

VTT Technical Research Centre of Finland

Creating conditions for sustainability transformation through transformative governance – The case of plastic food packaging in Finland

Sundqvist, Henna; Åkerman, Maria

Published in:
Journal of Cleaner Production

DOI:
[10.1016/j.jclepro.2023.140296](https://doi.org/10.1016/j.jclepro.2023.140296)

Published: 01/01/2024

Document Version
Publisher's final version

License
CC BY

[Link to publication](#)

Please cite the original version:

Sundqvist, H., & Åkerman, M. (2024). Creating conditions for sustainability transformation through transformative governance – The case of plastic food packaging in Finland. *Journal of Cleaner Production*, 434, Article 140296. <https://doi.org/10.1016/j.jclepro.2023.140296>



VTT
<http://www.vtt.fi>
P.O. box 1000FI-02044 VTT
Finland

By using VTT's Research Information Portal you are bound by the following Terms & Conditions.

I have read and I understand the following statement:

This document is protected by copyright and other intellectual property rights, and duplication or sale of all or part of any of this document is not permitted, except duplication for research use or educational purposes in electronic or print form. You must obtain permission for any other use. Electronic or print copies may not be offered for sale.



Creating conditions for sustainability transformation through transformative governance – The case of plastic food packaging in Finland

Henna Sundqvist^{a,*}, Maria Åkerman^b

^a VTT Technical Research Centre of Finland Ltd, Tekniikantie 21, 02044 Espoo, Finland

^b VTT Technical Research Centre of Finland Ltd, Visiokatu 4, 33101 Tampere, Finland

ARTICLE INFO

Handling Editor: Jian Zuo

Keywords:

Environmental policies

Food packaging

Plastics

Sustainability transformation

Transformative governance

ABSTRACT

Transformative governance is an emerging approach to addressing major sustainability challenges. Despite the mounting research on this topic, there is still limited understanding on how to create conditions for transformation in practice. Through an analytical frame of transformative governance, in this qualitative case study we investigate how policies and governance in Finland have created conditions for sustainability transformation in food packaging, a key source of plastics pollution, and how the joint implementation of different transformative approaches affects their power to induce systemic change. Our results, based on policy mapping and stakeholder interviews, show that applying principles of transformative governance is necessary but not yet effective enough for creating conditions that encourage and motivate key actors to advance in sustainability transformation. Joint implementation of different transformative approaches and modes of governance can be beneficial, but it is also challenging and may in the worst case even weaken the transformative power and slow down progress. The current governance has fostered packaging waste recycling but does not effectively solve the root cause of unsustainability: mounting consumption of single-use packaging, despite current policy targets and active use of transformative approaches. To reduce packaging consumption and create favourable conditions for packaging reuse, more emphasis is needed on transformative innovation policies, as well as setting more ambitious and proactive measures such as implementing tighter legislation and carrying out ex-ante impact evaluations when designing new policies and regulation. Integrative governance should also be strengthened to improve directionality and policy coherence.

1. Introduction

As anthropogenic environmental problems, such as plastics pollution, put entire socio-ecological systems under increasing pressure, new governance approaches are being sought (Chaffin et al., 2016; Salo et al., 2022; Visseren-Hamakers et al., 2021). What makes solving grand challenges difficult is their nature as wicked problems, characterised by fundamental value conflicts, contested goals, and knowledge uncertainties. Furthermore, many urgent sustainability issues fall between policy fields into an institutional void (Hajer, 2003). This is also true of plastics pollution, a key source of which is food packaging (Miller et al., 2018). Despite contributing to plastics pollution, single-use packaging is also essential for protecting, containing, and ensuring the performance of global food supply chains, reducing food loss, and diminishing the negative climate impacts of food supply (Marsh and Bugusu, 2007; Williams and Wikström, 2011).

Public environmental policies are important drivers of sustainability transformations. However, environmental policies are often criticised as suffering from incrementalism and low effectiveness (Jacob and Ekins, 2020). Many governments and actors have taken steps to mitigate and combat plastics pollution and improve packaging sustainability (Rhein and Sträter, 2021; Trubetskaya et al., 2022), but existing efforts tend to be fragmented and focus on single issues rather than a systems perspective (Chakori et al., 2022). This fragmentation is not effective in driving system-level transformations (Chakori et al., 2022; Jacob and Ekins, 2020). Furthermore, the ability of governance measures to transform the systems is limited if they do not properly guide the direction of change (Weber and Rohrer, 2012) or address the underlying causes of environmental problems (Jacob and Ekins, 2020; Visseren-Hamakers et al., 2021). Therefore, many scholars argue that sustainability transformations require holistic, transformative environmental governance (Jacob and Ekins, 2020) that addresses the root

* Corresponding author.

