Advancing Sustainability Transformations

Co-design for Sustainable Development Policies

Satu Lähteenoja
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Abstract

We are living in an era of multiple environmental and social crises. Sustainability transformations are needed since no country has reached sustainability as yet and none are on the way to meeting the Sustainable Development Goals (SDGs) by 2030. Multiple challenges with SDG implementation have been identified, such as the integration and coordination of cross-sectoral topics, policy coherence, institutional capacities and local contextualisation. There is a call for new mechanisms with which to guide nations towards sustainability.

Co-design for transitions, or transition co-design, is an emerging area, bringing together the scholarships of collaborative design and transition management. More empirical studies are needed on what transition co-design actually means and what it can offer for sustainability transformations, especially in the governance and policy contexts. This dissertation contributes to this research gap by empirically studying sustainable development policies and the possibilities for co-design to advance them. The research consists of four case studies approaching the topic from different angles, ranging from national to local SDG implementation, as well as from broad, systemic sustainable development topics to the narrower target of increasing renewable energy production in housing companies. The research is based on qualitative methods, including document analysis, interviews and co-design workshops. It consists of five interrelated articles. The findings of the research highlight the role of small wins in sustainability transformations.

While sustainable development policy that is only based on small wins can be too incremental and slow to meet the sustainability challenges of our time, the small wins seem to pave the way for more transformative policy changes. However, to achieve sustainability transformations, small wins need to contribute to a shared ambition at a higher level.

The research introduces a policy edition of the transition arena, wherein some of the earlier assumptions have been readjusted to cope with policy realities, thus enabling the tools' closer integration into official policy processes. The policy edition was developed and tested during the creation of the national sustainable development strategy, led by the Prime Minister's Office, Finland. According to the results, this method can provide a safe space for facilitated discussion on difficult topics with conflicts of interests. After co-designing positive future visions and mid-range transition pathways, the participants of transition arenas experienced increased understanding of complex systemic changes and better understood the agency of different actors in sustainability transformations. The final strategy raises difficult, transformative topics as being important for further work. While there is a need for more empirical studies on the topic, the research recommends utilising transition co-design methods in the agenda-setting phase of complex sustainability-related policy processes.

Keywords sustainability transformations, sustainability transitions, transition co-design, sustainable development, policy, transition arena
Elämme useiden samanaikainen ympäristön ja sosiaalisten kriisien aikakautta.
Kestävyysmunrokselle on suuri tarve, koska toistaiseksi yksikään maa ei ole tiellä kohti YK:n
estävän kehityksen tavoitteiden (SDG) saavuttamista vuoteen 2030 mennessä. SDG-tavoitteiden
toteuttamisessa on tunnistettu useita haasteita esimerkiksi sektorirajat yllättävien teemojen
koordinoinnissa ja yhteistyössä, poliittikakeroheressä, instituuttioiden muutosvalmiuudeissa sekä
tavoitteiden sovittamisessa paikalliseen kontekstiin. Tarvitaan uusia mekanismeja, jotka ohjaavat
valtoita kohti kestävää kehitystä.

Tämä väittöskirja tutki kestävän kehityksen politiikkaa ja sen edistämisen mahdollisuuksia
yhteissuunnittelun avulla. Tutkimus koostuu neljästä tapaustutkimuksesta, jotka käsittelevät
äiheita eri näkökulmista: kansallisesta ja paikallisesta SDG-tavoitteiden toimeenpanosta sekä
laajasta, systeemistä kestävyysmunrakostaan kohtennettuaan tavoitteeseen lisänään uusiutuvan
energian tuotantoa taloyhtiöissä. Tutkimus perustuu laadullisiin menetelmiin, kuten asiakirja-
analyysiin, haastatteluihin ja työpajoihin. Tutkimus koostuu viidestä toisiinsa liittyvästä
artikkelista.

Tutkimustulokset korostavat niin sanottujen pienten voittojen roolia kestävyyssuurroksessa. Vaikka
pelkästään pieniin voittoihin perustuva kestävän kehityksen politiikka voi olla liian hidas ja
asteittainen vastatakseen aikamme suurin kestävyyshoasteisiin, pienet voitot näyttävät tasoittavan
tietä muutosvoimaisemmille poliittikakeroimille. Kestävyysmunrakko saavuttamiseksi pienten
voittojen on kuitenkin liittyvästi jaettuaan tavoiteltava korkealla tasolla.

Tutkimus esittelee murrosareena-menetelmän ”politiikkaversion”, joka mahdollistaa menetelmän
tiiviimmän kytkemisen virallisiiin poliittikakoprosesseihin. Murrosareen poliittikakoversio kieltettiin
testattii osana Valtioneuvoston kanslian johtamaa kansallisen kestävän kehityksen strategia
valmistelua. Tulosten perusteella havaittiin, että menetelmä voi tarjota turvallisen tilan
fasilitoiduille keskusteluille myös vaikeista aiheista, joissa on esimerkiksi eturistiriiitoja.
Yhteiskehittämällä positiivisia tulevaisuuskuvia ja keskipitkän aikavälin muutospolkulua
murrosareenon osallistujat kokivat parempaa ymmärrystä monimuutkaisista systeemistä
muutoksista ja ymmärsivät paremmin eri toimijoiden roolia ja toimijuutta kestävyyssuurroksessa.
Vaikka aiheesta tarvitaan lisää empirististä tutkimusta, tutkimus suosittelee
yhteissuunnittelumenetelmin käyttää monimuutkaisissa kestävään kehityksen liittyvissä
poliittikakoprosessissa.

Avainsanat kestävyyssuurro, kestävyyspiirtymi, kestävyyspiirtymän yhteissuunnittelun, kestävä
kehitys, politiikka, murrosareena

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Helsinki, 2 May 2024

Satu Lähteenoja
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<td>Design for sustainability transitions</td>
</tr>
<tr>
<td>IPPC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<td>MLP</td>
<td>Multi-level perspective</td>
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<td>PMO</td>
<td>Prime Minister’s Office</td>
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<td>SDG</td>
<td>Sustainable Development Goal</td>
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<td>SRC</td>
<td>Strategic Research Council</td>
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<td>TA</td>
<td>Transition arena</td>
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<td>TM</td>
<td>Transition management</td>
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<td>UN</td>
<td>United Nations</td>
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<td>UNEP</td>
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Original publications


Author’s Contribution

Publication 1: The leadership and implementation of Sustainable Development Goals in Finnish municipalities.

Satu Lähteenoja is the lead author of the article and was in charge of writing the methodology and the results sections. The theoretical background and discussion sections were created by the four authors in equal collaboration.

Publication 2: Small wins enhancing sustainability transformations: Sustainable development policy in Finland.

Satu Lähteenoja took part in data collection, creating the methodology and the analytical framework. She wrote the case study description and parts of the introduction section. Lähteenoja led the evaluation of the case study on PATH2030. The results and discussion were collaboratively written by the four authors.

Publication 3: What does it take to study learning in transitions? A case of citizen energy in Finland.

Satu Lähteenoja is the lead author of the article. She collected and analysed the data and led the writing of the methodology and results sections. The discussion and conclusion sections were written collaboratively by the first four authors.

Publication 4: Citizen energy lost in sustainability transitions: Knowledge co-production in a complex governance context.

Satu Lähteenoja was one of the facilitators in the case transition arena. She had a major role in collecting the research data. She supported the analysis and co-writing of the article.

Publication 5: Transition co-design dynamics in high level policy processes.

Satu Lähteenoja is the lead author of the article. She led the case study project and developed the methodology related to that. She was in charge of both the analysis and writing the methodology and the analysis sections. The analytical framework and the discussion were created by the four authors in equal collaboration.
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- ‘KESTO - Leadership and implementation of sustainability: Action research on the localisation of the SDGs in Finnish municipalities’, funded by the Finnish Government’s unit of analysis, assessment and research activities
Descriptions of the key terms

This research is transdisciplinary by nature, operating in between different disciplines and their concepts. This short list of the key terms should help the reader and enhance coherence of the concepts used in this study. There are several concepts that are very close to each other, and as the fields are relatively new, not all the concepts are well established in their fields. Therefore, these are not the only relevant definitions but, rather, a description of how I have used the terms in this study.

**Design for sustainability transitions (DfST)** refers to the approach of bringing the principles of sustainability into the design and development of products, services, or systems. DfST highlights that, rather than simple solutions, design needs to address sustainability transitions from several points of view, taking into account several scales and domains, and it needs to include multiple sectors and actors. In DfST, the focus of design shifts from being on particular domains to being on the intersections of technical, ecological, cultural, social and economic change (Ceschin & Gaziulusoy, 2020).

**The multi-level perspective (MLP)** is a theoretical framework used in sustainability and innovation studies to understand and analyse transitions and changes in societal systems. It considers that transitions occur across three interconnected levels which dynamically interact with each other: niche innovations, sociotechnical regimes and the broader socio-cultural landscape (Geels, 2002; Geels & Schot, 2007).

**The Sustainable Development Goals (SDGs)** are a set of 17 interconnected global goals adopted by all United Nations Member States in 2015 as part of the 2030 Agenda for Sustainable Development. These goals serve as a universal call to action, aiming to end poverty, protect the planet and ensure prosperity for all. The goals cover various areas, including poverty, hunger, health, education, gender equality, clean water, affordable and clean energy, responsible consumption, climate action and partnerships for achieving these objectives (United Nations, 2015).

**Sustainability transformations** refer to the fundamental and systemic changes required in various aspects of society, economy and the environment in
order to achieve long-term sustainability goals. These transformations are characterised by shifts in the values, behaviour, technologies, policies and institutional structures that contribute to more sustainable and resilient futures (Feola, 2015; Olsson et al., 2014).

**Sustainability transitions** refer to the long-term gradual and incremental processes of shifting from one sociotechnical system or mode of production to another that is more sustainable. Such transitions typically occur within established systems and tend to focus on specific sectors, industries or technologies (Geels, 2002; Geels & Schot, 2007).

**The transition arena (TA)** method refers to a facilitated process designed to address complex systemic transition topics and to facilitate the creation of normative transition pathways that enhance a desired development. It consists of a series of workshops in which the identification of challenges, vision building and the construction of pathways of change take place within diverse stakeholder groups (Rotmans & Loorbach, 2009; Frantzeskaki et al., 2017).

**Transition design** addresses complex, interconnected systems at the societal level. The goal of transition design is to contribute to shaping more sustainable and just futures by intervening in and facilitating transitions at various scales. Transition design often involves a combination of traditional design methods, systems thinking and participatory approaches (Irwin, 2015; Tonkinwise, 2014; Tonkinwise, 2019).

**Transition co-design** is a shortened form of **co-design for transitions**. Here, it refers to collaborative DfST in large-scale systemic changes. It promotes inclusive and collaborative processes wherein various stakeholders actively participate in designing and shaping transitions towards more sustainable and resilient systems (Hyysalo et al., 2019a, 2019b; Article 5 of this dissertation).

**Transition management (TM)** is a framework that aims to create novel ways to steer and govern transitions. The aim is to accelerate sustainability transitions through providing space for frontrunners to inform and challenge policymaking and create experiments and strategies based on future pathway creation (Loorbach, 2007; Loorbach et al., 2015).

**A transition pathway**, in the context of this research, refers to the co-designed, envisioned trajectory or route that a society, sector or system takes to achieve more sustainable futures. These pathways often incorporate a range of the most relevant policies, strategies, interventions and innovations at different levels, acknowledging uncertainty and the need for adjustments based on changes in regime-, niche- or landscape-level structures (Loorbach, 2010).
As a preface, I would like to describe the background and motivation for starting this research. Although my official PhD journey started in 2019, this research interlinks with my attempts to drive change towards a more sustainable society over the past 15 years. During this time, I have been able to both witness and actively contribute to such change in different roles: as a researcher, a consultant, an expert and an active citizen.

Almost 15 years is a long enough time to observe societal changes. In 2010, when I started to work at the think tank Demos Helsinki, we were running a project called Peloton. In that project, we organised an idea competition for entrepreneur-minded frontrunners in climate topics to co-create visions and develop concepts on products and services that support low-carbon lifestyles. The results were visualised and communicated as ‘future advertisements’. One of the results was an advertisement for a ‘Freshburger’, a vegan hamburger. ‘Becoming true soon’, was stated in the advertisement. In 2010, it was hard to imagine that in 14 years it would be normal to order a vegan burger from any burger chain that had such taste and structure that one might not even notice the difference compared to a meat burger.

Since then, as a professional facilitator and mediator, I have organised hundreds of future-oriented co-creation workshops on different topics related to sustainable lifestyles, infrastructures and societies. Sometimes it is difficult to see if anything has changed, but looking back shows that the hamburger case is just one example among many other similar cases that have mainstreamed over these years. We are living and experiencing sustainability transitions right now, even if the change seems to happen too slow in the light of the rate of climate change.

In addition to having seen the transition of several low-carbon products and services from niche to mainstream, I have seen a change in the participants of our workshops. In the early years, we mostly co-created with the entrepreneurs and frontrunning individuals in start-ups and big companies. Nowadays, I am still organising workshops with some of the same topics, but the participants we have now are the key ministries, representatives of regions, the biggest trade unions and incumbent companies. In the terms of the multi-level perspective, the change is now on the tables of regime-level actors. Many of the imagined
future visions have become the official goals of incumbent organisations during the last 15 years.

I started this PhD because I wanted to better understand the impacts of my work as a workshop organiser. I have literally run hundreds of them, ranging from single brainstorming events and hackathons to different future pathway creation processes and participatory scenario building, with thousands of stakeholders from different backgrounds involved. To perhaps over-simplify a bit, the theory of change seemed to be that people come to our workshops, they learn from us and from the other participants, they are empowered and get new ideas, and then they go back to their organisations to drive change. In some cases, this has happened, and I even know cases where people have left their jobs and started something totally new. However, my assumption is that, typically, people feel inspired shortly after the event, but then, in the rush of everyday life, the good ideas are forgotten. This is what I wanted to understand better. Do future-oriented co-creation workshops have an impact? If so, what impact do they have? What do people actually learn and how can it be measured? Is this a good way to accelerate sustainability transitions? What kind of events should be designed in the future in order to have a larger impact? Obviously, these topics were too large for one PhD, but this was the starting point. As you will see after reading this dissertation, my results reflect this journey and the questions I had in the beginning. As one part of the change, imagining positive, not-yet-existing futures and co-designing pathways towards them seems to have an important role in driving sustainability transformations.
1. Introduction

1.1 Background: Sustainability transformations through co-design

Achieving sustainable futures requires a fundamental reorientation of our societies and economies (Haberl et al., 2011). Numerous global problems – such as resource depletion, the climate crisis, biodiversity loss and widening social inequality – require institutional, technological and organisational transformations (Köhler et al., 2019; Markard et al., 2012). The phrase ‘transformations towards sustainability’ refers to fundamental changes in the structural, functional, relational and cognitive aspects of sociotechnical-ecological systems, changes that lead to new patterns of interactions and outcomes (Patterson et al., 2017; see also Section 2.1.5). Patterson et al. (2017, p. 2) argued that governance and politics should be placed at the centre of the sustainability transformations research. Effective governance of transformations needs to appreciate the uncertainty, complexity, emergence and asymmetries of power (Turnheim et al., 2015). The political nature of sustainability transformations is inherent as they involve continuous negotiations, both horizontally and vertically, with different actors. Moreover, these transformations have uneven impacts on various groups of actors (Meadowcroft, 2009; Nordbeck & Steurer, 2016; Patterson et al., 2017).

Sustainable development is an often-used example of large sustainability transformations. Defined as ‘development that meets the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987, p. 44), sustainable development is a shared goal of every nation in the world. Further developed using the traditional three-pillar approach of sustainable development – the pillars being people, planet and prosperity (see, e.g. WCED, 1987, p. 41) – the agreement on the 2030 Agenda (adopted in 2015) provided goals that define what sustainable development means for all countries. With 17 goals and 169 concrete targets, the agenda calls for transforming the world in order to reach the goals. Sustainability transformations are indeed needed since no country has reached sustainability as yet and none are on the
way to meeting the Sustainable Development Goals (SDGs) by 2030 (O’Neill et al., 2018; Sachs et al., 2023).

Sustainability transformations and transition management (TM) research have been able to put into words what kind of multidisciplinary change and related expertise and decision-making are needed in order for there to be progress in sustainability transformations. Originating in the Netherlands in the early 2000s, TM is one of the most developed transition governance approaches (Kemp et al., 2007; Loorbach & Rotmans, 2010). TM studies long-term sociotechnical change and reorganisation of the involved systems. Its goal is to establish spaces in which to identify changes in the existing system, learn about them and experiment with new forms of change (Kemp et al., 2007; Loorbach & Rotmans, 2010). TM emphasises the construction of pathways of change that will meet specific transition goals (Loorbach & Rotmans, 2010).

TM methods are closely linked to co-design, and there has been growing interest in design and co-design in transitions scholarship since the 2000s (Ceschin & Gaziulusoy, 2016; Hyysalo et al., 2019a; 2019b; Irwin, 2015; Tonkinwise, 2014). Design for sustainability transitions (DfST) is an emerging field with limited empirical studies so far, especially at the level of sociotechnical-ecological systems (Ceschin & Gaziulusoy, 2020). Bringing the fields of TM and DfST closer can create opportunities to advance sustainability transformations in new ways and thus support the change where numerous previous approaches have not succeeded.

1.2 The aim of the research

The aim of this research is to study the possibilities of using so-called transition co-design in advancing sustainability transformations in policy and governance contexts. Transition co-design refers to collaborative design for sustainability transitions in large-scale systemic changes (Hyysalo, 2019a, 2019b; Article 5). This study brings together three fields of research, the fields of sustainability transformations, TM and DfST studies (see Figure 1). As sustainability transformations form an extremely broad topic, the research focuses on sustainable development policies, focusing in more detail on the implementation of the 2030 Agenda at national and local levels. The research context is Finland as all the four case studies are from Finland. Yet, the results of this research have international relevance since the SDGs apply to all countries and many countries are facing similar implementation challenges. In Section 3.2, I introduce the context in more detail.

This research complements the so far scarce empirical studies in academic literature on transition co-design. It further elaborates what it means to co-design sustainability transitions, particularly in the policy context. The aim is to better understand how design research can support transitions research and how the methods and tools of transition co-design can be used to support and accelerate sustainability transformations. In Section 2.4, after introducing the theoretical
background, I will present the theoretical positioning of the research in more detail.

This research consists of the five interrelated contributions depicted in figure 1. In the next section, I will briefly introduce the research of the thesis and the case studies. More detailed data and an analysis description follow in Chapter 3.

