	Hydro-tech
<b>Consumption Pattern</b>	Cheap crap			
<b>Awareness/Literacy</b>	Non-literate	Forerunner	Knowledge	
<b>Goals &amp; Priorities</b>		Conservation of nature	Social Wellbeing	
<b>Price for harm</b>				Financial sanctions
<b>Industry Practices</b>	Lagging	Pioneer		
<b>Sustainability Education</b>	None	In all levels	Only in universities	In all levels
<b>Social Values</b>		Global	Individualism	
<b>Taxes</b>		Consumption based	Income-based	
<b>Thinking Pattern</b>	Doubtful about future	Hopeful about the future	Linear thinking	
<b>Energy</b>	Less		More	Massively more
<b>Geopolitics</b>	War		Tension	Peace
<b>Urban structure</b>	gets worse	Enhance	Increases	Clean and efficient
<b>Daily consumption</b>	Inequality	overconsumption decreases	Increases	In balance
<b>Forestry</b>	is destroyed	increases	decreases	Barely touched
<b>Transport system</b>	is destroyed	develops	deteriorates	Dynamic and intelligent
<b>Energy sector</b>	dependent on fossils	innovations	trust nuclear	Abundant
<b>Agriculture sector</b>	land intensive	plant-based	meat-based	Provides all we need

In the ‘Stale’ image (refer to Table 2), investments are characterised by their national scope within a services-intensive economy. In this image, the public sector plays a significant role in the economic structure. The regulatory environment established by the European Union has been intensifying, accompanied by a sustained push towards electrification, evidenced by the expected increase in the

emergence of electricity-based technologies. While nuclear energy sources remain operational, sustainability education is predominantly constrained to universities, encouraging a culture of individualism. Taxation is primarily income-based, and there is an evident need for a greater energy supply. Geopolitical tensions further complicate these circumstances.

In the '**Utopy**' image, the public sector's involvement is minimised, allowing the private sector to flourish and meet the needs of society through enhanced services and products. This mechanism denies the necessity for extensive regulations, as companies are motivated to optimise their offerings. Efficient hydro technology emerges as a viable source of renewable energy, characterised by low energy consumption to generate hydroelectric power. Sustainable education and environmental consciousness are woven into the fabric of daily life, beginning at the elementary level and spreading to all stages of education. In addition to balanced energy consumption, the sources used are cleaner and more efficient. This image envisions a world in which all nations coexist in peace.

Conversely, the '**Regression**' image represents an undesired future state marked by widespread destruction and pervasive uncertainty about the future. The absence of sustainability education leaves individuals unaware of sustainable practices, contributing to intensified inequality amidst ongoing conflict. Consumers remain obsessed with low-cost and low-quality goods, while the energy sector continues to rely heavily on fossil fuels, and the agriculture industry remains land-intensive.

#### *4.2.2.1 Preferred Image Two: 'Progression'*

Among the four prospective future images, the '**Progression**' image emerges as the most desirable to the participants. This image emphasises greater conservation of natural resources as the goal of the economy. A global social value system that is universally acknowledged has emerged as a defining characteristic. Sustainability education would be expanded beyond higher education to encompass all educational levels to become the forerunner through enhancing awareness. Notably, this approach is expected to cultivate a collective sense of hope regarding the future, which cultivates optimism.

Enhanced investments, particularly at the EU level Industries are anticipated to engage in a competitive drive towards innovation and excellence. Taxation would shift towards a consumption-based model to make the polluter pay. Urban structures are expected to become significantly more efficient and enhanced, while over-consumption would decrease notably compared to current global levels with the values considering resource scarcity. Furthermore, an advanced transportation system and greater innovations, particularly within the energy sector, are anticipated. Particularly, the field of agriculture will be plant-based.

### 4.2.3 A Spectrum of Futures from Planet B to Back to Nature or Sustainable Dream World

Group 3 has articulated five distinct future images: ‘Planet B’, ‘Excessive Consumerism’, ‘Technology Solves Everything’, ‘Back to Nature’, and ‘Sustainable Dream World’ (refer to Table 3). These images encompass a comprehensive range of possibilities, including both preferred and undesirable futures. This diversity enriches the discussion and offers a diverse range of perspectives on what may lie ahead.

Table 3: Future Images by Group 3

<b>YEAR 2035</b>	<b>Planet B</b>	<b>Excessive consumerism</b>	<b>Technology solves everything</b>	<b>Back to nature</b>	<b>Sustainable dream world</b>
<b>Investments</b>					
Investment Time Horizon	Short	short / medium	Medium long & Super long	Super long	Super long
Sustainable Investment Scale	No investment	moderate	Substantial	Moderate	Substantial
<b>Economic Structure</b>					
Mode of economy	Capitalism	capitalism	Capitalism	Sharing economy	Sharing economy/welfare state
Structure of production	Unsustainable and short-term	Large amounts of imported goods with no responsibility	High productivity and high-tech	Nature-based self-sufficiency	High-tech necessities
<b>Laws and Regulations</b>					
National	Climate and environmental legislation are being weakened	Climate and environmental legislation remain at the same level	Climate and environmental legislation are being strengthened	Climate and environmental legislation remain at the same level	Climate and environmental legislation are being strengthened
EU level	No new directives/commitments	A limited number of binding directives, Ambitious directives, and commitments	Ambitious directives and commitments	A limited number of binding directives, Ambitious directives and commitments	Ambitious directives and commitments
Global	No new agreements	Fewer agreements	More binding targets	More binding agreements by a few countries	More binding targets
Climate and environmental regulation	No effort	Some effort	High effort	Some effort	High effort
<b>Technology/Innovation</b>					
Carbon capture innovations	No innovations		Technology-based solutions	Nature-based solutions	Nature-based solutions
Energy efficiency	Low targets	Medium targets	Ambitious targets	Ambitious targets	Ambitious targets
Energy sources	Fossil fuel	Mixed sources	Mixed sources / nuclear	Zero-emission energy sources	Zero-emission & Nuclear
<b>Consumption Pattern</b>	Negative handprint of consumption	Negative handprint of consumption		Positive handprint of consumption	Positive handprint of consumption
<b>Awareness/Literacy</b>	Low	Medium	High & Fragmented	Fragmented	High
<b>Goals &amp; Priorities</b>	Emissions exceeding planetary boundaries	Emissions exceeding planetary boundaries	Emissions exceeding planetary boundaries	Degrowth	Doughnut economy/degrowth