E-mail addresses: henna.sundqvist@vtt.fi (H. Sundqvist), maria.akerman@vtt.fi (M. Åkerman).

<https://doi.org/10.1016/j.jclepro.2023.140296>

Received 8 September 2023; Received in revised form 13 December 2023; Accepted 18 December 2023

Available online 22 December 2023

0959-6526/© 2023 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

cause of a targeted problem (Visseren-Hamakers et al., 2021) and combines traditional environmental policy measures with systematic innovation policies (Kern et al., 2019; Kivimaa and Kern, 2016; Rogge et al., 2020). It thus seems evident that to transform the food packaging system into a more sustainable state, transformative governance would be needed.

Despite increasing research interest in transformative governance, the current understanding of how to create conditions for transformation in practice remains limited (Visseren-Hamakers et al., 2021). While the need for case studies investigating the constraints and opportunities of transformative governance was identified almost a decade ago (Chaffin et al., 2016), there is still a lack of empirical evidence due to slow adoption of transformative principles in sustainability governance. With this article, we aim to address these gaps and contribute to the literature on transformative governance with new knowledge on opportunities and shortcomings related to the joint implementation of transformative governance measures. Our article is based on an empirical case study of food packaging governance within an EU member state, Finland. Our key research questions are: 1) *how existing policies and governance approaches have created conditions for sustainability transformation in food packaging in Finland* and 2) *how the joint implementation of different transformative approaches may reinforce or impede their power to induce change*. To answer these questions, we elaborate an analytical framework on transformative governance and use it to explore the application and intertwining of different transformative governance principles in policy goals and agendas. Furthermore, we investigate how key actors of food packing perceive the power of these actions to create favourable conditions for systemic change.

This paper is structured as follows: Section 2 introduces the theoretical background of transformative sustainability governance and presents the analytical frame based on previous literature. In section 3, we describe our research approach and methods. Section 4 summarises the policies and measures through which food packaging is currently governed and analyses how governance measures have been able to create conditions for sustainability transformation. Section 5 discusses the opportunities and challenges of applying the principles of transformative governance in practice. Finally, Section 6 concludes the study and suggests future research objectives.

2. Theoretical background

2.1. Transformative sustainability governance

The fundamental societal changes leading to sustainability transformations are inherently political (Eckersley, 2021; Patterson et al., 2017). Therefore, increasing the understanding of governance towards sustainability in complex systems with multiple and contested goals, multiple actors, and fundamental value conflicts is acknowledged as essential in the literature (Chaffin et al., 2016; Edmondson et al., 2018; Patterson et al., 2017). In this article, governance is seen not only as rules, rulemaking systems and actor networks, but also as a process which, according to Lange et al. (2013:406), is ‘—more or less institutionalised—interaction between public and/or private entities ultimately aiming at the realisation of collective goals.’ In our case, the collective interest is sustainability of food packaging. What makes this issue complex is the contested meanings of what sustainability means in this case (Dörnyei et al., 2023; Sundqvist-Andberg and Åkerman, 2022).

The idea of transformative sustainability governance draws particularly on the social-ecological systems literature and builds on resilience and adaptive governance approaches (Chaffin et al., 2016; Folke et al., 2005; Visseren-Hamakers et al., 2021). While adaptive governance aims to sustain the incumbent system by building resilience and adaptive management, the goal of transformative governance is to shape the system into a more desirable one (Chaffin et al., 2016; Walker et al., 2004). Transformative governance is called for when conditions of the system have become or are becoming unsustainable and the adaptive

governance mechanisms are insufficient to maintain the desired conditions (Chaffin et al., 2016). In other words, mere mitigation and adaptation are not enough; a more fundamental, deliberate change is needed. Transformative governance can be proactive or reactive. The latter tries deliberately to alter the current undesired direction of change (ibid.). In both cases, transformation requires new capacities, like leadership and innovation (ibid.), and efforts in capacity building (Wolfram, 2016). Thus, to be successful, transformative governance should set conditions to initiate and manage a desired change in a system. Problem framing, agenda setting, and deliberation play a key role in this process (Chaffin et al., 2016; Wolfram et al., 2019).