![Figure 1. This research is located in the nexus between three research areas.](image)

**1.3 The research of the thesis**

This research was initiated by my enthusiasm towards sustainable development and co-creation. Since 2010, I have conducted dozens of research and consultancy projects related to sustainability transformations at the think tank Demos Helsinki. The content of this work has varied from low-carbon lifestyles to supporting sustainable business models and promoting the circular economy, to name just a few of the topics. All of these projects have included co-creation and most of them have had a strong future orientation. This work has provided valuable lessons on how efforts to progress towards sustainability transformations can be co-designed. This practitioner experience served as a basis in the research leading to this dissertation.

I have had the privilege to study sustainability transformations from several viewpoints and at several levels. During 2018–2019, I led an evaluation of the national sustainable development policy in Finland. The evaluation was called ‘PATH2030 – Developmental evaluation of the Finnish sustainable develop-
ment policies and transformation pathways’. Funded by the Finnish Government’s analysis, assessment and research activities, it was the first comprehensive sustainable development policy evaluation for a long while and one of the first globally assessing the implementation of the 2030 Agenda. It was an independent study, albeit commissioned by the PMO (Finland) and steered by a broad group of experts and ministry representatives. Article 2 utilises the results of that evaluation.

In 2019, four years after the 2030 Agenda came into action, cities and municipalities started to become active in SDG implementation. Compared with the traditional focus on environmental issues, SDGs provide a more comprehensive interpretation of sustainable development and thus require different leadership at all levels, including the local level. This is what we studied in a project called ‘KESTO – Leadership and implementation of sustainability: Action research on the localisation of the SDGs in Finnish municipalities’. The project ran from March 2019 to May 2020 and it was part of the Finnish Government’s analysis, assessment and research activities, conducted together with the Ministry of the Environment. The project was led by Demos Helsinki, and the consortium partners included the Finnish Environment Institute (Syke), the Finnish Consulting Group, the Association of Finnish Municipalities and MSDI Ltd. Article 1 presents the lessons learned from that work.

In Demos Helsinki, I was first introduced to the transition arena (TA) methodology in 2018 in a project called BlueAdapt, funded by the Strategic Research Council of the Academy of Finland (Valve et al., 2019a, 2019b). I joined the TA team as a facilitator, got excited about the method and wanted to study and develop it further. After starting as a doctoral researcher in Aalto University’s NO-DUS Sustainable Design Research Group in 2019, I have co-organised and co-facilitated four TA processes in addition to the two arenas organised in BlueAdapt. One of them was called Citizen Energy Arena. It was hosted by two ministries (the Ministry of the Environment and the Ministry of Economic Affairs and Employment) and conducted together with Aalto University and Syke in cooperation with two research projects (‘SET – Smart Energy Transition: Realising its Potential for Sustainable Growth for Finland’s Second Century’ and ‘CORE – Collaborative Remedies for Fragmented Societies – Facilitating the Collaborative Turn in Environmental Decision-making’) that were in charge of the design, facilitation and documentation of the process. Citizen Energy Arena was organised between January 2020 and May 2020. Articles 3 and 4 use the Citizen Energy Arena as a case study.

To continue my journey as a TA facilitator, I was also one of the facilitators in the Biodiversity Transition Arena, which was conducted together with the Ministry of the Environment and Syke during 2020–2021. In 2021, I lead a TA process as part of a national 2030 Agenda roadmap creation process, commissioned by the PMO, Finland. The participants of the arena were the members of the National Commission on Sustainable Development, and I was able to test the use of the method in a high-level policy making context. The roadmap served as a basis for the new national sustainable development strategy, published in 2022. Article 5 of this dissertation uses that arena as a case study.
1.4 The research questions and the dissertation’s structure

The overall research question of the thesis is:

What can transition co-design offer in governance and policy processes related to sustainability transformations?

In order to answer this main research question, I study the topic with the following three sub-questions:

1. What kind of transformative potential can SDG implementation have at a national level and a local level? (Articles 1 and 2)
2. How can TAs be incorporated in governmental policy processes? (Articles 3, 4 and 5)
3. What types of design are involved in advancing sustainability transformations through TAs? (Article 5)

This dissertation is structured in the following way. After this introduction to the research (Chapter 1), I will present the relevant theoretical background in Chapter 2. The literature review consists of a brief introduction to all of the three research areas in which this research is situated: sustainability transformations studies, TM studies and DfST studies. As the co-design in this research has a future orientation, I will also present some of the basics of future studies. At the end, I will summarise how this thesis is positioned at the intersection of these areas.

In Chapter 3 I will present the methodologies and data applied in this research. This will begin by discussing the research design and then moving onto the case studies, methodologies and data-gathering activities. After that I will describe the analysis of the data. Chapter 4 includes short summaries of all of the five research articles included in this dissertation. Finally, in Chapter 5, I will present the cross-cutting contributions, including a synthesis of the findings wherein I will answer the research questions. At the end, I will discuss the limitations of the research as well as suggestions for future research.
2. The theoretical background

2.1 Understanding sustainability transformations

2.1.1 Multiple environmental and social crises

As a human society, we are going through very challenging times. Despite the numerous global climate and environmental summits, declarations and programmes, the state of planet Earth has radically declined during the past decades. The global emission reduction targets are still not being met and the window for limiting the average global temperature rise to between 1.5°C and 2°C above pre-industrial levels is closing or has already closed (Raftery et al., 2017). In their sixth synthesis report, the Intergovernmental Panel on Climate Change (IPCC) (2021), states that human-caused climate change has already caused widespread and rapid changes in the atmosphere, ocean and biosphere. The Emissions Gap Report of the United Nations Environment Programme (UNEP) states that ‘the international community is falling far short of the Paris climate goals, with no credible pathway to 1.5°C in place. Only an urgent system-wide transformation can avoid climate disaster’ (UNEP, 2022).

The climate crisis is arguably the most pressing global environmental problem, but it is not the only one. The ‘Planetary Boundaries’ framework (Steffen et al., 2015) sets out precautionary boundaries for nine critical processes of human-caused environmental change. In 2023, in the same week that I wrote this chapter, Richardson et al. (2023) published an assessment report of the state of all nine boundaries with more data than in the previous report: six of the nine boundaries are crossed, including those for climate change, biosphere integrity, biogeochemical flows, the land-change system, freshwater change and novel entities. Only three of the nine boundaries (those for ocean acidification, atmospheric aerosol loading and stratospheric ozone depletion) are currently not being breached. Crossing these boundaries means an increasing possibility of abrupt, large-scale changes in the functioning of the Earth’s system and significant risks to societies and economies worldwide (Richardson et al., 2023).

Compared with policy cycles, many changes proceed slowly, although they are too fast for the adaptive capacity of ecosystems. We are rapidly approaching a loss of biodiversity similar to that seen during mass extinctions. In contrast to
past extinction events, which were triggered by natural phenomena (like the most recent one, 65.5 million years ago that led to the extinction of dinosaurs), the sixth mass extinction will be a result of human activities. Biologists predict that unless we change course and actively work to conserve more species, within the next few centuries, we will become the cause of the Earth’s sixth mass extinction (Pimm et al., 2006; Barnosky et al., 2011).

The reason behind these severe environmental crises is our unsustainable production–consumption system and, more precisely, our overconsumption of natural resources, especially in developed countries (see, e.g. WWF, 2010; United Nations [UN], 2016). The Earth Overshoot Day symbolically marks the estimated date when humanity’s demand for ecological resources and services in a given year exceeds what Earth can regenerate in that year. In 2023, it fell on 2 August. As the resource consumption levels are very different in different parts of the world, Finland had the country's national overshoot day already on 31 March in 2023, while countries like Ecuador and Jamaica had it in December (Global Footprint Network, 2023). This is not an absolute indicator, but an example of ways to raise awareness about the problem. This makes another dimension of the challenge visible: unequal resource distribution. Twenty per cent of the world’s richest countries consume 80% of the global resources. The unequal resource distribution and significant differences of resource-use levels between the rich and the poor across and within countries cause unethical circumstances and injustice, which only gets worse as the consequences of the climate crisis hit the poorest countries the hardest.

Continuing from the so-called Factor 10 benchmark created by Schmidt-Bleek (1993), who argued for the need to reduce material consumption by a factor of ten, Lettenmeier (2018) brought the benchmark to the individual level and developed the lifestyle material footprint approach. Using this approach, he calculated that in Finland, for example, households would need to reduce their lifestyle material footprint from forty tonnes to eight tonnes (an 80% reduction) by 2050 to achieve a sustainable level. Similarly, the household-level carbon footprints should be reduced by 91–95% by 2050 in high-income countries (Akenji et al., 2021; Koide et al., 2021).

The sustainability crisis is not only about physical systems but also about the difficulty of addressing these issues within the complex, globally interrelated sociotechnical-ecological systems. Social sustainability challenges are diverse and vary by region. Some of the most crucial social sustainability challenges on a global scale include poverty and economic inequality; access to education, healthcare, clean water and sanitation; food security; gender inequality; human rights and social justice; and conflict resolution and peacebuilding (UN, 2015). These challenges are interrelated and represent a complex web of problems that impact on the well-being and future of societies worldwide. The above-mentioned problems are often referred to as *wicked problems*, referring to social problems that are continuously changing and not well defined. As they are interconnected, the challenge is that the solutions of today can turn out to be the problems of tomorrow (Churchman, 1967; Rittel & Weber, 1973; Termeer & Dewulf, 2019).
In an effort to combine and visualise the different dimensions of the sustainability crisis, Raworth (2012) developed the concept of social foundations to complement the Planetary Boundaries framework. These social foundations include housing, food security, water and sanitation, healthcare, education, energy, gender equality, social equity, networks, having a political voice, income and work, and peace and justice. These twelve dimensions of the social foundation are derived from internationally agreed minimum social standards, as identified by the world’s governments when setting the SDGs (UN, 2015). Between social and planetary boundaries lies an environmentally safe and socially just space in which humanity can thrive. This model is called the doughnut economics model (see Figure 2).

The doughnut economics model demonstrates that humanity is currently failing to fit into the safe operating space. The model aims to reframe economic problems and set new goals. In this context, the model is also rereferred to as a ‘wake-up call to transform our capitalist worldview, which is targeting to growth, into a more balanced, sustainable perspective that allows both humans and the planet to thrive’ (Ross, 2019, p. 81). O’Neill et al. (2018) did country comparisons and found out that not a single country has achieved a high level of well-being in an ecologically sustainable way (see figure 3). Several European countries, including Finland, have achieved a high level of well-being, but at the same time, ecologically sustainable limits have been crossed. The Asian and African countries that have not overstepped the planetary boundaries are lagging behind in achieving social targets. ‘Humanity’s sweet spot’, where well-being is
achieved without exceeding the planetary boundaries, is found in the lower right corner of Figure 3.

Not a single country has achieved a high level of well-being in an ecologically sustainable way

![Figure 3](image-url)

Figure 3. Not a single country has achieved a high level of well-being in an ecologically sustainable way (original source: O’Neill et al., 2018; adopted by Furman et al., 2018).

2.1.2 Sustainable development in international politics – a short history

Sustainable development tries to respond to the above-described multiple and complex environmental and social challenges. Sustainable development policies are founded on international agreements and commonly agreed goals (Allen et al., 2018; Nordbeck & Steurer, 2016; Sachs, 2015). The concept of sustainable development policies is broad and can be used in different ways. It can be seen as referring to policies implemented by some institutions or as policies formed with the intention of promoting sustainable development. In this research, I refer to sustainable development policies creating a form of meta-policy that, in turn, creates the framework for the more detailed policies of governments and other organisations (Meuleman, 2018).

Since the 1970s, the international political arenas have included discussions on the global environmental crises, as brought up by, for example, Meadows et al. (1972) in the report *The Limits to Growth* and, ten years earlier, by Carson (1962) in her book called *Silent Spring*. Since the formation of the UN after the
Second World War, it has expanded its agenda beyond the original core, which related to international security and human rights, to include global environmental, developmental and climate issues.

The UN Conference on the Human Environment, held in Stockholm in 1972, can be considered as a beginning for the international environmental policy. The 'Stockholm declaration' contained 26 principles concerning the environment and development, which were also used as starting points also in the conferences that followed. Another remarkable step resulting from the conference was the establishment of the UNEP. In 1987, the UN published a report called *Our Common Future*, also known as *The Brundtland Report*, in recognition of Gro Harlem Brundtland, former Norwegian Prime Minister and Chair of the World Commission on Environment and Development. The report firmly landmarked environmental issues on the political agenda, and its definition of *sustainable development* is still widely used (see the definition in Section 1.1). Followed and strongly influenced by *The Brundtland Report*, the UN Conference on Environment and Development was held in Rio De Janeiro in 1992. As an outcome, the Rio Declaration emphasised the close relations between human development and the environment. The declaration states that ‘the major cause of the continued deterioration of the global environment is the unsustainable pattern of consumption and production, particularly in industrialised countries’ (UN, 1992, p. 18). Since that, sustainable development has been on the political agendas at international, national and local levels. Respectively, there is considerable amount of scientific literature on sustainable development (see, e.g. Schubert & Láng, 2005, for a review on the early years).

In 2001, UN Secretary-General Kofi Annan hosted the Millennium Summit, where the UN member countries agreed on the Millennium Development Goals (MDGs), to be reached by 2015. The MDGs had a focus on developing countries and on the social aspects of sustainability. The MDGs included eight goals which were related to hunger, education, gender equality, child mortality, maternal health, HIV/AIDS and malaria, environmental sustainability and global partnership for development. Agreeing on the MDGs was a big achievement in regard to a global mobilisation to achieve social sustainability. However, the goals mainly targeted developing countries, while the role of rich countries was to support them through finances and technology (Sachs, 2012). One criticism is that the goals were approached using a sectoral approach, often referred to as a *silo structure*. The goals were treated as stand-alone goals, which disregarded the synergies between different goals. The lesson learned was that the goals should be addressed simultaneously rather than separately (Rippin, 2014). Progress towards reaching the goals was uneven across countries: some countries, such as Brazil, reached many of the goals, while some others, such as Benin, did not reach any (MDG Monitor, 2023).

In 2012, 20 years after the Rio conference, the UN organised the Rio+20 conference. The outcome of the conference was titled ‘The future we want’. It included an agreement to develop the SDGs (UN, 2012). The preparation started already earlier with a planning work on ‘The post-2015 development agenda’,
referring to the follow-ups for the MDGs. The 2030 Agenda is actually the outcome of two parallel policy processes: The post-2015 development agenda (UN, 2013), considering the follow-up of the MDGs, and the SDGs, which are a continuation of the outcomes of the Rio+20 conference.

### 2.1.3 The 2030 Agenda: Current state and critique

In September 2015, the 193 countries of the UN General Assembly adopted the 2030 Agenda, titled ‘Transforming our world: the 2030 Agenda for Sustainable Development’ (UN, 2015). The 2030 Agenda includes the 17 SDGs with 169 targets and 231 official unique indicators (UN, 2015, 2017) (see Figure 4).

![Figure 4. The 17 Sustainable Development Goals](https://sustainabledevelopment.un.org/sdgs).

The 2030 Agenda manifests being universal, transformative, integrated and indivisible. *Being universal* means that the SDGs, unlike the MDGs, apply to all countries. Thus, it is possible to compare the implementation and achievements of different countries and world regions. *Being transformative* means that the vision and the goals are supremely ambitious. The emphasis on the *indivisible* and *integrated* nature of the goals reflects the recognition that they depend on each other – each goal must be met in order for the 2030 Agenda to be achieved. There are synergies and trade-offs between the targets and the goals can only be achieved with coherent policies (Collste, 2021). Recognising the essential trade-offs and synergies can help the efficient implementation of SDGs by improving the opportunities to focus policy attention and actions on the most relevant topics (see, e.g. Bennich et al., 2020, for a literature review; Lyytimäki et al., 2021).

At the midpoint of the 2030 Agenda, none of the goals are on track to be achieved globally by 2030 (Sachs et al., 2023; see figure 5). The *Sustainable Development Report* describes the current state like this: ‘Despite the world improving on average half a point per year on the SDG Index between 2015 and 2019 (which was already too slow) progress has stalled since the outbreak of the...
pandemic and the onset of other overlapping crises’ (Sachs et al., 2023, p. 23). While most high-income countries were able to mitigate the socioeconomic impacts of these crises with the help of recovery plans and emergency expenditure, the progress on environmental and biodiversity goals has been limited, including the progress in the countries that are largely responsible for the environmental crises (Sachs et al., 2023). Bernstein et al. (2023) stated that despite the current situation, the transformation to sustainability is still possible but it would require an immediate ‘Giant Leap’ in relation to poverty, inequality, empowerment, food and energy.

Figure 5. The World Sustainable Development Goal Dashboard at the midpoint of the 2030 Agenda (source: Sachs et al., 2023; presented in https://dashboards.sdgindex.org/chapters/part-2-the-sdg-index-and-dashboards).

Such a ‘Giant Leap’ can be difficult to imagine within the current state of the world and the UN. The current crises, particularly Russia’s full-scale war against Ukraine which began in 2022, have brought the UN’s ability to effectively function into question. The conflict has exposed divisions within the UN system, which is notably visible in the Security Council’s paralysis due to Russia’s veto power. This deadlock has diluted the UN’s capacity to fulfill its primary mandate to foster international co-operation and peace. Additionally, the escalating humanitarian fallout from the conflict strains the resources and focus of UN agencies, potentially diverting attention and resources away from SDG initiatives (UN, 2022; Shulla & Leal Filho, 2023).

When looking at the low success levels of sustainability politics, it is understandable that the SDG concept has raised a lot of criticism. Right after the 2030 Agenda was published, a series of scholars (Hajer et al., 2015) came out with an article raising their concern about the ‘cockpit-ism’ of the SDGs. The scholars criticised the SDGs, stating that solving global problems would be a matter of top-down leadership, belonging only to governments and intergovernmental organisations. They called for the mobilisation of a new set of change agents, such as cities, businesses and civil society (Hajer et al., 2015, p. 1625; see Article 1).
Sustainable development belongs to the wicked problems that are associated with a multiplicity of goals, long-term time frames and large systemic transformations (see Section 2.1.1). This characteristic makes sustainable development an important societal goal, but it also renders it prone to unrealistic expectations under current political realities. While the SDGs are widely accepted targets, they remain vague as policy goals and are often considered too universal for specific country contexts. Policymakers might encounter difficulties in addressing such broad topics or they may be tempted to make promises beyond their immediate capacity (Hajer et al., 2015; Termeer & Dewulf, 2019). To overcome this paradox, Termeer and Dewulf (2019) suggested using an alternative, small-wins framework to study wicked problems (see more in Article 2).