<b>YEAR 2035</b>	<b>Planet B</b>	<b>Excessive consumerism</b>	<b>Technology solves everything</b>	<b>Back to nature</b>	<b>Sustainable dream world</b>
<b>Price for harm</b>					
Global agreements	No	Moderate	High	Moderate	High
National and EU-level agreements	No	Moderate	High	Moderate	High
<b>Industry Practices</b>					
Willingness to change/ambition	Low	Low	High	Medium	High
<b>Sustainability Education</b>					
Media literacy	Disinformation increases	Education as a privilege	Education as a privilege	Education as a privilege	Science-based knowledge is largely available at education
Social Values	Individualism & national borders closed	Individualism	global awareness and care	global awareness and care	global awareness and care
<b>Taxes</b>	Sustainable practices are priced more	Taxes stay as is	Sustainable practices are taxed less	Sustainable practices are taxed less	Sustainable practices are taxed less
<b>Thinking Pattern</b>	Focused on the present benefits	Focused on the present benefits	Future-oriented thinking	Future-oriented thinking	Future-oriented thinking
<b>Urban structure</b>	The regionally collapsed urban structure on Earth			Part of the population has left the cities to live a self-sufficient lifestyle.	Urbanisation, cities are built sustainably with lots of green space.
<b>Daily consumption</b>	People need to try to take care of their basic needs, such as clean water			The amount of consumption is divided by ideology and region.	People consume less and use less energy.
<b>Forestry</b>	Barely any forests left, areas turned into deserts			Part of the forest is highly protected, and part over overconsumed.	A balance between protection and sustainable use
<b>Transport system</b>	Regions that are habitable become overcrowded. Transport is only available to rich people. Air-conditioned vehicles.			Localism is on the rise. Demand for aviation decreases.	In cities, concentrated free public transport and cycling are made very accessible.
<b>Energy sector</b>	High prices for fossil fuels with no alternatives.			Focus on distributed systems.	Energy consumption decreases significantly, and what is needed is produced with zero emissions.
<b>Agriculture sector</b>	Dryness and low yield			Diverse traditional farming practices are gaining popularity.	Diversified, no meat production.

The most undesirable future scenario, referred to as ‘**Planet B**’ (refer to Table 3), illustrates a reality where Planet A is on the edge of destruction. In this context, the investment horizon for environmental initiatives remains significantly short, with minimal to no investments undertaken. The prevailing economic framework is characterised by capitalism, operating under a production model that prioritises short-term benefits over sustainability. A lack of comprehensive laws and regulations has

resulted in the absence of new agreements or efforts directed towards climate and environmental governance.

Furthermore, inadequate innovation in carbon capture processes. Energy efficiency targets are alarmingly low, and energy production relies predominantly on fossil fuels, leading to a negative consumption handprint driven by existing policies. Public awareness regarding environmental literature remains limited, and emissions are surpassing planetary boundaries without any effective pricing mechanisms for environmental harm. The industrial sector displays a significant reluctance to adopt transformative practices, while media literacy is hindered by a rise in disinformation. Social values in this image tend to incline towards individualism, worsened by the closure of national borders. The sustainable practices are being heavily taxed, resulting in high costs. The global mindset is predominantly focused on immediate benefits.

In this gloomy and depressing future, urban infrastructures have deteriorated as populations migrate to areas where water is still accessible. Cities become deserted, and the loss of forests leads to widespread desertification. Transportation becomes a privilege for the wealthiest, while habitable regions become overcrowded. Fossil fuel prices soar without viable alternatives, and the agricultural sector suffers from drought and declining yields.

Compared to the preferred images of ‘Sustainable Dream World’ and ‘Back to Nature’, which will be detailed below, the images of ‘**Excessive Consumerism**’ and ‘**Technology Solves Everything**’ rank lower on the desirability scale, even though they are considered better than ‘Planet B’.

#### *4.2.3.1 Preferred Image Three: ‘Sustainable Dream World’*

Among the five distinct images, the ‘**Sustainable Dream World**’ image emerges as the most desirable. The goal of the economy is degrowth, prioritising the principles of the Doughnut economy with ideologies of sharing and a welfare state structure. The predominant mindset shifts towards a future-oriented perspective. Consequently, social values are oriented towards global awareness and collective responsibility, with sustainable practices facing lower tax burdens. Consumption patterns reflect a positive handprint, as public awareness and knowledge about sustainability issues are significantly enhanced. The pricing of environmental harm is elevated at all levels, encouraging a high willingness among companies to embrace change and ambition. Education in sustainable practices is based on scientific literacy and is readily available across various educational tiers.

In this image, the investment horizon is extended, with a recognition of long-term effects and substantial financial commitment to sustainability. encouraging a high-tech production model that

aligns with sustainability goals. Climate and environmental regulations are robust, incorporating binding targets and ambitious directives. Innovations in carbon capture primarily utilize nature-based solutions, emphasising energy efficiency and the transition to zero-emission energy sources. Urban development is characterised by sustainable construction practices, with abundant green spaces integrated into city planning. A balance is maintained between urbanisation and population influx. Generally, consumption rates and energy usage decline significantly, with urban areas prioritising free public transport and cycling initiatives. Accessibility to renewable energy sources is drastically enhanced, and all production processes achieve zero emissions. The agricultural field diversifies, evidently excluding meat production.

#### *4.2.3.2 Preferred Image Four: 'Back to Nature'*

Despite the “Sustainable dream world” being recognised as the preferred future image by the group, in my personal view, the ‘**Back-to-Nature**’ image also appears as a pragmatic and yet desirable future image among the five distinct images presented.

The pursuit of degrowth constitutes the central goal of the economy, prioritising nature-based self-sufficiency with ideologies of the sharing economy. Consumption patterns reflect a positive handprint, with a predominant mindset shifting towards a future-oriented perspective. Part of the population has left the cities to live a self-sufficient lifestyle, while localism is on the rise. Diverse traditional farming practices are gaining popularity while innovations are based on nature-based solutions. Social values are oriented towards global awareness and collective responsibility, with sustainable practices facing lower tax burdens. Energy innovations emphasise energy efficiency and the transition to zero-emission energy sources.

### **4.3 Co-creating the Vision (FW3)**

The last Futures workshop aimed to collaboratively create a vision for a preferred economy. With only one group participating, they identified a preferred, yet realistically attainable future image focused on achieving a carbon-neutral economy in Finland by 2035, based on the future images developed in the previous workshop. The group began to explore the transition toward this preferred future, which laid the groundwork for outlining the necessary development steps by concentrating on the desired end state of 2035. They evaluated what must have emerged and what milestones must be reached by that time to ensure the scenario’s plausibility. The preferred scenario narrative they formulated explains a picture of a transformative future for a carbon-neutral economy as follows.

“Imagine the year 2035, when cities and communities have transformed into a vibrant and sustainable economy. The skyline is dotted with **repurposed buildings**, once abandoned or underutilised, now bustling with new life and purpose. Old factories, office buildings, and shopping centres have been converted to support human **creativity** flourishing in a world with **scarce resources**, steering in a new wave of enterprises embracing the Green New Deal and producing commodities sustainably, showcasing the norm of repurposing and recycling infrastructure.