Over time, transformative governance has also become increasingly rooted in studies of technological transformation and innovation studies as a part of sustainability transitions research (Chaffin et al., 2016; Köhler et al., 2019; Lange et al., 2013; Pattersson et al., 2017) and has been studied particularly within transition management (Loorbach et al., 2011) and strategic niche management literatures (Schot and Geels, 2008). Transformative governance has also been studied within innovation studies, with growing interest in transformative innovation policies as means for sustainability governance (Haddad et al., 2022). In contrast to more traditional innovation policies aiming to support any innovations for the promotion of economic growth, transformative innovation policy addresses key societal challenges (Grillitsch et al., 2019). Furthermore, there has been growing interest within environmental policy research in combining environmental policy studies with innovation policy approaches to reach a more comprehensive, transformative environmental policy approach (Jacob and Ekins, 2020).

Despite recent research, debates around transformative sustainability governance are still fragmented. However, all the theories share the understanding that sustainability transformations are fundamental and that long-term system changes require a holistic governance approach to a variety of measures on different scales—including temporal (short vs. long-term), geographic (local vs. global), level of change (radical vs. incremental), and level of sustainability (strong vs. weak)—and that these cumulative changes must be aligned with a longer-term transformative agenda or goals (Lorek and Fuchs, 2013; Patterson et al., 2017; Salo et al., 2022; Termeer and Metzke, 2019). Therefore, transformative governance needs to combine different modes and a mix of policies that reinforce each other and, when necessary, support innovation and organise exnovation out of incumbent systems (Edmondson et al., 2018; Jacob and Ekins, 2020; Kern et al., 2019; Rogge et al., 2020). Besides policy coherence, it is suggested that leadership and agenda setting, active participation of diverse actors, information exchange, and adaptivity and reflexivity, combined with distributed power and the presence of democratic institutions, can foster transformative change (Chaffin et al., 2016; Glass and Newig, 2019; Jacob and Ekins, 2020; Rijke et al., 2013; Stirling, 2006; Visseren-Hamakers et al., 2021; Westley et al., 2011).

2.2. Studying transformative sustainability governance in action

As discussed in the previous section, transformative governance requires a broad set of different approaches and measures to create conditions for systemic change. Visseren-Hamakers et al. (2021) recently proposed a framework for studying transformative governance in the field of biodiversity policy. According to them, governance becomes transformative if it entails integrative, inclusive, adaptive, and pluralist approaches that are jointly implemented and operationalised and if it addresses the root causes of unsustainability. Integrative governance entails a mix of policies and measures that enhance coherence across sectors, issues, and governance modes while addressing the root causes. Policy coherence demands coordination and integration of sustainability concerns in different strategies and policies (Visseren-Hamakers, 2018; Visseren-Hamakers et al., 2021). Thus, studying integrative governance also requires an understanding of policies and policy mixes (Jacob and Ekins, 2020; Kern et al., 2019) and context-specificity in implementation

(Kelemen et al., 2023).

Inclusive governance addresses power asymmetries and enables underrepresented rights-, knowledge- and stakeholders to participate in the decision making, thus favouring deliberation and collaboration (Visseren-Hamakers et al., 2021). While Chaffin et al. (2016) distinguish between transformative and adaptive governance approaches, Visseren-Hamakers et al. (2021) incorporate adaptive governance into transformative governance and include actions that stimulate dialogue, learning, and reflection. Also, in other strands of the sustainability governance literature, particularly in reflexive governance (Newig et al., 2007; Voß et al., 2006), learning and reflection are seen as integral elements that contribute to transformation by building reflexivity, i.e., social/political dimension, and reflectiveness, i.e., cognitive dimension of governance (Stirling, 2006). The fourth governance approach suggested by Visseren-Hamakers et al. (2021), pluralistic governance, refers to considering diverse values, perspectives, and knowledge systems, including collaborative knowledge production and transformative capacity building.

The analytical framework suggested by Visseren-Hamakers et al. (2021) places a lot of emphasis on deliberation, collaboration, negotiations, and coordination across sectors, timescales, and spheres of action. Reflexive approaches together with inclusive and adaptive approaches form a basis for collaborative governance (Newig et al., 2018). While these aspects are integral to learning and adaptation, we argue—in line with previous transformative environmental and innovation policy literatures—that for governance to be transformative, it should also entail approaches that clearly drive a more deliberate renewal of the system. Therefore, for the purposes of our study we have elaborated the framework to include approaches of innovative and anticipatory governance as presented in Table 1. By innovative governance we mean not only that innovations should be actively promoted through appropriate innovation policy measures (Haddad et al., 2022; Jacob and Ekins, 2020; Kern et al., 2019), but also that governance fosters policy experimentation (Jacob and Ekins, 2020). Anticipatory approach refers to governance that is proactive (cf. Chaffin et al., 2016), including activities that support transformative capacity building (Wolfram, 2016; Wolfram et al., 2019) and encourage stakeholders toward joint visioning and target setting needed to build long-term transition agendas (Chaffin et al., 2016; Loorbach et al., 2011). We will use these categorisations as presented in Table 1 to study how different transformative approaches are present in the existing food packaging governance in Finland and how they create conditions for sustainability transformation.