Furthermore, the transformative potential and the internal coherence of the 2030 Agenda has been questioned. Hickel (2019) studied the SDGs by looking at the compatibility of realising SDG 8, which includes targets for aggregate global economic growth, and the environmental SDGs 6, 12, 13, 14 and 15. He found out that SDG 8 violates the environmental sustainability goals and that the SDGs include an assumption that efficiency improvements will resolve the tension between growth and ecological sustainability. He suggests removing the aggregated growth target and introducing quantified objectives for resource use per capita with substantial reductions in high-income nations. Similarly, Weber and Weber (2020, p.1) demonstrated that the SDG approach aligns strongly with ecological modernisation theory, which is based on privileging economic growth over social and environmental concerns and, according to them, ‘Presenting it as inevitable, and accepting its premises turns out to be ultimately an ideological choice’. However, it is good to remember that the 2030 Agenda is a global agreement and developed in multilateral negotiations; the result is a compromise between the different member states. Although the transformative potential of the 2030 Agenda seems to be moderate, it is still an official agenda of the UN member states. It can be seen as one further step towards globally acknowledging the interdependencies of social and ecological systems, which (in a longer perspective) can contribute to the needed societal transformations (see also Collste, 2021).

2.1.4 Towards an embedded view of sustainability

To continue discussing the challenges related to sustainable development, a common criticism is that there is often an imbalance between the ecological, economic and social dimensions; a lack of synergies and integration between the dimensions; and cherry-picking of the goals that support policymakers’ interests (see, e.g. Allen et al., 2018; Forestier & Kim, 2020). Interestingly, Purvis et al. (2018) studied the origins of the ‘three pillars of sustainability’ and found out that the conceptual foundations are not clear and there appears to be no singular source or theories from which they are derived. However, for a long time it was the common way of understanding sustainability (see, e.g. Giddings et al., 2002). From the 2010s onwards, researchers have proposed alternative
illustrations that are better in line with the embedded view of sustainable development, wherein ecological, social and economic considerations are integrated and the interconnectedness of environmental health, social well-being and economic prosperity are emphasised. Rockström and Sukhdev introduced ‘the SDG wedding cake’ (see figure 6; from Folke et al., 2016). It presents the 17 SDGs in the following three linked categories: the biosphere, society and the economy. The biosphere is at the bottom, the foundation for the whole cake, demonstrating how economies and societies should be seen as founded upon the biosphere.

Figure 6. The Sustainable Development Goal wedding cake (source: Folke et al., 2016; illustration by Azote for the Stockholm Resilience Centre, Stockholm University, CC BY-ND 3.0).

Another concept illustrating the embedded view of sustainability is Kate Raworth’s (2012, 2017) doughnut economics concept (see figure 2 in Section 2.1.1). This framework brings backbone to the definition of sustainable development: the framework does not just aim to result in slightly improved performance – the ecological ceiling and social foundations define the safe operating space. This illustration has been used in several participatory processes (see, e.g. the Doughnut Economics Action Lab: https://doughnuteconomics.org). In Finland, I have used this embedded view of sustainability when communicating sustainable-development policy evaluation results to, for example, members of parliament (Berg et al., 2019, Lähteenoja et al., 2019) and gained feedback from policymakers stating that the doughnut concept is more understandable than the 17 separate SDGs.
2.1.5 Sustainability transitions and transformations

In sustainability studies, as well as in transition studies, the terms transition and transformation are sometimes used interchangeably and sometimes with different meanings in different contexts. Sustainability transitions and sustainability transformations are related concepts, but they have distinct meanings and implications. According to a literature review by Hölscher et al. (2018), both terms signal the need for large-scale changes in order for a sustainable society to be achieved, and they are not mutually exclusive. Sustainability transition often refers to a long-term, gradual and incremental process of shifting from one sociotechnical system or mode of production to another that is more sustainable. This transition often involves changes in the policies, technologies and practices that take place within existing structures or replace the existing structures (Geels, 2002; Geels & Schot, 2007). For example, the transition from fossil fuel-based energy systems to renewable energy sources (like solar and wind power) is considered a sustainability transition. Transitions typically occur within established systems and tend to focus on specific sectors, industries or technologies. They involve adapting and improving existing systems in order to reduce negative environmental and social impacts (Berkhaut et al., 2005; Loorbach et al., 2017; Smith et al., 2010).

Sustainability transformations, on the other hand, refer to more fundamental and radical changes that encompass multiple dimensions of society. A sustainability transformation involves reshaping the core norms, values, behaviour and structures that underpin entire societies (Feola, 2015; Olsson et al., 2014). These changes go beyond singular technological shifts and include economic, social, cultural and political dimensions. Sustainability transformations require systemic shifts and often require reimagining and redesigning entire societal systems (O’Brien & Sygna, 2013; Patterson et al., 2017). An example of a sustainability transformation could be a shift from a growth-centric economic model to having a regenerative and equitable economy that prioritises well-being over constant material consumption.

2.1.6 Sustainability transformations in governance and policy contexts

It has been widely acknowledged by scholars in different fields that sustainability transitions and transformations require changes in governance systems (Meadowcroft, 2009; Loorbach, 2010; Smith et al., 2005; Patterson et al., 2017). Governance here refers to the structures, processes, rules and traditions that determine how people in societies make decisions, share power and implement responsibility (Folke et al., 2005; Lebel et al., 2006; Pierre, 2000; Pierre & Peters, 2000). This includes multiple modes and levels of policymaking and decision-making, as well as multiple possible actors (e.g. government, industry, research and civil society actors). Based on a literature review, Patterson et al.
(2017: 4) classified the following three sometimes overlapping views on governance and transformation in sustainability literature:

- ‘Governance for transformations, i.e., governance that creates the conditions for transformation to emerge from complex dynamics in socio-technical-ecological systems,
- Governance of transformations, i.e., governance to actively trigger and steer a transformation process, and
- Transformations in governance, i.e., transformative change in governance regimes.’

The need for rapid sustainability transformations challenges the current governance structures, which were originally designed to create stability and incremental change (not transformative change) (Johnstone & Newell, 2018; Turnheim et al., 2015). A crucial question is, whether or not incremental change with a general commitment to sustainability can lead to systemic transformations (Pelling, 2011; see also Article 2). Stimulating and orchestrating transformations towards sustainable development requires governance approaches that enable, support and push different actors towards the same goal, while avoiding pitfalls (Meadowcroft, 2009; Patterson et al., 2017). The effective governance of transformations needs to appreciate the complexity, uncertainty, emergence and asymmetries of power (Turnheim et al., 2015). Hence, Patterson et al. (2017) argued that ‘governance for sustainability transformations entails a dual focus on high-level, longer-term transformation combined with an honest recognition of the realities of near-term incrementalism at the same time’. Like the perspective offered by Scoones et al. (2015), rather than there being one big green transformation, it is more likely that there will be multiple transformations that will intersect but overlap and also conflict with each other.

It is also important to remember that sustainability transition and transformation needs are deeply political (see, e.g. Meadowcroft, 2011; Scoones et al., 2015). Policymaking has become highly complex in the context of multiple ongoing crises and the related uncertainties as different perspectives and actors need to be dealt with (Loorbach, 2010). Concerns relating to whose knowledge counts, who promotes what and from which particular political perspective, what changes are necessary and desirable, and even what constitutes the end goal of transformation are all intensely political processes (Patterson et al., 2017). Thus, tools and mechanisms that support sustainability transformations and take political challenges that confront transformations (such as short-termism, dealing with opposing interests and deficits in representation) into account are needed (see also WBGU, 2011; Harjuniemi et al., 2023). Furthermore, there is a need for tools that support multi-level governance both horizontally and vertically (Mickwitz et al., 2009). This is why it is crucial to develop the existing tools in order to be more adaptable to governance and policy processes.
2.2 Advancing and accelerating sustainability transitions

2.2.1 Sociotechnical-ecological transitions into sustainability

In transition studies, sectors such as housing, mobility, energy, food production or transportation are conceptualised as sociotechnical systems. These systems consist of networks of actors (individuals, communities, companies and other organisations), institutions (regulations as well as societal and technical norms and practices), material artefacts and knowledge. These are closely interrelated and dependent on each other (Markard et al., 2012). Rotmans et al. (2001: 16) defined a sociotechnical transition as a ‘set of connected changes, which reinforce each other but take place in several different areas, such as technology, the economy, institutions, behaviour, culture, ecology and belief systems’. In the course of a sociotechnical transition, new products, services and business models emerge and either replace or complement existing ones, changing technological and institutional structures as well as the perceptions of consumers. Historical transitions that are often cited in transition studies include the transition from sailing ships to steam ships (Geels, 2002) and the introduction of pipe-based water supply (Geels, 2006).

Transition concepts have increasingly been applied in studying complex sustainability challenges (see, e.g. Markard et al., 2012). One of the main themes of sustainability transitions research during the last decade has been the transition from a fossil-based centralised energy system to a decentralised system that is based on renewable energy (Loorbach & Wijsman, 2013; Hyysalo et al., 2019a). In transition studies, the roles and agencies of actors are important (see Fischer & Newig, 2016, for a literature review; Wittmayer et al., 2017), as are the power relations between different actors and actor groups (Avelino & Wittmayer, 2016).

The four different transition phases conceptualised by Rotmans et al. (2001) are: predevelopment, take-off, acceleration (or breakthrough) and stabilisation. Sustainability transitions literature highlights the importance of the acceleration of the required transitions (Grin et al., 2010; Köhler et al., 2019; Roberts et al., 2018). The acceleration phase is critical for the societal impacts to emerge as it means that there is a widespread uptake of the new, more sustainable alternative and that the alternative approach is embedded in society’s institutions, organisations and culture (Geels & Schot, 2007, 2011).

Multiple theoretical frameworks and governance approaches have emerged to analyse and support the sustainability transitions of different sectors. I will next introduce two of them that are relevant to this research: the MLP and TM. I will also introduce concepts related to them.
2.2.2 The Multi-level perspective (MLP)

Transition theories describe the world in nested system levels which dynamically interact with each other. First formulated by evolutionary economists Rip and Kemp (1998), the MLP on sociotechnical transitions theorises change between and within three levels: niche, regime and landscape levels (Geels, 2002; Geels & Schot, 2007). The regime level refers to the settled systems and subsystems, practices and cultures that together form sociotechnical systems. Regimes are shaped by industry, regulation, policy, technology, science and market structures (Rip & Kemp, 1998). Regime dynamics create regime rules and structures unless there are disruptions from the landscape level and/or strong alternatives that add pressure for change from the niche level. Regime-level networks include different actors: users, producers of technologies and services, policymakers, companies and communities (Geels & Schot, 2011). There are constant changes within a regime, but these changes are usually minor and collectively agreed upon.

The niche level is the second analytical level of the MLP. The niche level refers to the frontiers of innovation and research where alternative sociotechnical configurations get developed, experimented with and embedded in local contexts. Compared with the functions of the regime level, the functions in the niche level are less stabilised and less predictable and the networks related to them are relatively small and loose. In earlier phases of transitions, niches develop independently, outside of the immediate pressure of the regime. Over time, niche-level innovations either remain, flourish or collapse. If niche innovations start to accumulate, they may become more relevant, competitive and start to put pressure on the regime (Geels & Schot, 2011).

The landscape level is the third analytical level of the MLP. It refers to overarching sociotechnical trends, and sociocultural and socio-ecological phenomena, creating the context of social order. This level includes the values, beliefs and ideas that influence public opinion, upon which sociotechnical systems and lifestyles are built. This level also contains large-scale and long-term trends, such as climate change and other sustainability challenges, as well as longer-term technological and regulatory trends. Contextual landscape factors beyond immediate developments have a long-term impact on the regime. However, major shocks, such as wars or pandemics, can disturb it fundamentally, providing a window of opportunity for niche innovations to break through (Geels & Schot, 2011).

Although there are multiple typologies of regime change (Geels & Schot, 2007; Geels et al., 2016), the overall idea of the MLP is that the regime changes in dynamic response to landscape-level changes and niche-level pressures (see figure 7). The path dependency of existing regimes hinders the possibilities for new innovations and technologies to compete with existing ones. This kind of lock-in only allows incremental innovation along established trajectories (Geels & Kemp, 2007). There are also numerous actors for whom it is beneficial to keep the existing structures.
The MLP has traditionally been used to describe past transitions, but it can also be used to describe potential future scenarios. The transition studies literature outlines the following archetypes of possible scenarios or pathways that use the MLP framework (Geels & Schot, 2007, 2011, 2016):

- **The technological substitution pathway**: There are mature niche technologies that can become dominant following changes on a landscape level.

- **The transformation pathway**: There are pressures from the landscape level, but there are no niche innovations that are mature enough to take over the regime. This provides incumbent regime actors with time and the opportunity to gradually adjust the regime to correspond with the new operational environment.

- **The reconfiguration pathway**: Agile regime actors are willing to change by consciously nurturing and benefiting from the development of niche-level technologies.

- **The de-alignment and re-alignment pathway**: Significant pressure from the landscape level changes the rules of the game at the regime level. There are no immediate substitutes available in the niche, instead, a competition of several potential niche solutions follows.
Geels et al. (2016) further developed these four pathways and highlighted that the transitions may shift between the pathways, depending on changes related to actors, institutions and technologies. Conceptualised around the MLP, Kanger et al. (2020) identified six policy intervention points. They refer to points in the sociotechnical system where transformative change is possible with appropriate policy instruments. The six policy intervention points include:

1. Stimulate different niches
2. Accelerate the niches
3. Destabilise the regime;
4. Address the broader repercussions of regime destabilisation
5. Provide coordination to multi-regime interaction
6. Tilt the landscape.

Here, 'tilt the landscape' refers to, for example, binding agreements achieved at the international or global level which can open new possibilities and directions at the regime and niche levels (Kanger et al., 2020).

MLP theory has been criticised for several limitations, such as not offering a decent framework for the analysis of network activities by diverse actors (de Haan & Rotmans, 2018). Holsgens et al. (2018) claimed that the role of social innovations in transitions is considered too limited. Some critics argue that the MLP may have limited explanatory power for certain empirical cases, which may cause challenges in capturing the complexity and diversity of transitions in different contexts, and it might not provide sufficient insights in certain situations (Smith et al., 2005, 2010; Hyysalo, 2021). The lack of focus on multi-regime interactions and how system change is related to broader historical transformations has been brought up, for example, by Schot and Kanger (2018). The landscape level is argued to be loosely conceptualised as anything and everything that might affect the regimes and niches under scrutiny (Hyysalo, 2010; Slayton & Spinardi, 2016). The MLP has also been criticised for portraying an over-simplified picture of the acceleration and embedment phase, assuming that it progresses on its own accord after the start-up phase (Hyysalo, 2021) with unrealistically rigid roles cast for incumbent and niche actors (Fünfschilling & Truffer, 2014).

Shove and Walker (2007) questioned if sustainable transitions are really as tractable to policymakers as implied in some interpretations of the MLP, calling for a more reflexive and better politically informed appreciation of the way the systems are constructed. However, as Lauttamäki (2018) and Vähäkari et al. (2020) have also stated, as the MLP describes an open development in the interactions between the multiple levels, with transitions taking place over time, it is well-suited to being applied alongside other future-oriented theories and methods. For further research, Geels (2018) suggested, among many other issues, that analytical attention should be broadened from being on singular niche innovations to incorporating 'whole system' change. They also state that the regime developments should be further researched and analysed.
2.2.3 Transition management (TM)

TM is one of the approaches that aims to create novel ways to steer and govern transitions (Loorbach, 2007). Developed in the Netherlands since the 2000s, the TM framework provides guidance for accelerating transitions and for implementing concrete strategies. The TM framework provides a systematic and reflexive methodology for constructing transition pathways in different governance contexts that are characterised by diversity, uncertainty, heterogeneity of society and the decreased role of the government (Frantzeskaki et al., 2018; de Geus et al., 2022). The underlying aim is to accelerate sustainability transitions through providing space for frontrunners to inform, and challenge, the policymaking related to the ambition and variability of future pathways (Loorbach et al., 2015).

The TM framework is based on systems theory, which refers to using a universal language to address complex patterns of interaction between different components in complex adaptive systems (Gell-Man, 1994; Holland, 1995). Systems theory offers a conceptual lens through which to analyse and understand both societal and governance complexity. The transitions of societal systems can be considered as a particular case of complex systems dynamics (Grin et al., 2009). Dealing with complex and long-term societal problems requires approaches that give special attention to learning, interaction, integration and experimentation on the level of society instead of on the level of policy alone (Loorbach, 2010). TM aims to offer an approach to dealing with these complexities in governance and policymaking. It is a governance approach that aims to coordinate and encourage frontrunners, who can be experts, networkers or opinion leaders promoting sustainable development and related policies in society, going beyond the political election cycles (Loorbach, 2010; Voß et al., 2009). By understanding the system and the needed changes, these frontrunners better understand their role and can expand their agency in transitions (Grin et al., 2011).

Similarly to the MLP model, Loorbach (2007) conceptualises system levels as macro, meso and micro levels. The macro level encompasses ideas and worldviews that shape profound sociocultural frames of reference. This level includes societal norms and visions of change, defining the orientations of transitions. The meso level refers to the institutionalised structures, cultures and practices that shape system configurations. The micro level refers to local innovations and alternatives that are experimented on, implemented and evaluated for their implications for generating local change and altering system trajectories. Transitions require managing changes at all these levels dynamically (Kemp et al., 2007; Voß et al., 2006). While prevailing unsustainable structures and systems need to be destabilised and broken down, sustainable alternatives need to be built up, accelerated and institutionalised (Loorbach et al., 2017).

Governance processes based on the TM framework are designed to create space for short-term innovation and develop long-term sustainability visions that are linked to desired societal transitions (Loorbach, 2010, p, 163). The TM
framework can be used both to analyse and to structure or ‘manage’ ongoing governance processes in society (Loorbach, 2010).

Loorbach (2010) presented TM as a cycle with four phases (see figure 8). The strategic phase consists of the establishment of a transition arena (TA), which is one of the key co-design methods used in TM. A TA refers to a facilitated co-design process designed to address complex systemic transition topics and to facilitate the creation of normative transition pathways that enhance desired development (Rotmans & Loorbach, 2009). It consists of a series of workshops in which the identification of challenges, vision building and the construction of pathways of change take place within diverse stakeholder groups (Frantzeskaki et al., 2017). The TAs consist of a small number of carefully selected frontrunners from different backgrounds, competencies and interests. These people do not necessarily need to be experts. Loorbach (2010, pp. 173–174) listed the following competencies that are expected of the participants: ‘(1) The ability to consider complex problems at a high level of abstraction, (2) The ability to look beyond the limits of their own discipline and background, (3) The ability to enjoy a certain level of authority within various networks, (4) The ability to establish and explain visions of sustainable development within their own networks, (5) The willingness to think together, and (6) open for innovation instead of already having specific solutions in mind.’ The idea is to have both regime- and niche-level actors involved. The group will have facilitated discussions on the selected problem and generate future sustainability visions. After agreeing on a vision, the group will develop transition pathways to reach the vision and draw up a transition agenda with objectives and concrete action points with responsibilities.