In this future, conscious consumption is re-negotiated based on **knowledge and information**, and it is **integral to the prevailing economy**. People prioritise quality over quantity, opting for services instead of products, as well as for products that are durable, repairable, and ethically produced. The market is driven by holistic, diverse factors that concentrate on **enhancing the value per unit** while decreasing overall volume. This shift has resulted in a flourishing economy where businesses innovate to create high-value, sustainable products.

Electric public transport is extensive, seamlessly connecting urban and rural areas. Buses, trams, and trains glide silently through the streets, powered by **boundless sustainable energy resources**. Solar panels, wind turbines, and advanced **energy storage systems** ensure that clean energy is always available, significantly reducing the carbon footprint to near zero.

Agriculture has experienced a revolution with the introduction of new local and sustainable industrial-scale production methods. **Urban farms and greenhouses** are common sights, providing fresh, locally grown produce throughout the year. Forestry has undergone a disruptive change in its value system, with a focus on **carbon capture, biodiversity, and nature preservation** becoming the primary drivers in forestry. These innovations have made food systems more resilient and less reliant on lengthy supply chains, thereby ensuring food security for everyone.

The concept of locality is the key strength of the future **societies of trust**. Value creation is deeply rooted in **local narratives**. Local production has already demonstrated to have a lasting impact on the economy, creating happiness and empowering members of the society.” (C1)

Based on this scenario narrative of the envisioned preferred future, developed by the participants, I have created an illustration to represent this ideal vision in a simple yet appealing manner (see Figure 3). Since this image has been generated using Generative AI (ChatGPT), some details may not be represented accurately; rather, it aims to depict the carbon-neutral economy simply. This illustration serves as a basic visual representation of the narrative articulated by the participants, providing a compelling glimpse into the future they strive to achieve.



Figure 3: The 'Silver Bullet' Image Illustrated with Generative AI Using Scenario Narrative (ChatGPT)

#### 4.3.1 Scenario Pathways from 2025 to 2035

After that, to bring this vision to life, the participants repeated this process by identifying the milestones needed by 2030 and determining the immediate actions required by 2025 at both the national and local levels. They methodically considered the key milestones and necessary changes that must occur over the years to ensure the envisioned scenario remains achievable and grounded. With their preferred vision in place, they constructed a development pathway extending from 2025 to 2035 and finalised the scenario narrative based on group discussions. The resulting development pathway is clearly outlined in the table below (refer to Table 4), showcasing the strategic events and timelines necessary to realise their shared vision for a sustainable future.

Table 4: Scenario pathways from 2025 to 2035

Milestones	2025	2030	2035
Industry practices	Renegotiating remote work.	Taking advantage of the change in the global supply chain system will lift the forerunners of a circular economy.	Imagine the year 2035, when cities and communities have transformed into vibrant, sustainable economies. The skyline is dotted with <b>repurposed buildings</b> , once abandoned or underutilized, now bustling with new life and purpose.
Cities and Infrastructures	Adapting to the disruption of several industries because of digitalization, automatization and AI.	Abandoned factories and city centres all over the world are becoming more prominent.	Old factories, office buildings and shopping malls have been converted to support human <b>creativity</b> flourishing in a world of <b>scarcity of resources</b> , a new wave of enterprises embracing the Green New Deal and producing commodities sustainably, showcasing the norm of repurposing and recycling infrastructure.

Milestones	2025	2030	2035
Society and Welfare	Political problems related to immigration are resolved.	Europe resolves challenges regarding innovation and the speed of commercialization.  Finland, as a member state of the European Union, overcomes challenges related to matching the education system's capabilities with the market's demand for workforce.  The decoupling of human labour and livelihood is enforced with basic income.	In this future, conscious consuming is re-negotiated <b>based on knowledge and information</b> and is <b>integral to the prevailing economy</b> . People prioritize quality over quantity, choosing services over products and products that are durable, repairable, and ethically produced. The market is driven by holistic, diverse drivers that focus on <b>increasing the value per unit</b> while decreasing overall volume. This shift has led to a thriving economy where businesses innovate to create high-value, sustainable products.
Renewable Energy	Mining regulation and taxation of the mining industry revenue are scrutinized to ensure sustainable industry practices locally.	The war in Ukraine has come to a resolution, and once again, peace prevails in Europe.  A new European energy market based solely on renewable energies is emerging.	Electric public transport is ubiquitous, seamlessly connecting urban and rural areas. Buses, trams, and trains glide silently through the streets, powered by <b>unlimited sustainable energy resources</b> . Solar panels, wind turbines, and advanced <b>energy storage systems</b> ensure that clean energy is always available, reducing the carbon footprint to near zero.
Agriculture practices	The Finns' special relationship with nature is re-examined and a new narrative in Nordic Forest know-how emerges.	"Newtrition" (as in comparison with "New Green Deal") becomes a term describing how the EU restructures the agricultural subsidy system, leading to the complete reorganisation of European and local food production practices.	Agriculture has undergone a revolution with new local and sustainable industrial-scale production methods. <b>Urban farms and greenhouses</b> are common sights, providing fresh, locally grown produce year-round. Forestry has undergone a disruptive change in value system thinking. <b>Carbon capture, biodiversity and nature preservation</b> have become primary drivers in forestry. These innovations have made food systems more resilient and less dependent on long supply chains, ensuring food security for all.
Political System Support	People start trusting democracy because the Economy Greens can communicate the present and its future implications in a way that does not alienate but rather encompasses people.	The prime minister supports green values and is preferably a member of the Green party.	The new locality is the superpower of the future <b>societies of trust</b> . Value creation is deeply rooted in <b>local narratives</b> . Local production has already proven to have a lasting impact on the economy, creating happiness and empowering members of society.

#### 4.3.2 Suggestions for Policy Measures

In alignment with the preferred future scenario, participants engaged in a comprehensive discussion regarding national policies and local initiatives that could facilitate the transformation towards carbon neutrality in Finland by the year 2035. The resulting policy measures proposed include:

- Implementation of taxonomies and pricing for natural resources
- Re-assessment of national and global productivity metrics

- Enforcement of European investment criteria and standards for reporting
- Integration of humanistic studies, such as philosophy and psychology, into elementary school curricula
- Establishment of new immigration policies within Europe and Finland
- Regulation and taxation of revenue generated from the mining industry
- Introduction of a basic income system in Finland
- Development of a new European energy market

The participants underscored the critical necessity of reforming the educational system to promote an understanding and acceptance of diversity. A significant emphasis was placed on cultivating empathy and resilience among students. The consensus emerged that a multidisciplinary educational framework, as opposed to a narrow specialisation, equips individuals with a broader toolkit necessary to endure an uncertain future. This dialogue was precisely linked to the discussion surrounding the evaluation of national and global productivity metrics, suggesting that these metrics should incorporate a wider spectrum, surpassing simplistic economic valuations such as Gross Domestic Product (GDP), etc.