In reality, the suggested governance approaches and related transformative mechanisms (Table 1) do not occur in isolation but are interrelated and have synergies with each other (Visseren-Hamakers et al., 2021). Joint implementation of differing approaches may also create paradoxes and require trade-offs (Qi and Ran, 2023). As frequently emphasised in studies on collaborative governance, while diversity and consensus building are cornerstones of collaborative governance (Ansell and Gash, 2008), these principles are potentially

contradictory. For example, including diverse stakeholders enables combining multiple perspectives, values, and knowledge, but may also create competition over goals and perspectives, making consensus building more difficult (Qi and Ran, 2023). Furthermore, collaborative measures are likely to be less effective than regulatory measures in achieving ambitious environmental outcomes, especially if the expected outcomes contradict stakeholders' interests (Newig et al., 2018; Qi and Ran, 2023). Although these paradoxes have been widely discussed within collaborative governance studies, they have received surprisingly limited attention in the literature on transformative sustainability governance. By exploring different actors' experiences, our study provides new knowledge on how the implementation of different transformative approaches may reinforce or hinder each other in the governance of food packaging in Finland.

3. Materials and methods

3.1. Data collection

Our empirical approach relies on the tradition of a qualitative case study (Yin, 2014) and we focus on plastic food packaging governance for sustainability in Finland. In contrast to several other EU member states, where key plastic governance measures such as the Single-Use Plastics Directive (SUPD) are implemented by setting binding laws, Finland has a strong tradition of using voluntary, collaborative governance measures alongside regulatory governance, also in the implementation of certain articles of EU directives.

Data collection began with identifying key policies and instruments from the European Union, Commission and Parliament and national ministries relevant to plastic food packaging, Fig. 1. The process, a prerequisite for the governance analysis, focused on public and collaborative governance approaches and excluded private governance and related instruments. The process lasted from 2019 to 2023 and produced a corpus of 52 policy documents. The documentary material was accessed in English and Finnish and is available from the authors upon request.

The second key source of data was expert interviews, conducted using a semi-structured protocol, which ensured flexibility and helped obtain in-depth data on the rapidly evolving subject (Yin, 2014). The interviews touched upon two main themes: 1) sustainability (goals, sustainability challenges, transformation) and 2) food packaging governance (public policies and targets, instruments, and processes, including regulatory, collaborative, and voluntary measures). The sub-themes varied depending on the interviewee's expertise.

Purposive and iterative sampling (Drisko and Maschi, 2015) was applied to identify and select relevant interviewees. We acknowledge that the governance of food packaging involves a wide range of stakeholders, including private companies and consumers. The scope of this paper on public and collaborative governance helped us narrow down potential stakeholders to public authorities and meta-organisations representing companies, such as producer and industry organisations.

Table 1

Synthesis of transformative governance approaches based on different strands of environmental, sustainability, and innovation governance literatures (Chaffin et al., 2016; Jacob and Ekins, 2020; Loorbach et al., 2011; Visseren-Hamakers et al., 2021; Voß et al., 2006; Wolfram, 2016).

Governance approach	Description of transformative mechanisms
Integrative	Entails coherent governance and policy mixes that address the root causes of unsustainability and support transformation on different levels and scales. Incorporates a versatile set of governance modes and measures and considers both radical and incremental approaches to foster a cumulative change.
Inclusive	Addresses power asymmetries, supports deliberative democracy and enables underrepresented rights-, knowledge- and stakeholders to participate in decision making, thus favouring deliberation and collaboration.
Reflexive	Stimulates dialogue, supports evaluation, learning and reflection.
Pluralistic	Combines multiple perspectives and knowledge (production) systems, including collaborative knowledge production.
Innovative	Fosters experimentation, innovation and renewal not only through (transformative) innovation policies but also through policy experimentation.
Anticipatory	Encourages joint visioning, sets ambitious targets and fosters directionality. Relies on future-oriented knowledge production. Supports transformative leadership through e.g., capacity building.