In the second phase, the tactical phase, the focus is on the structural, regime-level barriers that hinder development in the desired direction. The barriers can include regulatory, institutional and economic conditions and also involve infrastructures, consumer habits or specific technologies. Based on what is identified in the first phase, the transition network is expanded. Together with the larger network, the actions are concretised and quantified, with the idea that the members of the network will then place the topics within the strategies of their organisations (Loorbach, 2010).

The third phase, the operational phase, consists of mobilising actors, executing projects and experiments. The transition experiments need to fit within the context of the vision and transition paths developed. Over a timespan of 5–10 years, successful experiments can be repeated in different contexts and scaled up. The fourth phase, the reflexive phase, concentrates on evaluating, monitoring and learning from the transition project itself, as well as monitoring TM (Loorbach, 2010).
Roorda et al. (2014, p.12) listed the following outcomes of TM processes, based on studies and experiments at the city level:

- **A sense of direction**: Proposing a strategic future perspective which addresses the fundamental changes needed to reach a sustainable future
- **An impulse for local change**: Inspiring new and enhancing existing initiatives that contribute to the envisioned future
- **Collective empowerment**: Enabling actors to tackle challenges and seize opportunities

The main differences between TAs and regular policy arenas can be summarised as the following: while regular policy arenas focus on short-term action and problem solving through negotiations, mostly involving the incumbent actors, TAs aim for long-term problem identification and co-creation with change agents (Loorbach, 2023).

Several shortcomings of the TM methodology have been pointed out. It has been criticised for only involving a limited number of carefully selected elite actors and lacking inclusive participation and fair deliberation (Hendriks, 2009; Voß et al., 2009). A central challenge for transition governance has been the lack of engagement of the regime actors, which has hindered the possibilities for niche and regime actors to co-create new regimes (Loorbach & Rotmans, 2010). This may be because TM has often been disconnected from the official decision-making processes, an aspect which has been criticised by de Geus et al. (2022). Critics point to the difficulties in translating theoretical frameworks into actionable policies and strategies, especially when dealing with complex and dynamic sociotechnical systems. Voß et al. (2009) stated that a large part of the TM literature stays on a conceptual level, overlooking the political processes through which TM is realised.
Another challenge includes determining whether the created transition visions and pathways are legitimate and capture the discursive and agonistic aspects of democracy that often become sanitised from transition lessons (de Geus et al., 2022; Jhagroe & Loorbach, 2015; Hendriks, 2009). Hölscher et al. (2017) raised the point that a managerial approach and result orientation might lead to the disempowerment of stakeholders rather than leading to mobilising the transformative action through the creation of engaged communities. With regard to the early experiments of translating the TM framework into a Finnish context, Heiskanen et al. (2009) noted a significant gap between the capacities for reflexive governance and the prevailing policy realities. Hence, it is crucial to consider cultural and geographical differences and adjust the framework and methods accordingly – what works in the Netherlands may not work similarly in every country.

TM has so far mainly focused on the pre-development phase of transitions: TAs with frontrunners structuring societal problems, developing transition visions and transition experiments (Loorbach & Rotmans, 2010). However, the last decade has shown sociopolitical momentum and interest in transformative change. Some sectors, like the energy system sector in several European countries, have moved to an acceleration phase in which a structural regime transformation has taken place. As Loorbach and Rotmans (2010, p. 245) stated, 'The crucial challenge for transition management will therefore be for the coming years to engage regime actors in the process and develop societal pressure so that the newly emerging niches and the innovative regime actors can co-create new societal regimes'.

As the TA framework is the key framework studied in this research, I will next go through the redevelopment of the TA methodology in Finland.

### 2.2.4 Mid-range transition arenas (TAs)

As explained in the previous chapter, the TA method is one of the key methods of the early phases of TM. Traditionally, TA processes have been geared towards a long-term transition focus of 40–80 years and the pathways have reflected this, remaining relatively broadscale, potentially hindering the urgency to take immediate actions and to prepare for the often thorny challenges that lie ahead in the mid-range time span (Frantzeskaki et al., 2017; Roorda et al., 2014). Presently, the necessity to accelerate sustainability transitions calls for better means to address the 5–15-year mid-range dynamics, forming the most relevant policy time frame considering climate change action. As a result, in Finland, the TA processes have been further developed towards a mid-range time-scale focus (Hyysalo et al., 2019a; see Figure 9). The 5–15-year time scale ensures the policy relevance that is often missing from long-term future visions and enables the participants to more directly participate in the co-design of a shared agenda, pathways and actions (Hyysalo et al., 2019a) that are connected to official policy processes (Lukkarinen et al., 2022).
The mid-range TAs have the potential to coordinate incumbent regime actors’ interests in relation to emerging challenges, pressures and innovations while articulating and dealing with possible conflicts (Hyysalo et al., 2019a). Essentially, the TA process brings the diverse ‘theories of change’ of participating stakeholders into a dialogue and helps in identifying the links crossing systemic societal challenges and spatial contexts (Matschoss et al., 2020). TAs have been utilised in diverse institutional and geographical contexts, such as providing visions for urban planning, rethinking the institutional structures of water governance and revisiting national energy policies (Hyysalo et al., 2019a, 2019b, 2019c; Frantzeskaki et al., 2018, Marttila et al., 2023; Valve et al., 2023).

2.2.5 Learning in transitions

As discussed in Article 3, learning is commonly presented as one of the key premises of transitions governance (see, e.g. Loorbach, 2010; Kemp & Rotmans, 2009; Van Poeck et al., 2020; Doci et al., 2022). It has been argued that learning is crucial for sustainability transitions because it can lead to reflexivity and support scaling up innovations for developing alternative development pathways (Patterson et al., 2017; Schäpke et al., 2017). Furthermore, it has been asserted that the actors involved in transitions governance need to learn to move away from their existing regime-aligned perceptions and routine ways of working and learn about more sustainable alternatives and the changes required to mainstream them (Loorbach, 2010; Geels, 2002; Frantzeskaki & Rok, 2018; Voß et al., 2009).
In TA processes, the co-productive setting has been assumed to have an influence on the dynamics of learning among the stakeholders. Co-productive learning is often framed with phrases such as ‘learning by doing’, ‘doing by learning’ (see, e.g. Kemp & Rotmans, 2009) or ‘social learning’ (see, e.g. Van Mierlo & Beers, 2020), emphasising the role of knowledge in reproducing the social order (Jasanoff, 2004). However, empirical literature on learning in a sustainability transition context remains generic, without in-depth analysis of what is actually learned and by whom (cf. Doci et al., 2022). Instead, sustainability transition researchers often refer to learning without conceptualising or studying the concept in depth – learning is just assumed to happen (van Mierlo et al., 2020, p. 253). One reason for that is that learning, forgetting and learning-away processes are challenging to study reliably in transition governance settings. This research gap has lately been acknowledged and more empirical case studies on learning in transitions have been published (e.g. Erdoğan Öztekin & Gaziulusoy, 2021; Erdoğan Öztekin, 2022; Scholz & Methner, 2020). In Article 3, we argue the following: ‘If learning can be evidenced as a key (let alone as the) process driving transition-related deliberation, experiments, and policy, then the arrangements to further transitions should be specifically built to foster learning and specifically the types of learning processes that make a difference.’ In many cases, however, other phenomena (such as networking, interacting or influencing) may be more relevant than learning in transition-related processes. If this is the case, those phenomena should be supported and acknowledge that learning may or may not take place as a secondary issue.

2.2.6 A future orientation in sustainability transformations

As a field with the core idea of understanding and influencing development towards more sustainable systems, sustainability transformation studies, as well as DfST, display strong futures orientation (see, e.g. Hebinck et al., 2018; Ceschin & Gaziulusoy, 2020; Wittmayer et al., 2019). Futures studies aim to detect and understand expected societal changes and in this way help people and organisations to prepare for and react to them (Bell, 1997). Both fields are based on the systems approach (see, e.g. Ison, 2010), examining the multiple interactions and linkages of a phenomenon instead of only focusing on simplifications (see Vähäkari et al., 2020). Both fields highlight the importance of imagining positive futures and demonstrating the multiple ways to reach them.

Vähäkari et al. (2020) have studied the conceptual, content-based and methodological connections between the MLP and futures studies that (according to them) have been under-represented in both fields of literature (see also Lauttamäki, 2018). In futures studies, new innovations and trends are described as processes that start off as weak signals or emerging issues, growing into new trends and potentially accumulating into megatrends (Hiltunen, 2008). In the MLP, the same processes grow from niche innovations to reach regime level and landscape level (Geels, 2002; Vähäkari et al., 2020).
Scenarios, or scenario pathways, are one of the key concepts in futures studies. Scenarios are typically alternative hypothetical pathways that describe how to move towards a set of possible futures. Scenarios can be quantitative or qualitative and they often involve co-creation. They can be built in a forward-looking way or in a backward-looking way. Forward-looking scenarios begin from the present and move onto the future, whereas backward-looking scenarios start with certain future states and move backwards, towards the present (Vergragt & Quist, 2011). Backcasting is a special form of backward-looking scenario as it describes alternative scenario paths to one preferred future (Mont et al., 2014; Neuvonen et al., 2014; Neuvonen, 2022). Backcasting is explicitly referred to as the approach of pathway formation in TM, albeit in a reduced sense (see, e.g. Roorda et al., 2014; Nevens et al., 2013). Also, the mid–range TAs and toolsets combine backward- and forward-looking pathway construction but do not interrogate the full variety of pathways to the end state (see, e.g. Hyyssalo et al., 2019a). In both traditional TM and mid-range arenas, the emphasis is on elaborating the change pathways and the systemic interlinkages. In comparison to backcasting, the mid-range TAs aim to also include more detailed steps and actions that are considerably more specific than those pursued in backcasting (Hyyssalo et al., 2019a; Articles 4 and 5). Thus, it is good to acknowledge that TM has adopted scenario methods, such as pathway creation, from futures studies and modified them to fit the contexts of TM (Loorbach, 2010) wherein unmodified scenario methods would likely remain too generic.

2.3 Designing for and in sustainability transitions

2.3.1 Design for sustainability transitions (DfST)

In the past decades, design has been expanding its historically overriding focus on the creation of commodities of consumption in the service of the manufacturing industry. Nowadays it is widely acknowledged that design can play a crucial role in societal transformations aimed towards sustainability. The new areas of design include designing business strategies (Siedels, 2000; Keinonen, 2008; Dorst, 2015), facilitating community-driven social innovations (Chick, 2012; Manzini, 2014), developing human-centred services for the private and public sectors (Meroni & Sangiorgi, 2016; Bowen et al., 2013) and assisting governments in designing policies for governance and the management of complex societal problems (Chisholm et al., 2013). The focus of design for sustainability action has moved from technologies (e.g. ecodesign) towards people (e.g. social innovation), and the approach of design has expanded towards supporting systemic transitions (Ceschin & Gaziulusoy, 2020; Gaziulusoy et al., 2021).
DfST is an emerging field that studies the roles, scopes, actions, actors and contexts of design in relation to sustainability transitions (Erdoğan Öztekin & Gaziulusoy, 2020; Gaziulusoy & Erdoğan Öztekin, 2019; Ceschin & Gaziulusoy, 2020). DfST recognises the multiple actors, levels and scales within which design operates. Its primary objective is to broaden the understanding of design's systemic complexity. DfST argues that, by relating to these systemic complexities, design can develop strategic intent while identifying relevant entry points for change and formulating transformative design actions. Consequently, design can play a more important role in leading sustainability transformations (Ceschin & Gaziulusoy, 2016; Gaziulusoy & Brezet, 2015; Young, 2008; Irwin, 2015).

In their book, Ceschin and Gaziulusoy (2020) summarised a framework for design for sustainability approaches (see figure 10). It includes five innovation levels upon which design can focus and an additional sixth level which represents a possible future direction for the design for sustainability field. Secondly, it presents the ‘scope of design intervention’ on the horizontal axis, ranging from insular to systemic interventions. Thirdly, the vertical axis describes the problem framing, ranging from techno-centric to human and earth-centric framing. Finally, they mapped different design for sustainability approaches onto the framework (Ceschin & Gaziulusoy, 2020, p. 148).

Figure 10. The design for sustainability innovation framework and approaches (source: Ceschin & Gaziulusoy, 2020).
The value of such a depiction is in highlighting the expanding scopes of the phenomena involved in the evolution of the concerns found in designing for sustainability. However, the expanding-squares ontology present in the diagram conveys the image that all these social and technical formations are somehow neatly nested. Such an understanding of varying social and sociotechnical phenomena was still common in 1980s but has since been cast out from almost all theoretical traditions in social sciences – different fields and spheres of society have their own logics and complex interrelations rather than nested governance or subordinance relations (see, e.g. Clarke, 2005; Shove et al., 2012). The relevance of this observation to design for transitions is the recognition that the different expertise, interests and resources of frontrunner actors are enmeshed in different societal areas, concerns and types of power, with varying dealings and perspectives. This potentially decentres the role that design and designers may play in DfST.

DfST highlights that, rather than simple solutions, design needs to address sustainability transitions from several points of view, taking into account several scales and domains and including multiple sectors and actors. In DfST, the focus of design shifts from particular domains to the intersections of technical, ecological, cultural, social and economic change. Even more than that, DfST emphasises that design should aim at delivering changes to the entirety of systems, structures, cultures and practices (Ceschin, 2014; Ceschin & Gaziulusoy, 2016; Kossoff, 2015; Irwin et al., 2015; Hyysalo et al., 2019a). Thus, in DfST, the matters of design are no longer considered to be limited to products, technologies or services (Young, 2008). Instead, the matters relevant to design include policies, organisations, strategies, values and meanings – which together form whole systems.

Transition design is a specific and more narrowly defined approach than DfST, which can encompass a range of design efforts (including product design, service design and strategic design) aimed at influencing or supporting sustainability transitions. It aims at designing for large-scale societal transformations, particularly those related to sustainability, resilience and well-being (Irwin, 2015). Transition design proposes addressing complex, interconnected systems at the societal level. This would involve a deep understanding of systems thinking and stakeholder engagement and a commitment to fostering positive societal transformations. The goal of transition design is to contribute to shaping more sustainable and just futures by intervening in and facilitating transitions on various scales (Irwin et al., 2015). Transition design often involves a combination of traditional design methods, systems thinking and participatory approaches (Irwin, 2015; Tonkinwise, 2014, 2019; Liedtke et al., 2020).

Common to DfST approaches is that they recognise the need to pursue design at different scopes or levels, as do also other complexity and systems-oriented design scholars. As described in Article 5, Young (2008) introduced the following three embedded levels of design as a ‘complexity of design’ model: (1) design in context (design at the level of products and artefacts), (2) designing context (designing at the level of systems and services), and (3) the design of context
(design at the level of policy, ideology, purposes, values and norms) (see Figure 11). With reference to this framework, it can be stated that transitions cannot succeed solely by using design in context or designing context. There is a need for the design of context, which means high-level problem solving and sense making in order to create solutions that both tackle the complex environmental and social challenges and question settled rationales.

Figure 11. The three levels of design (adopted from Young, 2008).

Similarly to the work of Young but coming before that, Buchanan (1992, 1998) identified four orders of design: (1) communication with signs and words, (2) the construction of things and the material world, (3) the strategic planning of actions and services, and (4) the systemic integration of thoughts and environments. While these orders can be perceived to point to specific designer skills (Nylen et al., 2014), Buchanan argued that the activities associated with each level do not point to specific design disciplines and that all design specialisations may undertake activities across all these levels. However, in connection with the higher orders, the focus in design action becomes increasingly integrative, supporting the interaction of actors from various interacting communities (Golsby-Smith, 1996). As described in Article 5, as design practice moves towards the higher orders, the complexity of the context being designed increases, the diversity of stakeholders broadens and the activity of design increasingly shifts from performing expert design actions to supporting diffuse design actions by other actors (see Manzini, 2015).
With the growing interest in bringing the fields of transition studies and design studies closer together and the widening focus of design to include sociotechnical-ecological systems (Ceschin & Gaziulusoy, 2020), there is increasing discussion about the role of design and designers in transition processes. Design can play various roles in sustainability transitions projects, ranging from very tangible, technical, skills-based roles to very intangible roles, relating to how information is received, processed and synthesised (Gaziulusoy & Ryan, 2017). Recent case studies (see, e.g. Mok & Hyysalo, 2018; Erdogan Öztekin, 2022; Hakio, 2023) have demonstrated that design can also act as a tool for mediating conflicting stakeholder values and views in transition processes. These studies provide evidence that design can play several different roles in sustainability transitions, including (but not limited to) instrumental roles (see also Tonkinwise, 2019). Similarly, the design outcomes generated during transition projects may cover outcomes associated with all four orders of design (i.e. communication, construction, strategic planning and systemic integration; see Buchanan, 1998) and may include signs, symbols, images, physical objects, activities, services, processes, systems, environments, ideas and values (Ceschin & Gaziulusoy, 2020). At this point it is important to note that once DfST efforts proceed onto wide-reaching societal phenomena, such as seeking to instil systems change, the scope addressed is no longer designable as such. This requires an orientation shift regarding how design can catalyse other actors to collaboratively steer transitions (Hyysalo et al., 2019a, 2019b). Such co-design for transitions, or transition co-design, is located at the intersecting area between DfST and collaborative and participatory design.

2.3.2 Collaborative and participatory design

Participatory design began to emerge in Scandinavia in the late 1970s as part of what later became known as the workplace democracy movement (Floyd et al., 1989; see Asaro, 2000, for an overview of the early experiences). Trade unions were faced with the fact that the introduction of new technology into workplaces led to the deskilling of the workforce and the replacement of staff, rather than leading to higher productivity and better working conditions. Trade unions’ traditional ways of influencing were not successful against this phenomenon, and efforts were made to transform how technology design – and by implication, workplace design – was pursued. Therefore, the trade unions began a number of envisioning and engagement projects in companies that directly involved the workers (Asaro, 2000, p. 267). Over time, the ‘Scandinavian approach’ to participatory design has evolved into a well-established area of research and become an important practice across many design disciplines (Greenbaum & Loi, 2012; Robertson & Simonsen, 2012; Botero, 2013; Botero & Hyysalo, 2013). It emphasises the involvement of end users or stakeholders in the design process and creating means, tools and arrangements through which they can competently participate in the design process. Participatory design aims to empower
the stakeholders and ensure their perspectives shape the final design, often in collaboration with professional designers (Simonsen & Robertson, 2013).