Moreover, the group recommended the initiation of humanistic studies at the elementary level to mitigate bullying and promote empathy. Such an educational approach aims to enhance students' comprehension of the importance of interpersonal relationships and the recognition of diverse human identities, species, and individual differences.

Further discussions delved deep into the shifting economic paradigms, particularly examining the new classifications and reporting systems being formulated by the European Union. Participants speculated on the long-term consequences of these frameworks, emphasising the significance of the taxonomy and valuation of natural resources. One participant articulated,

“Taxonomy is a classification system for natural resources, putting a price tag on every single tree. For example, if we cut down trees to produce pulp, there's a price tag for that. And if we exhaust a certain amount of carbon dioxide in the atmosphere, there's a price tag for that. So, the taxonomies are just a kind of classification for these kinds of resource usage and harm done.” (C1).

Additionally, the necessity of enforcing European investment criteria was emphasised, with a focus on ensuring that financial investments align with sustainable practices, particularly in environmentally sensitive sectors such as mining. The discussion highlighted the urgent need for the

refinement of mining regulations and tax structures in Finland to comply with European standards, indicating that substantial work remains in this field.

The conversation also included themes related to human behaviour, economic policies, and immigration strategies. Participants recognised the importance of contemplating the concept of basic income to decouple livelihood from traditional employment. While acknowledging that basic income may not resolve all unemployment-related issues, it was suggested that such a system could empower individuals to avoid unproductive or environmentally detrimental work. One participant articulated a persuasive argument, stating,

“How many science-based deep tech start-ups would we get in Finland if everybody got a basic income of two thousand euros, where every single startup started with certain criteria, with creating a monthly revenue? Excellent reason to have a basic income.” (C1).

This perspective significantly strengthens the argument for considering the implementation of basic income. Finally, discussions encompassed the evolving European energy market, emphasising the critical need to promote renewable energy initiatives to ensure long-term security and resilience.

The subsequent chapter will conduct a comprehensive analysis of how the findings respond to the research questions framed within the theoretical perspectives discussed earlier, thereby deepening our understanding of the results’ implications within the context of existing literature.

## 5 Discussion

In the final chapter, this thesis critically examines the findings which facilitate a transition to a carbon-neutral economy, guided by the realization of two central research aims. The primary aim of the study was to conceptualize a sustainable, carbon-neutral economy for Finland by the year 2035, reflecting preferences articulated by economically concerned green political actors. The results delineated four distinct future images formulated, namely: ‘Silver Bullet’, ‘Progression’, ‘Sustainable Dream World’, and ‘Back to Nature’. Each of these images presents an alternative vision for a carbon-neutral economy, which resonates closely with Dator’s (1998, 305) framework of generic futures, underscoring its credibility. Specifically, the ‘Silver Bullet’ scenario aligns with the notion of “Transformation,” ‘Progression’ corresponds to the “Disciplined Society,” while ‘Back to Nature’ is indicative of “Collapse.” Concurrently, the ‘Sustainable Dream World’ occupies a nuanced position that intersects both the “Collapse” and “Disciplined Society” categories, embodying characteristics of both. Notably, these preferred visions for a carbon-neutral economy serve as a challenge to the prevailing growth-centric paradigm, advocating for a fundamental shift beyond traditional notions of economic growth, consistent with previous studies (Svenfelt et al. 2019; Vidal, 2006).

To complement the primary objective, the secondary aim of the research was to delineate how the formulation of transition pathways can facilitate the transition toward this envisioned future with the support of policy measures. The findings indicate that the proposed measures do not adhere to a singular or linear trajectory; rather, they encompass a range of synergistic and interactive policy bundles, including basic income, resource taxation, and educational reforms. Analysing these findings through the lens of the Multi-Level Perspective (MLP) framework reveals a “Mixing Pathways” approach, characterised by the co-evolution of “Transformation,” “Reconfiguration,” “Technological Substitution,” and “De-alignment/Re-alignment” in line with the transition archetypes identified in previous studies (Geels and Schot, 2007; Luttamäki & Hyysalo, 2019; Luttamäki, 2023; Vähäkari et al. 2020), reinforcing the validity of the framework. These mixing pathways suggested for reaching the vision of carbon neutrality reflect the complex realities inherent in the pursuit of a transition to a carbon-neutral economy.

Subsequently, this section provides an in-depth interpretation of these results, highlighting their implications for achieving the study’s objectives, alongside a reflection on the key findings discovered. The chapter will further explore the theoretical interpretation in the study, particularly how the results can be framed to respond to the research questions within the established theoretical frameworks, as well as other pertinent concepts. Additionally, the methodological approach

undertaken to address the issue and to shape the envisioned future will be analysed. Finally, the chapter will acknowledge the limitations of the study while identifying avenues for future research, followed by concluding remarks.

## **5.1 Reflection on Preferred Futures for a Carbon Neutral Economy**

The ideas generated through the participatory approach to envisioning carbon neutrality revealed a considerable range of possibilities, resulting in a diverse array of images with differing emphases. These comprehensive discussions appeared to foster a vivid conceptualisation of a sustainable future, reflecting participants' sense of agency regarding their prospective trajectories. To address the central question of this study, "What could be the preferred future scenarios for economically focused green political actors in Finland to achieve a carbon-neutral sustainable economy by 2035?", four distinct preferred future images were identified from a total of 13 alternative images developed during the futures workshops. The recognised preferred images, labelled as 'Silver Bullet', 'Progression', 'Sustainable Dream World', and 'Back to Nature', each present an alternative, unique vision for a carbon-neutral economy in Finland, aligning with the participants' preferences.

The preferred image of the 'Silver Bullet' envisions a technology-driven economy focused on innovations aimed at sustainability. The second preferred image, 'Progression', advocates for deeper conservation of natural resources as the central goal of the economy, while also recognising a universally acknowledged global social value system. The third preferred image, known as the 'Sustainable Dream World', envisions a future characterised by degrowth, prioritising the principles of the Doughnut economy along with ideologies of sharing and a welfare state structure. Furthermore, social values are directed towards global awareness and a collective sense of responsibility with a future-oriented perspective. The fourth preferred future image, 'Back to Nature', emphasises nature-based self-sufficiency across various economic dimensions, embracing the ideologies of a sharing economy and promoting a harmonious relationship between humans and the natural environment. Upon reflecting on the feasibility of these alternative preferred images, I believe that the 'Sustainable Dream World' presents a slightly utopian vision with overly optimistic features that may impede the realistic attainment of such a future state within the next decade.

A key observation from the analysis of these distinct preferred future images was the presence of common characteristics among the alternative futures. While the images depicted distinct centres of attention that mirror participants' lived experiences and perspectives, several key concepts emerged as commonalities. One of the salient common features among the preferred future images is that, serves as a challenge to the prevailing growth-centric paradigm, advocating for a fundamental shift

beyond traditional notions of economic growth. ‘Sustainability Dream World’ and ‘Back to Nature’ explicitly embody the degrowth perspective, while ‘Progression’ implicitly steers toward avoiding continuous growth by prioritising the goal of conservation of natural resources. The notion of ‘Silver Bullet’ is not explicit, however, the characteristics given in the technology-driven mission economy imply a shift, just beyond the growth perspective, to a sustainability-driven approach. These findings resonate with the feasible options that the economies can adapt within the biophysical boundaries of the planet, as proposed by Vidal (2006, 370). Furthermore, as Svenfelt et al. (2019, 2) argue, these preferred images demonstrate that the concept of intentional degrowth transcends merely doing less of the same; it presents an opportunity to achieve sustainable goals through re-evaluation and transformation of our existing approaches.

Other key concepts commonly symbolised in the preferred images for carbon carbon-neutral economy included significant long-term investments in sustainability, conscious consumption patterns, the adoption of renewable energy sources, the imposition of taxes on polluters, local plant-based agricultural practices, repurposing of urban structures, incorporating green spaces and facilitating electric or clean transportation. In addition to that, the necessity for knowledge of sustainability emerged as an essential component in participants’ preferred images. These common key concepts aligned consistently with findings from prior research (Carlsson-Kanyama, 2008; Geels, 2018; Kainuma et al. 2024; Madurai Elavarasan et al. 2022; Melkonyan et al. 2019; Onfrei et al. 2022), highlighting their relevance in the discourse surrounding a carbon-neutral and sustainable economy.

Nevertheless, one crucial perspective is notably absent from the participants’ discussion regarding preferred images. As I outlined in Chapter Two, for Finland to achieve its climate neutrality target by 2035, CO<sub>2</sub> removals must equal emissions, which necessitates a dual approach. The vital function of forests as carbon sinks was overlooked in the presented images, as it is included in images only at a surface level. However, the role of carbon sequestration was not explored in depth. Consequently, while the reduction of carbon emissions was extensively discussed, CO<sub>2</sub> removals were largely neglected in the preferred images, limiting the practical implications of the findings.

Subsequently, to find the transition pathways, the ‘Silver Bullet’ was presented as the ultimate preferred future vision of a carbon-neutral economy by the year 2035. The digital transformation, which was central to this scenario, resonates with the findings of Maksymova et al. (2024, 335), as it emerges as a key domain in achieving climate neutrality in the previous studies. The proposed

scenario outlined a feasible pathway to realise this vision, addressing prevailing challenges through a series of distinct milestones.

Consequently, one pivotal insight derived from the preferred vision of ‘Silver Bullet’ is the critical role of education as a fundamental mechanism for facilitating this transition. Despite investment in education being recognised as a fundamental means of achieving sustainability goals by previous studies (Eurofound and EEA, 2023; Firoiu et al. 2022), an innovative, different and wider perspective was highlighted in this scenario. As suggested by the participants, to cultivate conscious consumption and renegotiate societal values rooted in knowledge and information by 2035, Finland must address and resolve the discrepancies between the capabilities of its educational system and the demands of the labour market. A consensus has emerged emphasising the importance of a multidisciplinary educational framework, which is posited as more effective than narrow specialisations. Such an approach not only equips individuals with a more versatile skill set necessary for steering through an uncertain future but also contributes to a reduction in unemployment rates, which may indirectly lead to decreased carbon emissions in numerous ways. With stable income opportunities, individuals are more likely to explore sustainable alternatives, thus minimising the likelihood of engaging in environmentally detrimental practices for economic survival and fostering the development of a peaceful society with reduced crime rates.

In light of education’s vital importance, the team recommends integrating humanistic subjects like philosophy and psychology into elementary school curricula. This highlights the pressing need for educational reforms that foster an understanding and appreciation of diversity. The emphasis is placed on nurturing empathy and resilience among students, which could be fundamental to the transition toward sustainability. Before taking actions that support sustainability, individuals must grasp its core principles. By nurturing this understanding early on, students will develop a sense of responsibility towards both human and non-human entities, as well as future generations, encouraging environmental protective measures that align with sustainability goals. This approach represents a fresh perspective on education’s role in achieving carbon neutrality.

Nevertheless, in envisioning the future of Finland, it is crucial to consider additional critical factors that may have direct implications for other regions globally, such as embedded emissions resulting from the importation of goods consumed within Finland. Given that Finland is not insulated from global interdependencies, adverse effects experienced in other countries could subsequently impact Finland’s trajectory. While the targets and policy measures presented explicitly focus on the Finnish economy, there seems to be a significant lack of discussion regarding embedded emissions.

Therefore, I believe Finland could effectively address these complexities through policy initiatives aimed at minimizing the negative impacts associated with imported goods, thereby contributing to sustainable development on a global scale. Otherwise, the potential for these policies to achieve overarching global carbon neutrality targets remains highly uncertain.

Lastly, it can be argued that the developed scenario presents a singular perspective, resulting in a limited scope. The selection of this vision among other preferred options was based solely on the opinions of the participants, without any intervention from the facilitator (myself). However, due to the limited number of participants, particularly evident in the final workshop, only a few preferences from green political actors were reflected in the transition pathways of the economy, rather than a comprehensive combination from all participants. As such, I believe that the transition pathways for carbon neutrality could have been broader and more impactful, including a wider range of participants could have resulted in a different and more inclusive transition.

## **5.2 Theoretical Interpretations**

This study grasped a few theoretical frameworks to respond to the study's research questions while offering a foundational basis for the interpretation of the study findings. The first research question is "What are the preferred future scenarios that could be, for economically concerned green political actors in Finland, to achieve a carbon-neutral sustainable economy by 2035?" Thus, drawing inspiration from Jim Dator's (1998) insights, I intended to identify preferred scenarios for a carbon-neutral economy in Finland. As detailed above, the preferred scenarios of the study emerged as 'Silver Bullet', 'Progression', 'Sustainable Dream World', and 'Back to Nature'.