Participatory design is often linked to the terms co-creation and co-design or collaborative design. The terms are often used synonymously or they are mixed in a way that creates confusion. Sanders and Stappers (2008, p. 6) referred to co-creation as a very broad term meaning ‘any act of collective creativity, i.e. creativity that is shared by two or more people’. Co-design, according to them, indicates ‘collective creativity as it is applied across the whole span of a design process’. Thus, co-design is taken as co-creation applied across a design process. In a more nuanced definition, co-design is a participatory approach that uses creative design tools and techniques to nurture mutual learning and collective creativity among all the parties and stakeholders involved (Brandt et al., 2013). Here, the term stakeholder refers to people who may be directly or indirectly related to the outcomes of a project and are thus important to involve in the process. Co-design can refer to the creativity of designers and people who are not trained in design but who are working together in design processes (Sanders & Stappers, 2008). This definition, however, implies that co-design encompasses, for instance, standard within-industry project teams of, for example, an engineer, a marketing person and a designer, which leaves the definition very open. As most co-design builds on earlier principles, practices and tools developed in participatory design, the definition of co-design can be sought from these foundations. In this tradition, participatory design and co-design would refer to the direct involvement of final users, and other implied people and relevant stakeholders in design and the decision-making related to it (Törpel et al., 2009; Robertson & Simonssen, 2012; Botero et al., 2020). This more specified definition, emphasising the direct involvement in the decision-making of the people who are impacted upon helps to navigate the many scales, perspectives and agendas related to the activities associated with terms involving the prefix co- in the design field, which vary in different cases and contexts (Brandt et al., 2013; Botero et al., 2020). As participatory design originally referred to targeting large societal change, this definition gives a deeper meaning to what co-design actually entails in the transition co-design context (Asaro, 2000; Törpel et al., 2009).

The use of the prefix co- in front of design manifests a shift from designing for stakeholders to co-designing with stakeholders. Understanding and applying co-design practices entails a move away from a focus on methods and pre-designed proposals towards an acknowledgement of participants and formatting co-designing in the situations where people meet, align and act together (Törpel et al., 2009; Botero et al., 2020; Eriksen, 2012). Co-design typically happens in multidisciplinary and often complex settings where people meet occasionally at explicitly staged co-design events. In the co-design situations found at such events, selected stakeholders work together in facilitated sessions, share experiences, listen to each other and negotiate with each other in order to reach commonly agreed goals (see, e.g. Eriksen, 2012; Hyysalo et al, 2019a, 2019b).
In this research, the focus is on co-design events related to knowledge co-production. Voorberg et al. (2015) defined *knowledge co-production* as the active involvement and engagement of actors in the production of knowledge that takes place in processes either emerging or being facilitated and designed to accomplish such active involvement (see also Frantzeskaki & Kabisch, 2016). Knowledge co-production and co-design are related concepts that involve collaboration and shared decision-making in the context in question. The main difference is that they emphasise different outcomes. Co-design highlights the importance of actively involving stakeholders in the design process, allowing them to contribute their insights, preferences, expertise and decision-making to an outcome beyond words, insights and concepts (Brandt et al., 2013). Knowledge co-production refers to collaborative processes focusing on generating, synthesising or sharing knowledge, often in the context of research, policy development or problem solving in complex domains like sustainability science (see, e.g. Frantzeskaki & Kabisch, 2016; Turnhout et al., 2020). The focus of knowledge co-production is on producing new or improved understandings, insights or solutions. It involves engaging diverse stakeholders (including researchers, practitioners, policymakers and community members) in jointly producing knowledge that can inform decisions and actions. Fruitful knowledge co-production requires a designed and facilitated operating space in order to happen (Frantzeskaki & Kabisch, 2016). When well designed, organised and facilitated, knowledge co-production processes can differ radically from the institutionalised practices found in, for example, public governance. The processes can offer a space in which to question the ways policy options are envisioned, and expertise is defined in the everyday life of public administration (Valve et al., 2023).

Linking knowledge co-production to the focus of this research creates specific expectations and requirements for TA processes, as well as for the selection of stakeholders. First, TAs are expected to create a shared language among the diverse actors in regard to systemic challenges and possible solutions (Loorbach & Rotmans, 2010). Second, the co-production setting requires facilitated interaction between the stakeholders who can affect the future systems and those affected by them (Voß et al., 2009). Third, opening ‘co-production spaces’ offers a shared sense of purpose for the stakeholders with diverse backgrounds and potentially helps bridge science and policy interfaces (Frantzeskaki & Rok, 2018; see Article 3).

There are several challenges related to the co-design processes linked to large-scale sustainability governance and policy processes. A central challenge, especially in university-led co-design processes, is that the co-design processes are often separate from official policy processes, which means that their impacts on policymaking can be limited, reliant on individual, committed participants (Pirinen, 2016). If co-design efforts are not focused correctly or if the participants are unable to solve the problems, the impact is limited and the efforts only consume resources (Pirinen et al., 2022). If the background organisations of the participants do not commit to the results of co-design processes, the implementation does not happen (Heiskanen et al., 2010). Another risk is that certain
powerful stakeholders influence too much and, thus, the results are distorted (Hyysalo & Lehenkari, 2002). Thus, success depends on how the process is planned, organised and facilitated, as well as being dependent on how the results are operationalised in practice by governments and other key actors (Lewis et al., 2020).

### 2.4 Summary: Positioning this research

In Chapter 2 I have outlined the complex field of advancing sustainability transformations through co-design by reviewing the relevant literature on sustainability transformations, TM and DfST. To sum up these perspectives, I will describe how this research is situated within these study areas.

We are living in an era of multiple crises. Solving problems like resource depletion, climate crisis, biodiversity loss and widening social inequality requires institutional, technological and organisational transformations. In other words, achieving sustainable futures requires a fundamental re-orientation of our societies and economies. As the topic of advancing sustainability transformations is extremely broad, I have focused on sustainable development policies and the implementation of the 2030 Agenda in Finland. Implementing parts of the 2030 Agenda does not automatically lead to sustainability transformations, but even if the SDGs were close to being fully implemented, it would be transformative. Therefore, this research focuses on the transformative potential of sustainable development governance and policies.

Sustainability transformations and TM research have been able to put into words the kinds of multidisciplinary change, related expertise and decision-making that are needed in order for sustainability transformations to progress. Policy and governance have a crucial role in advancing sustainability transformations, and new tools are needed to support governments in this. If the TM initiatives are conducted separately from official policy processes, their policy impact can be limited (de Geus et al., 2022).

In this research I build on prominent work, such as that of Loorbach et al. (2010) and Hyysalo et al. (2019a, 2019b, 2019c), and study the possibilities of bringing the methods of TM closer to official sustainability policy processes. In doing so, I connect the research to the field of DfST and, more specifically, to transition co-design. It is an emerging field with limited empirical studies, especially at the level of sociotechnical-ecological systems (see Article 5; Ceschin & Gaziuso, 2020). It can open up opportunities to promote sustainable development in new ways and thus advance a change where numerous previous approaches have not succeeded.

This research is positioned in the top-right corner of the framework presented in figure 10, found in Section 2.3.1. The problem framing in the case studies aims to also address earth-centric views with consideration of the future of not only existing humans but also of non-humans and future generations, as defined by
Ceschin and Gaziulusoy (2020, p. 164). This research contributes to the literature of DfST by providing an empirical analyses of what transition co-design actually comprises of in the context of sustainability policy processes and by studying what it can offer for advancing sustainability transformations in the policy and governance contexts.
3. Research design, data and analysis

3.1 Research design and methodology: A multiple qualitative case study

In this chapter I describe my choices concerning the research design, including the methodology, methods and empirical case studies.

Across academic disciplines, there is a growing awareness of the need for hybrid forms of knowledge production through ‘transdisciplinary research’ (Hirsch Hadorn et al., 2008). This is seen as particularly relevant in regard to addressing complex and systemic societal problems (see, e.g. Gaziulusoy & Boyle, 2013). Lang et al. (2012, pp. 26–27) described transdisciplinarity as follows: ‘Transdisciplinarity is a reflexive, integrative, method-driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge’. This definition highlights that transdisciplinary research needs to focus on societally relevant problems and that it should aim at creating solution-oriented and socially robust knowledge that is transferable to both scientific and societal contexts. In addition, transdisciplinary research should involve researchers from several fields and stakeholders from outside academia (Lang et al., 2012). My research aligns well with Lang’s definition as it tackles the real-world challenges of implementing sustainability transformations in policy and governance and it involves a large number of diverse stakeholders in co-designing solutions.

The core focus of this research is on sustainability transformations. According to Westley et al. (2011), the general aim of studying transformations is to explore how change processes take place in societies and how societies are enabled to carry out changes that go beyond incremental technical developments. There are several approaches to sustainability transformations research (see Salomaa & Juhola, 2020, for a review). This research belongs to research for transformation, which can be described as action-oriented and intervention-focused research. It is conducted with the explicit purpose of actively supporting, guiding or catalysing sustainability transformations (Patterson et al., 2017). This research also includes elements of research on transformation, which primarily investigates and analyses ongoing or historical sustainability transformations,
seeking to understand the drivers, dynamics and outcomes of transformation processes.

This research includes elements of a multiple qualitative case-study approach, a research-through-design approach and an action research approach. As indicated in Chapter 2, sustainability transformations are broad and emerging processes. The phenomena are complex and often related to political, social and economic conditions. A case study approach is often an appropriate type of research approach for studying such broad phenomena (Flyvberg, 2006). One characteristic of a good case study is that it aims to build a general, holistic idea of an object in its context (Verschuren & Doorewaard, 2010). A good case can highlight a great number of the general characteristics of a phenomenon, which then structures learning around it (Flyvbjerg, 2006). This has been the aim when selecting the cases used in this study: the four different cases are separate contributions that complete each other.

Research through design is not a formal methodological approach with a particular epistemological basis but a foundational concept for approaching a research inquiry through the practice of design (Durrant et al., 2017, p. 3). The method blurs the boundaries between traditional research and design activities, emphasising iterative experimentation, reflection and collaboration. By engaging in the process of design, researchers can explore complex problems, uncover latent needs and develop novel perspectives that may not be attainable through conventional research methods alone (Durrant et al., 2017). In this research, I applied elements of RtD in transition arena processes (see Articles 3, 4 and 5). The arena processes were used as a data collection method for observing, documenting, evaluating and reflecting the different phases of the process. Through this research, I also developed the transition arena methodology further (see Section 5.2.)

In this research, I applied the qualitative research methods of the social sciences to collect and analyse data. Qualitative research has a long tradition, starting in the 1920s (Denzin & Lincoln, 1994). Qualitative research is seen to be especially relevant for studying subjective meanings, everyday experiences and practice, as well as for studying social interactions and relations (Flick, 2009). It includes multiple connected approaches, assumptions and terms. The characteristics of qualitative research that are relevant to this research include the use of multiple methods, understanding practice as a relevant source for knowledge production and acknowledging the researcher’s subjectivity and situatedness (Flick, 2009).

The role of the researcher varies in the different approaches of qualitative research. In ethnography (Wolcott, 2008) or participatory action research (Reason, 1994), a researcher might participate in certain activities and practices within the sites of their research. However, in qualitative research, the researcher is not usually an expert practitioner or a subject of research but keeps a certain distance, not becoming an insider of the studied activities (Coffey, 1999; Jones & Watt, 2010). In this research, my role as a researcher varies in different cases. As an organiser and facilitator of the transition arenas, I provided the space and circumstances for co-design, but I was also an insider and
had an influence on the outcomes of the arenas, as did all the other facilitators as well. At the same time, I had the researcher’s role of observing and documenting the work. Sometimes it was difficult to distinguish between the multifaceted roles I had in the cases presented in Articles 3, 4 and 5. This is, however, typical in design research (see Gray & Malins, 2004, pp. 20–21).

In particular, the methods used in the case study presented in Article 1 have elements of action research. In that case study, I conducted a municipal field study with 12 municipalities and worked closely with them to understand and solve the challenges related to the leadership of sustainable development. As described in the literature of action research, this research was collaborative, practice oriented and aimed at fostering change and improving operations (Gustavsen, 1992; Zeni, 1998). Professional learning often lies at the heart of action research, and this was the case in the KESTO case study. One of the goals of the KESTO project was that the employees of the municipalities would have more tools and increased agency for advancing sustainable development in their work. However, the research did not fulfil all the characteristics of action research as the project lasted for a short period of time and did not include long-term development (see Reason & Bradbury, 2001; Whyte, 1991).

In the next section, I introduce the contexts and case studies of this research in more detail.

3.2 The contexts: The national level, the local level and the housing company level in Finland

All the cases of this research are located in Finland. My research includes four cases from the following three societal levels: two cases from the national level, one at the local level and one at the housing company level. The national and local levels complete each other as implementing sustainable development policies are crucial in both levels. At the housing company level, the focus was on energy questions, which relate to SDG 7 (‘Affordable and clean energy’), an SDG that comes very close to people, with decisions even being made at the level of households and housing companies. I will next describe these three levels and provide relevant information on the current status and policy processes related to sustainable development; I will also present the case studies at each level. Some parts of the descriptions are directly taken from the five articles of this research: I wanted to collect and summarise them here to give a full picture of the phenomena found in different levels which may not become visible by reading the separate articles.
3.2.1 The national level

Finland provides a unique case for studying sustainable development policies. In the 2022 Sustainable Development Report, Finland was ranked as the first country in regard to SDG implementation in the global comparison (Sachs et al., 2023). According to the ranking, Finland has achieved (or is close to achieving) the SDGs related to poverty alleviation, health, education, water, energy, reducing inequality, peace and the rule of law. Finland’s greatest challenges are related to the fight against climate change, the need for more sustainable consumption and production patterns, and halting biodiversity loss (see figure 12). Furthermore, Finland causes negative spillover effects to other countries. This means that Finland’s actions related to trade have negative effects on other countries’ abilities to achieve the SDGs.

Figure 12. The 17 SDGs and the status of implementation in Finland in 2023. (source: Sachs et al., 2023; presented in https://dashboards.sdgindex.org/profiles/finland).

Finland already has a decades-long tradition in sustainable development policies (Niestroy et al., 2019; Rouhinen, 2014). Thus, sustainability seems to be widely accepted as a broad societal aim (see, for example, PMO Finland, 2019). A special feature of Finland’s sustainable development governance is wide participation through multiple different forums and panels, which means it makes it a good case for studying co-design. Sustainable development policy is coordinated from the core of the government, namely the PMO (OECD, 2018). The Finnish National Commission on Sustainable Development has acted as a coordinating body at the national level since 1993. The commission has been chaired by the prime minister and co-chaired by another minister, and its members have broadly represented various sectors, ranging from political decision-making to ministries, research institutes, interest groups and NGOs. In addition, sustainable development work is complemented by the science advice of an expert panel on sustainable development and the views of young people through the 2030 Agenda Youth Group.

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1 SDG 2, ‘Zero hunger’, is marked as red in the figure because of the challenges related to being overweight and obesity.
In this research, two of the four case studies are cases of the 2030 Agenda implementation at a national level (see Articles 2 and 5). The data collection and initial analyses of Article 2 were conducted during 2018-2019 in the ‘PATH2030’ evaluation of Finland’s sustainable development policy (Berg et al., 2019; Lähteenoja et al., 2019). It was the first comprehensive sustainable development evaluation after a long while; it aimed to assess the implementation of the 2030 Agenda and look at the longer-term transition needs (as also recommended by Mickwitz et al., 2021; Section 1.3).

One of the main recommendations of the PATH2030 evaluation was that Finland should draw up a national 2030 Agenda roadmap in order to pave the way to achieving all the SDGs by 2030 while supporting the achievement of the goals globally. This recommendation was adopted in the government programme in 2019. In 2020, the government gave the task of preparing a 2030 Agenda roadmap to the Finnish National Commission on Sustainable Development. From the beginning, the idea was that the roadmap would turn into a new national sustainable development strategy for Finland, and the new strategy was published in 2022 (PMO Finland, 2022). At Aalto University, I co-designed and co-facilitated a transition arena to support the creation of the roadmap. The data collection of Article 5 was conducted as part of this work.

3.2.2 The city and municipal levels

The case presented in Article 1 is about sustainable development at the city and municipal levels.

The relationship between the national government and local governments depends greatly on the national context. As described in Article 1, municipal administration in local governments in Finland is based on the self-government of the municipality’s residents. A municipal council, elected every four years, decides on the long-term goals of the municipality’s activities and finances in its municipal strategy. In addition to the council, a municipality has to have a municipal board and a board of auditors. The council may also appoint other institutions, such as boards and chambers. The council elects a municipal director or mayor. Finnish municipal self-governance is anchored in the constitution, and decision-making is based on the Local Government Act. The goals of the Local Government Act can be viewed in relation to the SDG framework, with, for example, ‘safeguarding the financing of municipal tasks’ having a direct link to the attainment of the SDGs related to food (SDG 2), education (SDG 4), water and sanitation (SDG 6), work and growth (SDG 8) and so on. Therefore, it is in fact mandatory for the local council to limit risks and mitigate the possible negative impacts related (almost directly) to a wide range of the SDGs, and it is voluntarily for them to do so for the rest of the SDGs.

Despite the fact that Finnish municipalities have long traditions in sustainable development, they are still facing several challenges in integrating sustainability
into the core of both their leadership and operations. Many Finnish municipalities were already active in the Local Agenda 21 work in the early 1990s and established their own local agendas. After that, there was a period with less activities related to sustainable development in Finnish municipalities. In recent years, there has again been an increasing interest in and more action towards sustainable development that is linked to the SDGs. Today, many municipalities consider sustainability or responsibility as one of their core values and show commitment to it in their strategies. Furthermore, municipalities are relatively well aware of the key challenges they still face around sustainability. These include, for example, climate change mitigation and the reduction of social disparities (see figure 13).

Figure 13. The key sustainability topics at the local level in Finland (source: the author; the figure is from Article 1).

The data of the first article was collected in a project called ‘KESTO – Leadership and implementation of sustainability: Action research on the localisation of the SDGs in Finnish municipalities’ (see Section 1.3). Similar to the findings of other studies (e.g. Lyytimäki et al., 2016, 2020; Berg et al., 2019), the municipalities of the KESTO project identified that their main challenges related to implementing sustainable development are linked to coherence in strategy and leadership, in the interlinkages of different dimensions of sustainability (e.g. social, environmental, economic dimensions), in the different time frames of implementation and in the challenges of cross-governmental leadership and management. These challenges were discussed and methods for improving the situation were co-designed with Finnish municipalities in the case described in Article 1.
3.2.3 The housing company level

The focus of the case study in Articles 3 and 4 is on the level of housing companies in urban areas. The case focused on the potential of increasing decentralised renewable energy production in owner-occupied housing companies in Finland. In this case, the focus is narrowed from covering all SDGs to covering renewable energy (SDG 7) and sustainable cities and communities (SDG 11).

As described in Article 3, there is variance in the legal, terminological and practical aspects of multi-owned housing across national contexts, but the Finnish housing company model is akin to housing cooperatives, condominiums and/or homeowner associations found in other countries (Lujanen, 2010). In Finland, more than half of the population lives in residences that are part of a total of 90,000 owner-occupied housing companies where decision-making power and access to apartments are divided based on ownership share. The majority of the buildings, built in the 1960s and 1970s, need extensive renovations in the short-term future. This is an enabling condition for significant energy-efficiency improvements and investments in decentralised energy production technologies, such as solar panels and heat pumps. In this case study, the situation was framed as a possibility for housing companies to emerge as energy communities with a more active role in energy policy. The critical role of housing companies has also been noted on the national policy level.