The preferred image of 'Silver Bullet' claims a technology-driven mission economy that emphasises innovations which aim for sustainability. It relies on the emergence of a new technological leader similar to Nokia, with quantum technologies playing a pivotal role in catalysing economic transformation. Access to universal electric public transportation and an ample supply of sustainable energy sources further indicate the involvement of innovative technology in different fields. Accordingly, the 'Silver Bullet' scenario aligns with the notion of "Transformation," which signifies the emergence of a dream society, primarily driven by the profound advancements in technology (Dator, 2019; Dator et al. 1998).

The second preferred image, 'Progression', supports greater conservation of natural resources, which serve as the goal of the economy, while the global social value system is universally acknowledged. The 'Progression' directly corresponds to the "Disciplined Society," which emerges when individuals

perceive continuous economic growth as unsustainable and the preservation of precious resources as these elements are deemed far more significant to humanity (Dator, 2019; Dator et al. 1998). Additionally, as Dator (1998) suggests, society should be guided by a core set of values that encourage a deeper understanding of life beyond the mere acquisition of infinite wealth and consumerism, which closely resonate with this image.

The third preferred image designated ‘Sustainable Dream World’, presents a goal of degrowth prioritising the principles of the Doughnut economy alongside ideologies of sharing and a welfare state structure. In addition, social values are oriented towards global awareness and collective responsibility with a forward-looking mindset. The degrowth perspective implies a notion of “Collapse”. However, as Dator (1998) suggested, society is guided by a core set of values, which is evidenced by the social values oriented towards collective responsibility, implying a notion of a “Disciplined Society”. Thus, the ‘Sustainable Dream World’ occupies a multifaceted position that intersects both the “Collapse” and “Disciplined Society” categories, embodying characteristics of both (Dator, 2019; Dator et al. 1998).

The fourth preferred future image, ‘Back to Nature’, emphasises nature-based self-sufficiency across various economic dimensions, rooted in the principles of a sharing economy. It reflects a harmonious relationship between humans and the natural environment. This concept has gained traction in traditional farming practices, as part of the population that left urban areas to adopt a self-sufficient lifestyle exemplifies this synergy with nature. Consequently, ‘Back to Nature’ reflects the potential for societal “Collapse”. However, it is important to note that this reduction in development stems not from economic disasters but from a moral or ideological shift towards pursuing a simpler lifestyle, which could ultimately lead to the end of the economic “rat race” (Dator, 2019; Dator et al. 1998).

Given that the preferred scenarios for a carbon-neutral sustainable economy among economically minded green political stakeholders are “Transformation,” “Collapse,” and “Disciplined Society,” it is essential to analyse how alternative pathways can align with the preferred future scenarios to support the transition towards a carbon-neutral sustainable Economy which is the second research question. The findings suggest that the proposed policy measures do not follow a singular or linear path; instead, they consist of a variety of synergistic and interactive policy bundles, encompassing elements such as basic income, resource taxation, and educational reforms. When examined through the lens of the Multi-Level Perspective (MLP) framework, a “Mixing Pathways” approach emerges (Geels and Schot, 2007; Luttamäki & Hyysalo, 2019; Luttamäki, 2023; Vähäkari et al. 2020).

The transition could commence with a societal reorientation through policies such as the reassessment of national and global productivity metrics, the integration of humanistic studies, like philosophy and psychology, into elementary school curricula, and the introduction of a basic income system in Finland. These approaches do not dismantle the existing regime but instead gradually shift its direction toward what is termed a “Transition” pathway. Following this, incumbent actors begin to adapt and incorporate niche innovations to address emerging challenges, exemplified by the establishment of a new European energy market, which underscores a “Reconfiguration” pathway.

The implementation of taxonomies and pricing for natural resources, along with the enforcement of European investment criteria and reporting standards, represents a set of mature niche innovations that are well-suited to address high landscape pressures. These measures could redirect capital flows toward clean technologies, effectively replacing the current regime and embodying a "Technological Substitution" pathway. Furthermore, this scenario underscores how geopolitical tensions and climate change can create external shocks at the landscape level, leading to the “De-alignment” of the existing regime. As a result, multiple niches may struggle to fill this void, ultimately leading to a “Re-alignment” in which one niche emerges as dominant.

Accordingly, the Multi-Level Perspective (MLP) framework reveals that these measures indicate a “Mixing Pathways” approach characterised by the co-evolution of “Transformation,” “Reconfiguration,” “Technological Substitution,” and “De-alignment/Re-alignment” in line with the transition archetypes identified in previous studies (Geels and Schot, 2007; Luttamäki & Hyysalo, 2019; Luttamäki, 2023; Vähäkari et al. 2020), reinforcing the validity of the framework in offering alternative transition pathways for the desired vision. Significantly, these mixing pathways suggested for reaching the vision of carbon neutrality reflect the complex realities inherent in the pursuit of a transition to a carbon-neutral economy.

### **5.3 Reflecting on the Methodology**

This study set out to create a preferred vision for achieving a carbon-neutral economy by 2035, employing Backcasting and Futures workshops as its methodological framework. Recognising the intricate and multifaceted nature of climate-related issues, the study emphasises the need for innovative problem-solving strategies that draw on diverse perspectives to discover and implement effective solutions. Thus, Backcasting scenarios proved particularly effective in this context, as they tackle complex, long-term challenges requiring substantial changes, as noted in earlier research (Dreborg, 1996; Heinonen & Lautamäki, 2012; Höjer et al. 2011). Additionally, Backcasting scenarios approached through a participatory lens, utilising Futures Workshops, yielded valuable

insights and supported transformative processes (Armanto, 2024, 1), addressing community concerns and fostering responsible actions (Vidal, 2006, 3). Therefore, this methodological approach is highly relevant for driving economic transformation towards carbon neutrality while fulfilling the responsibility of futurists.

The Backcasting scenarios employed in this study began with a vision for Finland in 2035, enabling a systematic exploration of potential alternative futures. By envisioning desirable outcomes, the study worked backwards to identify the necessary steps and strategies outlined at its outset. Establishing a preferred vision for 2035 from the very beginning allowed for the convenient identification of development pathways. Moreover, the subsequent task of determining the necessary policy measures essential for the successful realisation of the shared vision was made simpler through this Backcasting approach, as the well-defined vision guided the direction effectively, echoing the findings of previous studies (Börjeson et al. 2006; Dreborg, 1996; Höjer et al. 2011; Järvi et al. 2015; Robinson, 1990; Tuominen et al. 2014).

In addition, Futures Workshops served as a highly participatory approach for data collection, organisation, and presentation in a study as proposed by Lauttamäki (2016, 156). Consequently, the outcomes of these workshops were distinct and diverse, benefiting from the involvement of a group of participants (Nygrén, 2019, 31; Peterson et al. 2003, 362). This richness stems from the unique experiences, ideas, and insights of the participants, which could not be fully anticipated in advance. The collaborative discussions fostered during these workshops uncovered alternative pathways to facilitate this transition. Participants not only gained valuable insights from the workshops but also benefited from the learning opportunities inherent in the tasks and dialogues, which significantly heightened their active engagement in the research process. This enhancement of participant learning aligns with the study's complementary objective of participatory learning and is consistent with prior studies (Armanto, 2024; Patel et al. 2007), which underscores the significance of participatory methods from diverse perspectives.

One of the key implications is the valuable first-hand experience I gained as a facilitator, which provided a comprehensive understanding of the inherent unpredictability of the process. This includes factors such as timing, participant behaviour, the limitations of ongoing discussions, group outcomes, and emotional reactions to the subject matter. As outlined in Chapter 3.4.2, my role as a democratic facilitator enabled me to promote participant openness while avoiding constraints that could unduly influence the outcomes. Consequently, I believe that my efforts were successful in refraining from introducing personal biases that might have affected the study's results.

It is important to recognise that the results were inevitably influenced by the overall duration of the workshop series. Although the agenda was organised into distinct phases, the exact timing could not be fully anticipated, as it relied heavily on participant engagement and the level of in-depth, open discussions. While I maintained some oversight over the timing of various phases, I opted not to impose strict limits on the open group discussions, as doing so could stifle creativity and the uniqueness of the outcomes. Moreover, since all workshops were scheduled after working hours, participants encountered challenges in managing demanding tasks towards the end of the sessions. As a result, the future signals exercise that was intended to conclude the first workshop was ultimately cancelled. Had this exercise been executed, it may have facilitated a more coherent understanding of the findings at this stage.

It is important to note, as articulated by Vidal (2006, 10), that the creativity and effectiveness of group work are critical factors influencing the success of futures workshops. To enhance both creativity and effectiveness, the careful selection of participants and their organisation into subgroups is essential, and according to Dator (2019, 4), this selection should be comprehensive. In this study, green political actors voluntarily participated in a series of workshops driven by their shared interest in the subject, which resulted in unique and compelling outcomes. However, increasing the number of participants, especially from diverse fields, would have been beneficial in generating a broader range of inputs and perspectives, ideally targeting a participant range of 8 to 12 individuals (Vidal, 2006, 10). Moreover, the formation of subgroups was carried out without a structured approach due to the limited availability of participants. A more intentional segregation based on variables such as gender, age, and experience would have enhanced the collaborative process.

Furthermore, enhancing participant creativity presented a significant challenge, placing the responsibility on me as a facilitator to utilise creativity-boosting tools and methodologies as suggested by Vidal (2006, 12). To tackle this challenge, the Mental Time Travel approach used in this study effectively fostered creativity by engaging participants in a "fantasy trip" (Cuhls, 2017, 119) that tapped into their spontaneous imagination, shaped by their individual past experiences and knowledge. This innovative method allowed participants to visualise their desired futures, cultivating emotional connections to anticipated experiences. I believe that this imaginative journey heightened their awareness of personal desires and preferences, aligning with findings from previous studies (Seneviratne, 2024, 77), which advocated for the ability to foresee a preferred vision. Additionally, it not only inspired their personal conscious decision-making but also assisted in charting future pathways for this sustainability transition. This process of self-awareness is recognised as fundamental to sustainable development (Göpel, 2016, 161), potentially encouraging positive

lifestyle changes and fostering collective movements towards a more sustainable future, which serves as an essential starting point in the transition towards a carbon-neutral economy as proposed in this study.

Apart from that, as a result of this participatory framework, each phase of the research was carried out with active input from the client, allowing for real-time feedback and adjustments. This dynamic engagement not only enriched the research process but also established a sense of ownership and commitment to the study. Ultimately, this collaborative structure enhanced the quality of the findings, leading to more meaningful outcomes from the participatory Backcasting Futures Workshops and ensuring that the results were relevant and actionable for all stakeholders involved.

#### **5.4 Limitations and Suggestions**

In this chapter, I reflect on the unique learning opportunities gained throughout the study process, while also highlighting the importance of acknowledging the study's limitations. Effectively recognising these limitations is a vital aspect of the learning experience, as it lays the groundwork for future research improvements.

The success of the Futures workshop is closely linked to the creativity and effectiveness found in collaborative group work. Given the complex and multifaceted nature of climate-related challenges, which require a diverse range of perspectives, it is essential to engage a broader and more varied array of stakeholders. This includes ordinary citizens, who can bring their unique backgrounds and value orientations to the Futures workshops. Such inclusion not only enhances the comprehensiveness of the study's outcomes but also cultivates a greater sense of agency among participants, empowering them to address issues that impact their lives. Furthermore, this approach provides the potential to generalise findings with a wider array of voices reflecting the preferred futures of society at large. Ultimately, this facilitation could serve as a crucial starting point for meaningful societal transition.

Furthermore, to stimulate creativity and facilitate the envisioning process for participants, it is advisable to incorporate innovative approaches alongside techniques such as mental time travel. Employing a singular method might yield varied responses among participants, influenced by their distinct perspectives and experiences, which could be either positive or negative. In the present study, although the mental time travel exercise was implemented in the initial workshop, participant reflections following the exercise were not documented for further analysis. If participants had been granted an opportunity to present their reflections in writing as input, a more comprehensive understanding could have been achieved regarding the impact of the exercise, particularly in

comparing reflections among participants. Such insights could have demonstrated the degree and nature of influence the mental time travel exercise exerted on diverse participants, thereby enhancing the evaluation of its effectiveness. Nevertheless, the participants' contributions during the short reflective discussion highlighted an overall positive perception of the mental time travel technique.

Moreover, it would have been advantageous to incorporate concise, tailored interviews at least with a few participants following the series of futures workshops to gain deeper insights into their reflections. Such interviews could have unveiled personal perceptions regarding the methodologies employed in this study, particularly the mental time travel experience, and its varying effectiveness across different individuals. Additionally, this approach would have facilitated a more thorough reflection on the preferred visions developed by participants themselves, along with the associated transition pathways, given the limited time allocated for individual contemplation after the workshop series. These reflections could have significantly contributed to a boosted sense of agency regarding their envisioned futures.

The scenarios presented explain the necessary developments that must occur by 2035 to advance toward a carbon-neutral economy, as acknowledged in the reflections and can direct subsequent strategic planning tasks. However, it remains unestablished whether this vision or the development targets specified are feasible, as the scenarios do not indicate concrete measures or instruments required for actual implementation. Moreover, the challenges encountered may differ based on external or internal pressures arising from legislative and other systems. Consequently, a continuous assessment of the feasibility of the scenarios and the proposed policy measures would enhance the study's overall significance.