Housing companies have been slower to adopt decentralised energy production compared with detached building owners. One reason for this is that the decision-making process in housing companies is more complicated. Each building has unique material characteristics, and each housing company has its own social dynamics that affect how they may or may not proceed with energy projects. Moreover, the range of actors connected to housing companies is wide and heterogeneous, which calls for the facilitation of actor roles and knowledge exchange among the stakeholders. This was one of the aims of the case study presented in articles 3 and 4. The Citizen Energy Transition Arena (CE Arena) was a transition arena that addressed decentralised renewable energy production (citizen energy) in urban owner-occupied blocks of flats and in terraced housing in Finland (see Section 1.3).

### 3.3 Methods and data collection

In this section, I will summarise the methods used in the case studies and provide an overview of the data collected. Detailed data collection information can be found in the articles.
3.3.1 The transition arena as a tool used to study sustainability transformations

Three of the four case studies included a transition arena process as the key tool used to study sustainability transformations. Articles 3 and 4 used the data collected in the CE Arena, and Article 5 is based on the data collected in the 2030 Agenda Transition Arena (A2030 Arena). I was one of the facilitators in both arenas. In addition, I led the A2030 Arena process and partly re-designed it to fit the purpose of direct policy support.

Since 2015 and the establishment of the Finnish Strategic Research Council (SRC), there has been an increase in TM-related activities at Finland’s science–policy interface. The SRC has redirected state funding towards transdisciplinary research with a strong focus on stakeholder interaction across society (e.g. on policymakers, civil society and industry actors) with direct policy relevance (with topics including digitalisation, sustainable energy, food systems and governance renewal) (Heino & Hautala, 2021). In several of these projects, the mid-range adaptation to the transitions arena process with its supportive facilitation and co-design toolset (Hyysalo et al., 2019a, 2019b; see Section 2.2.4) has been used and developed further (see also Marttila et al., 2023; Valve et al., 2023). This development work and the experiences gained in them have led to the usage of the method to support policy processes without a direct linkage to an ongoing research project (see, e.g. Marttila et al., 2023, on the biodiversity transition arena). The two arena cases used in this research represent both cases: the CE Arena was organised as part of the SRC research project SET (see Section 3.2.3), while the A2030 Arena was organised to directly support a policy process.

Building on TM literature (Loorbach et al., 2015; Frantzeskaki et al., 2018), both transition arena processes were divided into three subsequent phases. The orienting phase included establishing the transition arena facilitation team, planning and scheduling the workshop series together with the ministries, gathering relevant background knowledge and recruiting the relevant participants. The CE Arena was organised in early 2020 in collaboration with the Ministry of the Environment and the Ministry of Economic Affairs and Employment. The A2030 Arena was organised in 2021 together with the PMO Finland. There were two main differences between the two case arenas, and the first one was the participant selection process. The CE Arena followed the TM literature and invited 17 carefully selected experts and frontrunners from different sectors (ministries, municipalities, NGOs, energy companies etc.; see a detailed list in Article 4). In the A2030 Arena, the participants were not selected but they included 58 members or deputy members of the Finnish National Commission on Sustainable Development. This included 21 ministry representatives, 13 NGOs, 13 trade unions, five regions, one member of the parliament and four representatives of other institutions (the church, the social security institution, think tanks). In both cases, the facilitator team consisted of technical and expert facilitators who led the pathway development in pairs. The organisers and facilitators prepared a background memo for the participants in both cases, including information
on the system boundaries, the emission reduction / sustainability gaps, existing policies and examples of existing pilots and good cases.

The agenda-setting phase was the main element in both processes, focusing on setting transition goals for the year 2030 in the A2030 Arena and for the year 2035 in the CE Arena. The CE Arena had the same quantitative transition goal for each of the four transition pathway groups. In the A2030 Arena, the participants created positive visions for 2030 and set goals in each of the six pathway groups. Based on the visions and goals, the groups co-designed transition pathways in order to identify key policy actions. This phase of the CE Arena consisted of four workshops, of which two workshops were used to actually co-design the transition pathways. The A2030 Arena had a similar setting with an additional cross-examination phase in between the two co-design workshops. After the first transition pathway workshops, all Commission members, as well as the expert panel on sustainable development, were able to comment on the draft pathways. In addition, a cross-examination workshop was held to look at the links, synergies, contradictions and possible overlaps between the different pathways. After that, the thematic groups addressed the comments received and finalised the transition pathways. They also discussed the principles of sustainable development policy and how to ensure their implementation along the pathways (see Mickwitz & Kivimaa, 2007). The CE Arena was shifted to an online format in the middle of the work because of the Covid-19 pandemic and the A2030 Arena was organised fully online for the same reason. Figure 14 provides a photo and a screenshot of the pathway co-design work in on-site and online modes.

In our transition arena settings, the co-designed transition pathways were not technical ‘hard’ scenarios of a whole-system or regime transition but, rather, they were heuristic ‘soft’ scenarios designed to draw a big picture of the needed changes and to identify the agencies of different sectors and organisations (see Grin et al., 2011).
Figure 14. A photo of onsite and a screenshot of online transition pathway co-design work (photo credit: Jere Loikkanen).

The second phase, in which the two arenas were different, was the activating and reflecting phase. The focus of the CE Arena was in informing ongoing policy processes on how to advance community energy projects. The policy lessons were published as a report and disseminated within existing relevant networks. The A2030 Arena was directly linked to the renewal process of the national sustainable development strategy. Therefore, the results of the arena were not published as such, the co-designed pathways formed a basis for the 2030 Agenda roadmap which was, after discussions and negotiations hosted by the PMO, turned into a national sustainable development strategy for Finland. Table 1 summarises the main characteristics of the two case arenas.
Table 1. A summary of the elements of the two case arenas.

<table>
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<tr>
<td>Participants</td>
<td>17 selected experts and frontrunners</td>
<td>58 registered members or deputy members of the Commission</td>
</tr>
</tbody>
</table>
| Goals                | One goal for all: to increase renewable energy production eightfold in Finnish housing companies in 15 years (by 2035) | Common goal: for Finland to reach all the SDGs by 2030  
Separate visions and goals for each of the six systemic areas |
| Workshops            | Four groups looking at the topic from different perspectives  
Four agenda setting workshops | Six groups based on the pre-identified systemic areas:  
- The economy and work promoting well-being and sustainable consumption  
- Education, competence and sustainable lifestyles  
- Well-being, health and social inclusion  
- The food system promoting well-being  
- Forest, water and land use promoting biodiversity and carbon neutrality  
- The sustainable energy system  
Four agenda setting workshops |
| The number of pathways produced | Four                                                                              | Six                                                                                                          |
| Outputs              | A report with dissemination materials (blog posts etc.)                              | A basis for the new national sustainable development strategy                                               |

The two transition arenas provided a multiple and diverse set of data for Articles 3, 4 and 5:

- The meeting notes of the preparatory and analysis meetings among the organisers and facilitators were mainly used as background information in Articles 3, 4 and 5. Similarly, the recordings of the workshops were not used systematically – they were used to check the facts and details of the discussions after the events.
- The co-designed transition pathways and the technical reports were used as data. The pathways created at the CE Arena case were used more as a background material in Articles 3 and 4, while the process and one of the pathways of the A2030 Arena was analysed systematically from the co-design perspective in Article 5.

In addition to the workshops, meetings and produced documents, additional data was collected by organising semi-structured interviews among the facilitators and participants of the arenas. Semi-structured interviews are based on a set of mostly open-ended questions that guide the interview process. The question set is applied flexibly, allowing additional perspectives and topics to arise from the interviewees (Flick, 2009). In 2020, we interviewed 13 of the CE Arena
participants. The interviews were conducted a month after the last arena meeting and before publishing the final results. The timing of the interviews was set so that the interviewees would have time to reflect on their participation experience while still having a relatively fresh memory of the events, not coloured by the final report. The interviews aimed to elicit the participants’ perceptions of the process and to detect the impacts of the arena work on a personal level (new ideas, learning, changes in perception). We also inquired about their plans for further steps and concrete actions based on the CE Arena results (the interview guide is published as an annex to Article 3).

In 2021, I conducted 12 semi-structured interviews with the facilitators and the organising team of the A2030 Arena after the workshop series. The interviews aimed to elicit facilitators’ and organisers’ perceptions of the process and to elaborate the transition co-design dynamics in each pathway creation workshop. The data-collection process was supplemented with participant observation documented through facilitators’ notes and reflections on the workshops from both arenas.

3.3.2 Other qualitative methods used in this research

The use of multiple sources is typical in case study-based research (Yin, 2009). In addition to the two transition arenas, I used a variety of other methods to collect data. I will next give an overview of the methods used. Detailed descriptions – as well as questionnaires, interview guides and workshop structures – can be found in the articles and their annexes.

The various policy documents and reports produced in the context of sustainable development policy in Finland provided a good starting point for the analysis. The material largely consists of official governmental documents and implementation and evaluation reports related to sustainable development policies in Finland. The depth of analysis of the documentary material varied in different cases: in Articles 1 and 5, much of the material provided only background information and understanding of the current situation. However, Article 2 is (for the most part) based on document analysis, focusing on the policy analyses that have mainly taken place since 2015. The analysed documents include the following (please see the full list of references in Article 2):

- The Government Annual Reports for 2015–2017
- The 2030 Agenda Report (2017)
- Draft budgetary plans for 2018 and 2019
- Previous sustainable development evaluations (e.g. Lyytimäki et al., 2016, 2017)
- The Voluntary National Review (VNR) 2020 (PMO, 2020b)
In Article 2, two surveys were conducted to collect stakeholders’ views on the state and political dimensions of sustainable development in Finland. The respondents were asked to evaluate the present state of SD, its achievements and the needs for improvement. The survey was distributed in two different ways: as a closed survey for key SD actors \( (N = 27) \) and as an open poll \( (N = 211) \) to anyone interested, distributed through sustainable development e-mail lists and social media. In addition to the surveys, we conducted 78 interviews with people representing all Finnish ministries, the expert panel on SD and key stakeholders. The interviews dealt with changes in the Finnish SD policy, the governance model, challenges and needs for improvement. In addition, we organised two stakeholder workshops in order to discuss and evaluate the Finnish SD policy (October 2018, 68 participants) and to co-create recommendations (December 2018, 19 participants).

The data collection process for Article 1 also included co-creation workshops. In the KESTO project, we conducted action research where we worked closely together with Finnish municipalities. As described in Article 1, we worked with cross-sectoral teams from 12 municipalities and, together with them, we first analysed the current situation of SD in their local municipalities. The first part included a text analysis of existing local administration strategy documents and the SDGs, interviews with public administration officials in municipalities and a co-creation workshop where potential substance-specific priority areas were identified and compared with those of other municipalities. In the second part, five municipalities continued the work by analysing their current leadership structures with respect to sustainable development. Based on the analysis, each municipality hosted a workshop together with the researchers in order to discuss the strengths and weaknesses of their existing models and the potential for improvement. In addition, we organised two common events for all the original 12 municipalities; during these events, the observations were discussed and much of the research material was produced. In a joint seminar at the semi-final stage, we used a tailor-made card game, through which the leadership models best suited for different municipality types were constructed. Each municipality selected a set of cards presenting those elements that best illustrated their model and situation. Afterward, the models were finalised by the research group and assessed by a steering group with representation across several government sectors. Table 2 provides a summary of the methods and data collected in each case study.
### Table 2. A summary of the methods used and data collected in the four case studies.

<table>
<thead>
<tr>
<th>The short name of the case</th>
<th>Timeline</th>
<th>Methods used</th>
<th>Data collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>KESTO (Article 1)</td>
<td>March 2019 to April 2020</td>
<td>Action research in two parts: 1. Two co-creation workshops with municipalities ($N = 12$ municipalities), including tasks before and in between the workshops 2. One follow-up workshop ($N = 5$ municipalities)</td>
<td>Workshop materials, results and notes Meeting notes 12 reports on the analysis of the state of SD in the local municipality</td>
</tr>
<tr>
<td>PATH2030 (Article 2)</td>
<td>2018–2020</td>
<td>A literature review and assessment of policy documents ($N = 12$) Stakeholder and expert interviews ($N = 78$) A closed survey ($N = 27$) An open survey ($N = 211$) Two stakeholder co-creation workshops ($N = 68, 19$)</td>
<td>An analysis of policy documents and literature Interview results Survey results Results from the two workshops Meeting notes</td>
</tr>
<tr>
<td>CE Arena (Articles 3 and 4)</td>
<td>2020</td>
<td>A transition arena with 4 workshops Participant interviews ($N = 13$)</td>
<td>Meeting notes Recordings and notes from four workshops (with several breakout groups). Interview results Technical report of the CE Arena (Lukkarinen et al., 2020)</td>
</tr>
<tr>
<td>A2030 Arena (Article 5)</td>
<td>March 2021 to October 2021</td>
<td>A transition arena with 4 workshops Facilitator interviews ($N = 12$) Transition pathway analysis</td>
<td>Meeting notes (for 15 meetings) Recordings and notes from four online workshops 12 semi-structured interviews conducted with the facilitators and the organising team after the workshop series Six finalised transition pathways with transition narrative descriptions for the period from 2022 to the 2030s A technical report of the A2030 Arena (Lähteenenoja et al., 2022), the 2030 Agenda Roadmap and the renewed national sustainable development strategy (PMO Finland, 2022).</td>
</tr>
</tbody>
</table>
3.4 Data analysis

As explained earlier, this research is based on four different cases with data collected between 2018 and 2022. As the different parts of the research are published as separate articles, I will next summarise the analyses case by case. A detailed description of the analyses can be found in the articles.

The action research of the KESTO project, published in Article 1, included analysis conducted together with the researchers (who also co-authored the article) and participating municipalities. It included a text analysis of existing local administration strategy documents and the SDGs, and an analysis of the results of interviews with public administration officials in municipalities and the co-creation workshop. In the second part, five municipalities continued the work by analysing their current leadership structures with respect to sustainable development. Based on the analysis, each municipality hosted a workshop together with the researchers to discuss the strengths and weaknesses of their existing models and the potential for improvement. The resulting three SD leadership models are based on the results of this analysis and formulated by the researchers.

In the PATH2030 research, as reported in Article 2, the materials were analysed in ATLAS.ti mainly by Hanna Entsalo, who is the first author of the article. The main purpose of the content analysis was to deepen the understanding of how various challenges and opportunities for sustainability transformations in Finland have been met with real-life wins. We analysed the transformative capacities of Finland’s sustainable development policy by drawing on the 4Is framework (Brockhaus & Angelsen, 2012). With the 4Is framework, we analysed the current situation and changes taking place in the realms of institutions, interests, information and ideas. The institutions here entail formal and informal institutional arrangements, path dependencies and potential resistance to change. The ideas in this context describe how the idea of SD is understood and discussed in politics. The interests here refer to actors in the policy field and their potential material benefits. The interests of various stakeholders influence the type of policy that is being promoted. Finally, information in this context entails the types of information used in decision-making and information’s ability to guide the direction of policy. Information includes data and knowledge, how they are formed and used, and by whom. The coding process is described in more detail in Appendix B of Article 2. Further, we returned to the interview material and analysed it through the lens of transformativeness.

ATLAS.ti was also used to analyse the transcribed interview recordings of the CE Arena (see Articles 3 and 4). In Article 3, where the focus of the analysis was on reported learning among the participants, we used the learning levels framework based on the work of Argyris and Schön (1978) and Bateson (2000) (see more details in the article). In Article 4, the analysis was mainly conducted by the first three authors of the article (Jani Lukkarinen, Miikka Salo and Maija Faehnle). As described in the article, the qualitative content analysis of workshop discussions and the produced textual materials enabled a systematic way of identifying contextually meaningful perspectives on citizen energy roles by focusing on repeated and contrasting statements. First, the analysis focused on
how the participants positioned different actor groups in relation to the challenge of advancing citizen energy action in housing companies at the beginning of the arena process. Second, the analysis moved onto the co-production of societal targets through transition pathway building. Finally, the process of outlining policy lessons and the outcome report were analysed.

For Article 5, we created an analytical framework with regard to Buchanan’s design orders (Buchanan, 1998) and Young’s design levels (Young, 2008). In the analysis, we looked into both the transition arena process and the actual outcomes of the pathway work. As described in Article 5, by tracking down important design decisions in this process, we analysed where, by whom and under what conditions these decisions took place in order to reflect on the contexts of interest for design types and the levels of design action. Through the framework, we further assessed the different phases of the process to identify how and through what type of activities different participants in the process are involved in the overall design and implementation of the arena work and its outcomes. In addition, we analysed the roles of the different actors of design in different phases of the process to further reflect on how they are set in design-for-transitions work. The analyses were conducted together by me and Tatu Marttila with continuous peer debriefing and reflection, assessed by all the authors and in a larger research group to gain different perspectives and ensure the quality of the analysis. The analysis is published in the annex to Article 5.

3.5 Ethical considerations

To ensure an ethically sound research approach, I followed the main ethical guidelines of Aalto University and the Finnish National Board on Research Integrity (https://www.tenk.fi/en). The ethical guidelines ensured that participants could be considered free from risk for the following reasons:

1. They were first informed and given the general information about the research and what was expected of them at different stages
2. By choosing to participate, they gave informed consent
3. They could refuse to participate, and they could withdraw at any time, even after the research had begun
4. Their response data was aggregated to above-individual level whenever possible

In physical events, the informed consent forms were distributed and signed at the beginning of the first gathering, before starting the actual workshop. During the Covid-19 pandemic, when all the meetings were held online, I collected the informed consents by e-mail.

In this research, as described in Section 3.1, I had a role as both a facilitator and an organiser of stakeholder workshops while also collecting research data through observation and documentation; several ethical points merit attention. First, transparency regarding the researcher’s multiple roles is essential. Clear
communication with participants about the researcher's involvement in both facilitating the workshops and collecting data helps establish trust and gain informed consent. The researcher’s multiple roles were explained to participants both in the written informed consent as well as at the beginning of the workshop series. Second, as a researcher fulfilling multiple roles, potential conflicts of interest may arise. In this case, there was a tension between the facilitation duties, which aim to support co-designing societally relevant pathways and policy recommendations, and my data collection responsibilities, which required maintaining objectivity. When the topics are political, there is a risk that the facilitator who sums up the discussions to the report highlights some topics more than the others. This was considered in the facilitation process, which included collective prioritisation and several commenting possibilities, as well as having facilitator pairs. Continuous discussions with the research team helped in navigating these situations and ensuring that the integrity of the research was not compromised.

Third, in processes like transition arenas, which include a limited number of participants, the anonymity of the participants is difficult to fully guarantee. This was discussed with the participants during the projects and towards the end of the projects. Project outputs were subject to a review of the participants prior to public disclosure. In accordance with open-data guidelines and the funder's requirements, the results of the projects were made public as a technical report, and in most cases, they were also made public as a policy brief. The drafts of the technical reports of the transition arena results included a list of the names of the participants, but the participants were given the opportunity to exclude their name from the list after reading the draft of the report. None of the participants wished to do that so we consider that the inclusion of their names was not a problem for them.
4. A summary of the articles

In this section, I present summaries of the five research articles included in this thesis. All the articles are co-authored. I am the first author in three of the five articles. All five articles are peer-reviewed through a double-blind review process and published in publications approved by the Finnish Publication Forum (JUFO). Four of the articles are published in scientific journals and one is a book chapter in a book published by Springer Nature.

Table 3 presents an overview of each article, describing the authors and the title, the research questions, and the article’s role in the thesis. The articles are numbered in chronological order to demonstrate the research journey. They have been written and published in the same order. The articles are appended to the dissertation.

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https://www.julkaisufoorumi.fi/en. JUFO ('Publication Forum' in English) ranks journal, conference and book publishing venues based on the quality, consistency and transparency of review processes. This helps to assess the quality of venues across disciplines because different disciplines prioritise and recognise different types of publication venues.
<table>
<thead>
<tr>
<th>Article number, authors, title, year</th>
<th>Research question(s)</th>
<th>The role in the thesis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article 1. Lähteenoja, S., Schmidt-Thomé, K., Päivänen, J., &amp; Terämä, E. (2021). The leadership and implementation of sustainable development goals in Finnish municipalities.</td>
<td>How is the leadership of sustainable development currently organised in Finnish municipalities? Which models can be abstracted?</td>
<td>It provides increased understanding of embedding sustainability in the practice of local-level leadership. It presents three models of SDG leadership at the local level. It recommends a participatory process, wherein SDGs are localised in a cross-sectoral manner.</td>
</tr>
<tr>
<td>Article 2. Salo, H., Berg, A, Korhonen-Kuki, K., &amp; Lähteenoja, S. (2022). Small wins enhancing sustainability transformations: Sustainable development policy in Finland.</td>
<td>What is Finland’s sustainable development policy scene like according to the 4Is framework? How have small wins manifested in the recent sustainable development policy’s development in Finland? What kind of potential do sustainable development small wins have to contribute to sustainability transformations?</td>
<td>It provides increased understanding of how changes of various sizes interact in sustainable development policy. It provides increased understanding of the role of small wins in paving the way for more transformative sustainability reforms.</td>
</tr>
<tr>
<td>Article 4. Lukkarinen, J. P., Salo M., Faehnle, M., Saarikoski, H., Hyysalo, S., Auvinen, K., Lähteenoja, S., &amp; Marttila, T. (2023). Citizen energy lost in sustainability transitions: Knowledge co-production in a complex governance context.</td>
<td>What kinds of system, target and transformation knowledge are co-produced in a transition arena promoting citizen energy communities in housing companies? How do the citizen energy roles in transitions become defined in the knowledge co-production process?</td>
<td>It provides increased understanding of how the decision-making and action in the existing and potential citizen energy communities connects to broader energy governance and policy priorities at local and national levels. It provides increased understanding of the use of the transition arena method in enhancing citizen energy communities.</td>
</tr>
<tr>
<td>Article 5. Lähteenoja, S., Marttila, T., Gaziususoy, I., &amp; Hyysalo, S. (2023). Transition co-design dynamics in high-level policy processes.</td>
<td>How a design-theoretical lens can support the analysis of transition co-design dynamics? What types of design and design competences are required in managing TA projects that support high-level and large-scale policy processes?</td>
<td>It provides increased understanding of what transition co-design consists of.</td>
</tr>
</tbody>
</table>
4.1 Article 1. The leadership and implementation of sustainable development goals in Finnish municipalities


This article was one of the starting points of my doctoral research. The article discusses the role of cities and municipalities in implementing the SDGs. Their role is crucial as many of the most significant sustainability initiatives (e.g., those linked to mobility or housing) are implemented at the local level. The article addresses the possibilities to accelerate transitions by embedding sustainability in the practice of local-level leadership. This is a matter of both substance and procedures. The local-level administration needs to know how to organise and orchestrate its sustainable development efforts and also needs to know which themes and actions to concentrate on in order to utilise the full local potential.

We examined whether the 2030 Agenda can support making the crucial choices in the context of cross-sectoral, strategic leadership and whether the SDGs can be localised in a manner that accelerates a systemic transition.

The broad research interests were the following: How do the municipalities embed sustainability into their operations? Which areas of sustainability receive the most attention and why? Which leadership models can accelerate the local-level sustainability transition? In more detail, we asked how the leadership of sustainable development is currently organised in Finnish municipalities and which models can be abstracted based on the action research done.

The conceptual framework of the article links the literature on sustainability transitions with public administration scholarship. In the action research, we identified the current baseline in the municipalities’ cross-sectoral strategic leadership work related to sustainability and we co-designed solutions that assist more long-term and coherent SDG leadership at the local level.

The partaking municipalities were at different stages both in their sustainability work in general and in their local adaptation/localisation of SDGs. Based on our findings, the following three different models for SDG leadership in municipalities were formed. Guiding stars is a model of strong high-level commitment and often ambitious goal setting. The power of networks model highlights the importance of coordination between different sectors and networks. The active individuals model shows how individuals and groups can start to act independently, even without high-level commitment. Sometimes good results at the grassroots level, however small, also support a gradual change in values and mindsets at the high level. The article describes the structures and agencies of each model, as well as their respective strengths and weaknesses in terms of sustainability acceleration. All of these models are abstractions, whereas in reality, most municipalities have features of the different models in their governing and management structures.
Although the approaches to adapting and utilising SDGs varied a lot among the case municipalities, there were several common features. One is using long-term strategic goals (as opposed to single, four-year timespan political targets) for formulating more robust and cohesive goals, for identifying key actions and for monitoring success in approaching sustainability. Secondly, sustainability work means dealing with a longer time horizon, advancing required long-term processes with perseverance, even stubbornness. Thirdly, SDGs provide the municipal sector with a shared language that can glue together experts working on diverse and seemingly incompatible challenges, ranging from saving the Baltic Sea to decreasing inequalities between demographic groups. While not solving any ethical questions per se, SDGs can be used to facilitate these often-challenging multi-disciplinary discussions and analyse their interlinkages – both synergies and trade-offs.

This study corroborated earlier findings on the crucial role of municipalities in the implementation of the SDGs. The mobilisation of change agents (cf. Hajer et al., 2015) committed to Agenda 2030 is very much ongoing at the local level but happens differently in diverse municipalities. The added value – as well as the challenge – of SDG implementation is its extremely cross-sectoral nature. Sustainable development can only become a guiding principle at the level of local decision-making when the localisation and local-priority setting have been conducted and integrated into the strategic goals of the city.

4.2 Article 2. Small wins enhancing sustainability transformations: Sustainable development policy in Finland


The second article is based on the results of the PATH2030 sustainable development evaluation work I led during 2018–2019 (see Section 1.3). Sustainable development is often associated with long timeframes and expectations of large transformations, making it overwhelmingly broad and challenging to interpret, predict and achieve. Addressing wicked problems, like sustainable development, may entail unrealistic expectations of rapid, radical and comprehensive solutions. So-called small wins are concrete and often incremental changes that can accumulate, scale up, broaden or deepen, and they can create momentum for larger-scale changes. Alone they might seem unimportant, but numerous small wins can yield transformative change towards unified goals. The article aims to increase understanding of how transformative governance and change take place by focusing on the ability of different types of wins to overcome sustainability governance challenges over time. We pay special attention to small
wins but also take note of changes of all sizes, including the larger and more transformative ones.

In summary, the Finnish sustainable development policy has essentially been about achieving a myriad of small wins. These wins have paved the way for more transformative and even radical changes, including the relocation of the sustainable development coordination secretariat to the PMO (representing institutions in the 4Is framework), the utilisation of sustainable development as an organising principle in Prime Minister Sanna Marin’s government programme (representing ideas in the 4Is framework), the large number of sustainable lifestyle tests taken (representing interests in the 4Is framework) and the yearly sustainability analysis of the state budget (representing information in the 4Is framework).

The results of this paper showed that the Finnish sustainable development policy has been built on both small and larger wins. Some of the more transformational policy changes seem to be accumulating from small wins, especially since the adoption of the SDGs in 2016 and Prime Minister Sanna Marin’s government term running from 2019 to 2023. During that time, the Finnish sustainable development policy seemed to benefit from the logic of attraction as previous small wins have provoked larger and more transformative changes, culminating in the government programme being based on sustainable development in 2019. Some of the small wins (the operational commitments, for example) have energised people by empowering and convincing them that they can make a difference towards achieving shared SDGs.

The findings reinforced the need for a two-fold strategy for sustainability transformations. Based on the research, sustainable development policy should strive for both small, continuous wins and larger, more revolutionary wins in order to truly contribute to sustainability transformations. Neither of the approaches is considered to be appropriate alone. By challenging the status quo on various fronts, small wins pave the way for more major reforms, such as the government programme being based on sustainable development. When the time is ripe (for example, politically or technologically), transformations can take place in a well-coordinated and coherent manner if a small-wins sustainable development policy has been applied in the long term.

4.3 Article 3. What does it take to study learning in transitions? A case of citizen energy in Finland

The motivation for the research presented in this article arose after I had co-facilitated two transition arena workshop series. I wanted to study the sustainability impacts of transition arenas as well as how the impacts can be measured. I soon realised that measuring the impact of a certain arena process in a society where several policy processes are going on at the same time at different levels is extremely difficult. This is why we decided to focus on learning in transitions.

In this article, we analyse a transition arena process that focuses on ways to increase renewable energy production via solar panels, heat pumps and other on-site solutions in urban areas (so-called citizen energy). The process was geared toward building a shared understanding of the action required to promote citizen energy among relevant actors. We use the learning levels or ‘loops’ framework (Bateson, 1972/2000; Argyris & Schön, 1978) because it is probably the learning theory that is most often referred to in the transitions literature. In their framework, first-order or ‘single loop’ learning occurs when the actor learns to purposefully adjust its response to the situation or to the variation within the situation, but the framing of the situation, the values guiding the action and so forth remain the same. Second-order or ‘double loop’ learning occurs when the learner questions the way in which he or she assesses the situation and/or the set of possible responses to it, thus extending the set of possible interpretations and the framing of responses to the situation. Thus, our research question is the following: Using the learning-level framework, what types of learning can be inferred to have taken place in the transition-arena process?

The method of designing and facilitating the CE Arena was built on the previous mid-range pathway-creation processes. The CE Arena had a special research design that supported the learning of the participants, as well as the possibilities to study learning.

Our results demonstrated that all the participants reported learning from the arena process. This learning was predominantly first-order learning within the participants’ extant pro-transition orientation. The majority of the participants reported content-related learning. For example, several respondents learned about the need and mechanisms to support decision-making processes in the housing companies related to investments into renewable energy. Furthermore, almost half of the participants pointed out the importance of collaboration between housing companies in the same neighbourhood in order to increase citizen energy in urban areas. Being able to directly link the new content to one’s work seemed to support first-order learning and led to more concrete plans.

Half of the participants also reported some second-order learning, indicating changing one’s interpretative framing of citizen energy. The most important lesson for the respondents seemed to be that housing companies do not have as good a basis for making decisions on renewable energy investments as the participants had thought. This led to the following: the energy companies considered rethinking the quality of the services available for housing companies; a public authority considered the challenge when planning future funding; and a city representative thought about how to support the local neighbourhoods in new ways and to put them at the centre of the climate work. According to this analysis, learning about the content of citizen energy was closely related to the
reported second-order learning. Overall, the multi-party envisioning process supported the participants’ ongoing transformation efforts more than it resulted in transformative learning.

As to the implications for building transition arenas that are conducive to learning, four issues stand out. First, the creation of well-working group dynamics by careful facilitation and selection of the participants enables a safe space for sharing ideas, which then supports learning about the viewpoints of other participants. Second, facilitated pathway creation, aimed at commonly agreed targets, enables learning about the content of the topic by providing common referents and externalising participants’ points of view. Third, having several sub-groups work on the same topic and goal and with the objective of sharing their productions with others before finalising their own pathways is an excellent way to encourage reflection and to gain a more comprehensive picture of the topic. Finally, given the different orientations and levels of expertise, organisers can level the interactions in important ways by providing a background memo that recounts key facts, ongoing policy processes and development projects for all participants.

4.4 Article 4. Citizen energy lost in sustainability transitions: Knowledge co-production in a complex governance context

https://doi.org/10.1016/j.erss.2022.102932

The fourth article complements the research by examining how the decision-making and action in the existing and potential citizen energy communities connects to broader energy governance and policy priorities at local and national levels. The data used for the analysis was collected in the same transition arena process as in article three. The CE Arena was carried out in spring 2020 in collaboration with the Ministry of Economic Affairs and Employment and the Ministry of the Environment, which are together responsible for implementing the new renewable energy and energy efficiency policies in Finland. The transition arena aimed to identify enabling and constraining factors for increasing citizen energy communities in housing companies based on on-site low-carbon energy solutions and to co-create transition pathways to inform policymaking on how to advance such community energy projects.

To analyse the citizen energy roles in the collective envisioning of the sustainable energy transitions, we utilised the framework of target, system and transformation knowledge (Noboa et al., 2018). System knowledge covers the empir-
ical aspects of contemporary systems, focusing on the drivers, barriers and uncertainties of change. *Target knowledge* deals with the purposive aspects with a view to gaining diverse actor perspectives and interests. *Transformative knowledge* can be derived from target knowledge by prescribing strategies for stakeholders to engage in transformative action.

The analysis shows how the different types of knowledge (system knowledge, target knowledge and transformative knowledge) are generated in the transition arena process and how the shared production of knowledge increases on each step, which is necessary for drawing systemic lessons in the sustainability transitions context. The enhanced role of citizen energy communities requires active and simultaneous coordination of multiple policy pathways.

The article reveals two layers of complexity in governing emerging energy community action. On the one hand, mobilising energy action in the communities faces dysfunctional decision-making structures, persistent everyday habits and very diverse socio-economic contexts. Overcoming these challenges requires new types of arrangements that involve reconfiguring administrative and market operations. On the other hand, mobilising energy action around the communities is currently characterised by mixed incentives, problematic administrative practices and weak targets. Thus, more active orchestration across the old positions, especially in urban energy systems, can be considered a necessity for engaging citizen energy communities in sustainability transitions. The four co-produced policy pathways provided starting points for these systemic considerations.

### 4.5 Article 5. Transition co-design dynamics in high-level policy processes


The fifth article brings together the different research areas of this dissertation. In this article, I contribute to the emerging literature at the intersection of design and transitions scholarship by empirically studying a process in which the tools and processes of designing for transitions were used in a high-level sustainable development policy process – the creation of a national sustainable development strategy by the Finnish PMO (the A2030 Arena, see Section 3.3.1).

To create an analytical framework for the research, we combined Buchanan’s (1992; 1998) ‘four orders of design’ and Young’s (2008) ‘complexity in design’ models (see Sections 3.3. and 3.4). We analysed the A2030 Arena process with this framework. This enabled us to expand our understanding of design in the context of transitions beyond the outputs and processes traditionally attributed
to design. Our analysis, assisted with this integrated analytical framework, resulted in new, empirically supported knowledge on the capabilities put on the table by design in transition contexts in addition to design's already acknowledged instrumental value. The created analytical framework can help analysing and planning future transition arena processes.

Our findings firstly indicate that designing for transitions consistently blends existing forms of design work in order to succeed. The need for expertise in the ‘lower orders’ of design and designing in and for context has not disappeared anywhere. In the article we argue that designing for transitions is not just another application area for any existing design expertise and methods. Designers work in novel ways and in new relations with other organisers and participants in transition endeavours. There is a special type of design orientation needed in facilitating the activities and phases involved in transition projects. These facilitators become experts in not only the preparation of materials and communication (signs, words, materials; cf. Buchanan, 1998) but also in facilitating co-design workshops (action), connecting outputs to guide further action (strategic planning) and in key phases of the process they are also able to integrate and ‘weave’ the contextual and material boundaries together (systemic integration). In all, there are good reasons to conceptualise design for transitions as an emergent and hybrid expertise area that does not belong to the current disciplinary boundaries of design or transitions.
5. Cross-cutting contributions

The articles summarised in Chapter 4 include the results of this research. However, there are also cross-cutting contributions which could not be fully elaborated in the articles due to their length. In this section, I synthesise the cross-cutting theoretical and practical contributions of this study.

5.1 Contributions to sustainability transformation studies: Small wins and big transformations

This section answers Research Sub-question 1: What kind of transformative potential can SDG implementation have at a national and local level? (Articles 1 and 2).

This research studied the transformative potential of the SDG implementation from two angles. First, we analysed the small wins and big transformations in national sustainability policies in Finland. We found out that the Finnish sustainable development policy has been built on both small and larger wins, and some of the more transformational policy changes seem to be accumulating from small wins. As concluded in Article 2, while a sustainable development policy based solely on small wins can be too slow and incremental in regard to meeting the major sustainability challenges of our time, it would pave the way for more transformative reforms. However, to achieve sustainability transformations, small wins need to contribute to a more or less shared ambition at a higher level. Supporting the small wins framework of Termeer and Dewulf (2019), my findings manifest the value of small, continuous wins and larger, more revolutionary wins in truly contributing to sustainability transformations.

Second, as presented in Article 1, this research produced new knowledge on SDG implementation and leadership at the local level. The role of local-level implementation is crucial as many of the goals and targets are implemented at the local level. At the local level, embedding sustainability in the practice of city or municipal leadership is a matter of both procedures and substance. The local-level administration needs to know how to orchestrate its sustainable development efforts as well as understand which themes and actions to concentrate on in order to utilise the full local potential. Based on action research with 12 municipalities, we identified three different sustainable development leadership
models at the local level. The guiding stars model represents a model of strong, high-level commitment and often ambitious goal setting. The power-of-networks model highlights the importance of coordination between different sectors and networks. The active individuals model shows how individuals and groups can start to act independently, even without high-level commitment. All of these models are abstractions; in reality, most municipalities have the features of different models in their governing and management structures. However, these models can help studying and gaining a wider understanding of the leadership of complex sustainability topics at the local level (Article 1). The results highlight the importance of the top-level leadership’s commitment to sustainability. If the strategic goals of the city or municipality are in line with sustainable development, there is transformative potential.

5.2 Contributions to transition management studies: The policy edition of the transition arena

This section answers Research Sub-question 2: How can transition arenas be incorporated in governmental policy processes? (Articles 3, 4 and 5).