Moreover, ensuring the consistency of policy measures is crucial for achieving the preferred vision, as even a single inconsistent or conflicting policy could undermine the effectiveness of other vital measures. For successful transition processes, a robust and coordinated policy package is imperative. A recommendation for future research would be to evaluate the coherence of policy measures in alignment with the preferred vision and the developmental pathways outlined in the scenario narratives.

## **5.5 A Concluding Thought**

In light of the urgent degradation of Earth's critical systems, which highlighted by Dyke and Monbiot (2024, 3), a systemic transition to carbon neutrality is imperative. The lessons derived from past mass extinctions not only serve as a cautionary reminder but also propel us towards transformative action.

To avert catastrophic consequences, it is crucial to reshape our economic framework to prioritise sustainability over conventional growth, embracing a broader array of synergistic and interactive pathways, since a carbon-neutral economy is essential to safeguard planetary health while ensuring the survival of humanity.

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**Note on the use of AI:** The Grammarly tool has been utilized for proofreading and refining the language throughout the study to enhance the readability of the thesis report. In addition to that to create an image of the preferred scenario, ChatGPT, a generative AI tool has been utilized.

## **Appendices**

### **Appendix 1 Agendas of the Series of Futures Workshops**

#### **Futures Workshop 1- Drivers and elements of a carbon-neutral economy**

- Introductory Round (15 Min)
- Brainstorming Speech from Saara Suurla & Visio Introduction (15 Min)
- The Applauding Phase (30 Min)
- The Problem Phase (30 Min)
- Group presentations (30 Min)
- Coffee break (30 Min)
- Mental Time Travelling Exercise (10 mins)
- Future Signal Exercise (45 Min)
- Group presentations (30 Min)
- Final discussions and next steps (15 Min)

#### **Futures Workshop 2 - Images of alternative carbon-neutral futures**

- Introductory session (15 Min)
- Introduction to Futures Table (15 Min)
- Completing Thematic (30 Min)
- Group Presentations (15 Min)
- Filling the Futures Table (45 Min)
- Coffee Break (30 Min)
- Construction of Future Images (60 Min)
- Group Presentations (30 Min)
- Final discussions and next steps (15 Min)

#### **Futures Workshop 3 - Co-creating the vision.**

- Summary of work done (15 Min)

- Drafting Scenario pathways (60 Min)
- Group Presentations (30 Min)
- Coffee Break (30 Min)
- Suggest Policy Measures (60 Min)
- Group Presentations (30 Min)
- Final Discussion and Feedback (15 Min)

## Appendix 2 Consent Form

### CONSENT FORM

#### Futures workshops: Preferred Futures of Carbon-Neutral Economy

I have been invited to participate in the study described above.

I have read and understood the research bulletin provided to me and received comprehensive information about the research, including how data will be collected, processed, and disclosed.

I am aware of my rights as a participant in the workshop series, the purpose and implementation of the research, and its potential benefits and risks. I have had sufficient time to consider my participation.

I understand that all inputs I provide will be documented on a virtual platform for future analysis by the researcher. Our brief group presentations following each discussion round will be recorded for further reference. To ensure anonymity, these recordings will be transcribed after the workshop, and the audio files will be promptly deleted, leaving only the transcribed documents for further analysis. These records will only be accessible to the student conducting the master's thesis and her supervisors.

I acknowledge that participation in this study is voluntary. I have the right to decline participation or withdraw my consent during the study without justifying, simply by notifying the research staff. My data will be treated confidentially and may be used in scientific publications as described in the research bulletin and above. Hence, my data will not be disclosed outside the research group.

Refusal to participate or withdraw consent will not have any negative consequences for me.

I PARTICIPATE IN THE STUDY.

Name: \_\_\_\_\_

Place and time: \_\_\_\_\_ / \_\_\_\_\_ / 2024.

Signature and name clarification: \_\_\_\_\_

## **Appendix 3 Script for Mental Time-Travel**

### **Introduction**

Welcome everyone! Today, we will take a mental journey to the year 2035 to explore a carbon-neutral, sustainable economy. Let's dive into the future we want to create.

### **Part 1: Personal Life in 2035**

#### **Relaxation and Focus**

Sit comfortably, close your eyes, and take a deep breath. Focus on your nose strip and think about how you feel as you inhale and exhale. Clear your mind and prepare for the journey.

#### **Setting the Scene**

Now, imagine you are entering a room with a time machine. You can see the control panels, and you can imagine you are in a time machine. The year on the control panel reads "2035." Activate the machine and feel yourself gently transported through time as you settle into your future body.

#### **Personal Environment**

Step out into your life in 2035. Observe your surroundings. If you are not already inside your home, move to your home and walk around. Notice the details of your home and the way it's powered. Take in the energy sources and how they are integrated into your living space.

#### **Daily Life**

Envision your typical day. Think about your commute and your daily activities. Observe how your routines have changed to align with a carbon-neutral economy.

#### **Consumption and Lifestyle**

Reflect on your consumption habits. Notice how you shop for goods and services. What kind of food and clothes are you consuming?

### **Part 2: Society in 2035**

#### **Broadening the Scope**

Now we will go outside to investigate your immediate neighbourhood. Step outside your front door and stand there for a while, eyes closed. Now, expand your vision to society in 2035. Look at nature and listen to the sounds of nature. What is your relationship with nature? Notice how cities and communities have transformed to embrace sustainability.

#### **Infrastructure and Technology**

Observe public infrastructure and technology. Notice the advancements that support a carbon-neutral society.

### **Economy and Work**

Reflect on the Preferred economic approach. Think about how industries have adapted and the new opportunities that have emerged.

### **Policies and Governance**

Consider the role of governments and policies. Observe the regulations and incentives promoting sustainability. Think about international cooperation and efforts to combat climate change.

### **Culture and Society**

Reflect on cultural shifts. Notice how values and norms have changed to support a sustainable lifestyle. Are there signs of new forms of sharing in the future? Which kinds of things or services are shared in your community? And how does sharing work? Do you have collections of things- clothes? Or maybe shared production of food. Shared energy production, facilities or maybe transportation? Do you have a sharing economy?

### **Return to the Present**

Gradually bring your mind back to the present. Imagine stepping back into the time machine and returning to 2024. Open your eyes when you are ready.

### **Reflection**

Take a moment to think about what you saw and felt. Reflect on the personal and societal changes you imagined. Consider what steps you can take today to move towards that future.

## **Appendix 4 Coding of Quotes by the Participants to Safeguard Anonymity**

All participants within the series of Futures Workshops were recognized as groups, and codes were given to groups as follows to safeguard the anonymity of the participants.

- Futures Workshop 1: Two Groups as A1 and A2
- Futures Workshop 2: Three Groups as B1, B2 and B3
- Futures Workshop 3: One Group as C1