Compared with the earlier use of mid-range transition arenas for informing policy processes, in this research the mid-range transition arenas were applied to directly support a national-level policy process on sustainable development strategy creation (see Article 5). For this purpose, the traditional transition arena process (Loorbach, 2010) and its mid-range edition (Hyysalo et al., 2019a, 2019b, 2019c) were partly redesigned. As presented in figure 15, the ‘policy edition’ of mid-range transition arenas is situated in between the original transition arenas and regular policy arenas. The policy edition contains four main differences to the original transition arenas, bringing it closer to the formal policy arenas.

First, the participant selection process can be different in the policy edition. While in the original transition arenas the participants are carefully hand-picked experts and frontrunners, the policy edition includes participants that are already part of a certain process. This can be strictly pre-determined – such as the members of a commission, as we had in the A2030 Arena – or there can be some room for inviting external experts and stakeholders. This also influences the size of the participant group: while in the original transition arena the ideal size of the group is typically around 15–25, in the policy edition the participant group can be several times larger as the stakeholders are often pre-designated.

Second, the role of participants can be different in the policy edition of the transition arena. In the original transition arena methodology, it is highlighted that the participants should participate as individuals and not represent their background organisations. This cannot be fully applied in the policy edition if the participants have been elected to represent a certain group or a party. The
participants may want to prepare or ask the opinion of their background organisations and this needs to be considered in the process design. While the original transition arenas aim for free co-creation and regular policy arenas often focus on detailed short-term negotiation, the policy edition has elements of both. In the 2A030 Arena, we started the transition pathway phase by co-designing the first versions with the participants. After that, we included an additional phase of cross-examining synergies and coherence between different pathways. This enabled the participants to comment on the other pathways as well as allowing them to hear and get feedback from their organisations.

Third, and linked to the second point, in the policy edition, co-designing the transition pathways can also include negotiations. In the original transition arenas, negotiations are replaced with alternative pathways presenting alternative ways of reaching the same goals. In the regular policy arenas, bilateral negotiations can be an important part of the process. In the policy edition of the transition arena, bilateral negotiations happen in between the workshops and outside the common programme. Here, the role of the organiser (e.g. a hosting ministry) is crucial as they have the mandate to negotiate. If there are significant differing opinions at the end, it is important to document them carefully. In the 2030 Agenda, one organisation left a written differing opinion which was included as an annex to the roadmap.

If the transition arena is part of a formal policy process, it can already have a direct influence on the vision and goal-setting phase. While in the research- and frontrunner-led arenas the goals can and should be visionary, the formal policy processes may require the use of existing and already politically agreed goals, and thus, legitimate, normative goals. Alternatively, the goals can be more loosely defined with phrases such as increase and reduce instead of clear quantitative targets. To retain transformative potential, the selection of legitimate yet ambitious political visions and goals as the starting points for the transition arena becomes paramount.

Fourth, the focus of the pathways and the level of details in the policy edition of the transition arena can be different to the original arenas. While regular policy arenas focus on solving short-term problems and while the original transition arenas focus on searching and defining long-term problems, the policy edition aims to frame the key agenda points and needed steps in the mid-range pathways. If the topics are large and complex, the level of detail may need to be lower than has been the case in mid-range arenas with frontrunners (cf. Hyysalo et al., 2019; Articles 3 and 4). The transition arenas should be utilised in the agenda-setting phase, and as also described by Auvinen (in press) in her forthcoming dissertation, the political decision-making should take place after the transition arena.
5.3 Contributions to design for transitions studies: The types of design involved in transition arena processes

This section answers Research Sub-question 3: What types of design are involved in advancing sustainability transformations through transition arenas? (Articles 4 and 5).

This research contributes to the emerging literature appearing at the intersection of design and transition scholarship by empirically studying a process in which the tools and processes of designing for transitions were used in a high-level sustainable development policy process. The case provides an empirical example of how to examine transition co-design dynamics by using Buchanan’s (1992, 1998) four orders of design and Young’s (2008) complexity in design models as a framework (see Article 5). As described in Article 5, the integrated analytical framework is both a theoretical and a methodological contribution at the intersections of two of the fields in which this research is situated: sustainability transformations and design research.

As a result, we found that all four orders of Buchanan and all three levels of Young were present in the A2030 Arena process. Table 4 gives examples of the types of design and design actions included.
Table 4. A summary of the levels of design and examples of different design actions involved in the A2030 Arena process (source: the author, adapted from a table presented in Article 5).

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<tr>
<td>Communication (1)</td>
<td>Communication between the project owner and transition arena (TA) design experts is negotiated</td>
<td>Communication between actors is designed with the project owner and the core TA team, supported with invited facilitators</td>
<td>External communication takes place in an already set context after the contents for communication have been refined together</td>
</tr>
<tr>
<td>Construction (2)</td>
<td>The structure for TA collaboration is set by the core TA team</td>
<td>The contents for the TA series are produced by a core TA team, contextual project owner and the invited facilitators</td>
<td>The actual TA work outcomes (pathways, change narratives) are co-designed with participants and facilitators</td>
</tr>
<tr>
<td>Strategic planning (3)</td>
<td>The setting for TA work is developed (e.g. pathway topics are developed)</td>
<td>The transition pathways are developed</td>
<td>The action points are considered based on the results of TA work</td>
</tr>
<tr>
<td>Systemic integration (4)</td>
<td>The TA work took place in internationally set A2030 context</td>
<td>The mid-range TA work was adjusted into an A2030 context by the contextual project owner and core TA team</td>
<td>The outputs are taken to external networks by all participants</td>
</tr>
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My findings indicate that designing for transitions consistently blends existing forms of design work to succeed. In different phases of the transition arena process the focus in design action shifts from studying and assessing the context (the design of context) to developing improvements to actor networks, socio-technical systems and collaborative process (designing context) and further onto supporting further work in the developed context (design in context). From a design perspective, the process is complex, and in many phases it is impossible to implicitly define to which level a certain phase belongs. The same applies to design orders (cf. Buchanan 1992, 1998): two or three out of four orders are present in most of the phases. Fourth-order design especially takes place in the beginning and at the end of the process and when working at the level of design of context; it takes place less at the level of design in context.

This research resulted in new, empirically supported knowledge of the capabilities put on the table by designers in the transition context. Design for transitions, especially at the level of the design of context (cf. Young, 2008), requires hybrid expertise that covers different design levels, and it requires understand-
ing the transformation needs in the content that is being co-designed. In transition co-design processes, a multidisciplinary team composition is a (practical) necessity (Hyysalo et al., 2019a), and this is further underscored in the policy edition of mid-range transition arenas in which the organising team must have a deep understanding of the policies and political processes involved in the domain.

5.4 The opportunities for transition arenas to advance sustainability in governance and policy processes

This section summarises the findings related to the main research question: What can transition co-design offer in the governance and policy processes related to sustainability transformations? (Articles 3–5).

As an emerging field with numerous different approaches and methods, transition co-design can support governance and policy processes related to sustainability transformations in several ways. In this research, the focus was on the use of mid-range transition arenas as part of ministry-led governance and policy processes. Figure 16 summarises the main advantages of using the transition arenas found in this research. It is not an exhaustive list, but highlights the main findings, taking into account the circumstances and operating environment in which this research was conducted.

Figure 16. The main advantages of utilising transition arenas in advancing sustainable development policies according to the results of this study.
According to the results of this study, transition arenas related to sustainability transformations, when embedded in governance and policy processes have two main advantages and numerous other advantages. These have been reported and discussed in Articles 3, 4 and 5, and thus, I will only summarise them here. Our transition arenas clearly increased the understanding of systemic change among the arena participants and facilitators. This was raised not only by the participants but also by the facilitators of both of the transition arenas studied in this research, and it links well with the original goals of the transition arenas (Loorbach & Rotmans, 2010). As can be seen in the resulting pathway descriptions and narratives, the mid-range arenas offer a space for thinking further than typical political cycles of four to six years and, at the same time, they are more concrete than one can be with a 25–40 year time frame in which it is relatively easy for participants to converge on ambitious future actions while placing little pressure on parties to act on the convergence in the present.

Pathway co-design enables creating positive and bold future visions together with relevant peers. The participants of the A2030 Arena created six visions for different change areas that are positive, consider significant changes to the current system and are still considered possible to reach. In addition, the pathway groups set more or less concrete mid-term goals, depending on the case. Agreeing on goals can be a major achievement in some cases. In other cases, if there are no official goals or if there are major uncertainties or differing opinions, it is possible to use more abstract goals. Furthermore, the pathway creation work makes the phase of transformation visible in certain systemic change areas. In the A2030 Arena, the work made it evident that some sectors (such as the energy sector) are more advanced in their sustainability transitions than other sectors (such as the nature and biodiversity conservation sector).

As reported by the participants in the interviews after the CE Arena, both the linkages between different steps and actions and the fact that (often) the current actions are not enough to reach the goals were made visible by the pathway creation work. The most fruitful knowledge co-production events often happened after acknowledging the insufficiency of current actions in regard to reaching the goals. During that phase, the group (at its best) co-produces ambitious steps to reach the agreed goals. This can also bring new topics to political discussion, and the arena can work as a space in which to discuss broader topics than those that it is possible to discuss in the everyday work of policy and governance. All this advances mutual learning among the participants, as reported in more detail in Article 3.

The second main advantage of the use of transition arenas, according to the findings of this research, is that the arenas can expand the agency of different actors in sustainability transformations. One reason for this can be that in our transition arenas, instead of leaving the steps to a passive form, we push the participants to name actors that are responsible for the steps. In the A2030 Arena, the transition pathways were formulated as narratives of change, including descriptions on the needed actors, their roles and developments that
lead to the desired future (see Wittmayer et al., 2019). This led to **increased understanding of the roles and agencies of different stakeholders, and most importantly, it led to increased understanding of one’s role in transformations** (see also Avelino & Wittmayer, 2016; Wittmayer et al., 2017; Grin et al., 2011; Loorbach, 2010; Smith et al., 2005). In the CE Arena, as reported in Article 3, the most important lesson for the interview respondents seemed to be that the housing companies do not have as good a basis for making decisions about renewable energy investments as the participants had thought. This led the energy companies to consider rethinking the quality of the services available for housing companies, it led a public authority to consider the challenge when planning future funding and it led a city representative to think about how to support the local neighbourhoods in new ways and put them at the centre of the climate work. Roorda et al. (2014, p. 12) reported similar outputs regarding the collective empowerment of participating actors. Thus, transition arenas can **build networks that support niche development**, as also highlighted by, for example, Hebinck et al. (2018) and Marttila et al. (2023).

During the planning and preparation of transition arenas, we aim to **provide a safe space for difficult conversations**. The A2030 Arena process, with its thematic sub-groups, was able to develop into a deliberative space in which it was possible to also discuss difficult topics that raised conflicts among the participants, such as the topic of biodiversity loss and nature conservation versus economic utilisation of forests. The final strategy raises difficult topics as important topics for further work, even if it does not provide solutions to all of them. This is typical in policy processes at this level: they set topics for political agendas which will be further discussed and concretised in other policy and governance processes. In this regard, the policy edition differs from the idea of Loorbach and Rotmans (2010, p. 243), who highlighted that a transition arena is a ‘protected environment without any power hierarchy’. When bringing transition management initiatives closer to official policy processes, questions of power and hierarchies also become important (see also Meadowcroft, 2009, 2011; Shove & Walker, 2007).

A transition arena can acknowledge and document conflicting views and **build trust among different stakeholders**, even among those who are often seen as opposing each other or competing with each other (see also Franzeskaki & Kabisch, 2016; Frantzeskaki & Rok, 2018). Loorbach and Rotmans (2010, p. 244) called for ways to also engage regime actors in addition to frontrunners, and having regime actors involved succeeded in the cases studied in this research.

In regard to the research question, I have here summarised the advantages of the transition arena methodology in the selected context. During the study, challenges in using the methodology were noticed. The method is time-consuming for both the organisers and the participants, and it has been difficult to show evidence of the acceleration of sustainability transitions or of second-order learning (see Article 3). If the topics are very broad, the co-designed solutions may stay on a very general level. If there is no direct continuation after the transition arena, there is a risk that the ideated initiatives are not developed and
implemented. Thus, the challenges are well in line with the ones highlighted by other scholars (e.g. Pirinen, 2016; Pirinen et al., 2022; Heiskanen et al., 2010; Hyysalo & Lehenkari, 2002; Lewis et al., 2020; see Section 2.3.2). However, within the context of this research, there seem to be clear benefits to utilising or embedding the methods of transition co-design in formal sustainability policy and governance processes.

5.5 The key contributions to practice and policy recommendations

Several of the theoretical contributions reported earlier in this section actually also include elements that are relevant to practice. As all of my research cases have been linked to policy and development processes, the research has also had practical contributions, such as ten transition pathway descriptions (see the technical reports listed in Appendix 1), one policy brief (Lähteenoja et al., 2019) and the renewed national sustainable development strategy (an indirect contribution) (PMO Finland, 2022). Below, I highlight three practice-relevant contributions or recommendations of this research:

- The findings of this research reinforce the need for a two-fold strategy for sustainability transformations. Sustainability policies should strive for both small, continuous wins and larger, more revolutionary wins in order to truly contribute to sustainability transformations. Neither of these approaches is considered to be appropriate alone (see Article 2).

- This research introduced a policy edition of the mid-range transition arena. The edition could and should be used in policy processes related to sustainability transformations, especially when there is a need for mid-term pathway creation, increasing the understanding of systemic change and expanding the agency of different actors in sustainability transformations.

- The identified sustainability leadership models can be used in cities and municipalities when identifying and adapting suitable sustainable development leadership models. To increase the transformative potential, this study suggests that local leaders could and should consciously use SDGs for shared strategy making, as well as for experts’ and stakeholders’ motivation (see Article 1).
5.6 Limitations and recommendations for further research

This research indicates both limitations and new research directions. When studying sustainable development policies, it is good to acknowledge that the importance and relevance of the topic in political agendas varies. During 2019–2023, a major period of my doctoral studies, Finland had a government programme that emphasised sustainable development. The following government, which started their work in 2023, barely mentions sustainable development in their programme. The change of government programme offers a huge empirical possibility to continue the research on small wins and larger sustainability transformations and reassess the findings presented in Article 2. In the end, the context determines what is considered a small win and what is considered a larger transformation, and political cycles can significantly either accelerate or hinder the development.

Further, the 2030 Agenda is relevant in 2024, but it will be outdated within one ‘mid-range’ time period and followed by something else. However, despite the different emphases and terms used over time, the main messages of sustainable development have stayed the same for decades, and it is becoming more urgent to solve the challenges. However, the findings related to the importance of small wins and the leadership models of sustainable development will stay valid beyond the time frame of the SDGs: the policy recognition of sustainable development will vary and the programmes will change, but the need for sustainable development policies will stay.

This research includes only two transition arena processes as case studies on transition co-design, and only one of them was directly part of a policy process. In addition to the A2030 Arena, there has been one other transition arena closely linked to a policy process which was related to a national biodiversity strategy creation. I was involved in that arena as well but it was not included as a case that was analysed in this research. More empirical studies on the policy edition of the transition arena are needed.

Another limitation of this study is that the case studies were only conducted in Finland. Co-design arrangements are closely related to cultural contexts and what works in one country may not work somewhere else. As an example, the discussion culture in Finnish working life is rather straightforward and people are used to going directly to the topic. This enables efficient workshop scheduling. In some other countries, more time for warming up and discussion would probably be needed. Similarly, in Finland, there is a high trust and low hierarchies between different organisations, including the private sector. Here in Finland, we have even been able to invite competitors to the same events and still achieved an atmosphere of trust. This may not be possible in some other countries. Thus, when utilising transition co-design methods in other countries and cultures, it is important to make adaptations so that they fit the context (see also Heiskanen et al., 2009).

This research provided an empirical analysis of what transition co-design actually means in the contexts of sustainability policy and governance. In Article 5, we recommend several further research directions related to transition co-
design. Here, I want to highlight the importance of continuing to study the agency of design in highly complex policy and governance processes. As stated in Article 5, given that design for transitions appears to be a hybrid expertise, situated at the intersection of the two fields of inquiry and practice, it requires careful consideration of the implications of this ‘in-betweenness’ for future educational and professional development activities in both fields.

This research was limited by the lack of longitudinal in-depth material in several cases. Future research could include a longitudinal analysis of how small wins have appeared and evolved in relation to transformations more thoroughly. Similarly, when studying learning in transitions, it would be interesting to analyse longer time frames. This study underscores that individual learning in transitions is a complex but worthy topic of study. My results provide a basis for further development of a learning-sensitive approach that enables the identification and consideration of the methodological challenges involved in inferring learning. Furthermore, the wider societal impact of the transition arena interventions remains partially unknown. Future research could analyse the impact trajectories of transition arenas and similar processes and, based on that, further develop the methods and design different adaptations for them.

5.7 Concluding thoughts

The 2030 Agenda represents a comprehensive and ambitious framework for addressing a wide range of global challenges. Implementing the SDGs globally would mean ending poverty, reducing inequality within and among countries, and achieving environmental sustainability, for example. However, the SDGs represent a policy compromise rather than target setting following scientific advice. Therefore, even the full achievement of the targets does not guarantee full sustainability, but it would still mean that transformative changes have been achieved.

Unfortunately, in 2024, over the midpoint from 2015 to 2030, we are off track and it seems that humanity will not achieve the 2030 Agenda. The challenges include a lack of political commitment and policy coherence, weak governance and a lack of finance, among many other challenges. However, with regard to sustainability transformations, the journey towards achieving the SDGs can be as important as the destination as the journey needs to continue beyond achieving the SDGs. Even if complete achievement will be unlikely by 2030, it is still possible by 2050 (Bernstein et al., 2023). Sustainable development gives a direction for continuous efforts to advance sustainability and improve the well-being of people.

I want to conclude by highlighting that, obviously, co-design will not solve the huge environmental and social crisis we are facing. The findings presented in this study do not answer the urgency presented in Section 1.1. To accelerate sustainability transformations, we need binding regulation, strong financial instruments and massive investments from both public and private sectors. However,
in democratic societies, the expectations for rapid transformations have not ma-
terialised, and hence, strategies combining both incremental and more trans-
formative changes are needed. Thus, I see significant value in transition co-de-
sign as a way to enhance peaceful transformations.
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Appendix: A list of the technical reports of the case studies


We are living in an era marked by multiple environmental and social crises. New mechanisms are needed to guide nations towards sustainability.

Finland’s sustainable development policy relies on voluntary action and broad societal involvement, which often leads to small policy wins. Although this approach can be too incremental and slow to address the challenges of our time, small wins can pave the way for more transformative policy changes.

Transition co-design appears to have potential in advancing sustainability transformations. This thesis further develops the transition arena method and introduces a policy edition of it, allowing for its integration into official policy processes. Participants in the transition arenas reported an increased understanding of systemic changes and of the roles of various actors in sustainability transformations. This thesis recommends using transition co-design methods in complex sustainability-related policy processes.