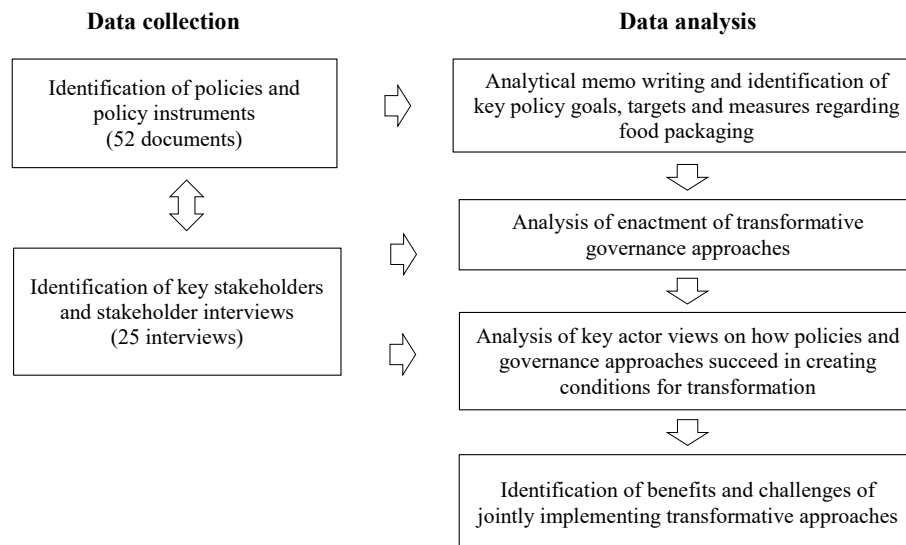


Fig. 1. Process of data collection and analysis.

Furthermore, we purposefully selected individuals with expertise in food packaging-related issues who had been involved in designing and/or implementing packaging-related policy instruments.

The selected interviewees included experts from the relevant ministries in Finland and departments of the European Commission (EC). Experts from national industry associations, an intermediary organisation, producer responsibility organisations, and research organisations were also interviewed (see Appendix A, Table A1). The primary data was gleaned from 25 semi-structured interviews with 25 interviewees conducted between December 2019 and August 2022, either in person or via videoconferencing. Five experts were interviewed twice (in 2019/2020 and 2022) to gain an understanding of the change and validate the mapped policies and instruments. Two interviewers were present for 24 interviews and one interviewer for one interview. In four of the interviews, two interviewees were present. Interviews ranged in length from 41 to 115 min, averaging 66 min, and were recorded and transcribed.

3.2. Data analysis

The first part of the analysis focused on an in-depth review of the examined policy documents, Fig. 1. The analysis began with writing analytical memos (Saldaña, 2021) summarising the key aspects, including key goals, targets, and measures related to food packaging. The memos were used not only to summarise the data but also to reflect the relevance of documents to plastic food packaging governance.

Next, the focus was on transformative approaches and measures, with analysed policy documents and transcribed research interviews forming the corpus. In this part, we applied a theory-driven qualitative content analysis (Hsieh and Shannon, 2005). The coding and analysis focused on how transformative governance approaches, as suggested in the literature (see Table 1), are present in policy documents and interview data. This was followed by identification of how key actors perceive and experience these policy measures and what kind of reinforcing and impeding interactions take place between different approaches. The coding was first done with NVIVO qualitative data analysis software and further elaborated on an Excel spreadsheet. One of the authors performed the memo writing, coding, and thematic categorisation. However, to ensure reliability, the coding procedure and categorisation were discussed and agreed upon by both authors.

The network of actors in the field of food packaging governance is relatively limited in Finland. To protect the anonymity of the interviewed experts, they are referred to in the results by number (e.g.,

interviewee 1, etc.), rather than revealing their background organisations or expert positions.

4. Results

4.1. Environmental policy measures addressing plastic food packaging in Finland

To understand how governance can create conditions for transformation, we first need to present the key policies and instruments that create points of intervention for plastic food packaging. The policy mapping exercise shows that plastic food packaging is a topic that is affected by several EU- and national level policies and regulations, particularly those drawing on circular economy (CE). We first briefly introduce the key EU policy measures (Table 2) that shape the national governance in Finland (Table 3).

The European Green Deal (EGD) (COM/2019/640) is a key European Commission strategy for promoting sustainable growth. It addresses plastic food packaging in a set of programmes and policies that promote circular economy and recycling. For example, the Circular Economy Action Plan (CEAP) (COM/2020/98) highlights packaging as a key product value chain threatening sustainability and calls for action to make all packaging on the EU market reusable or recyclable in an economically viable way by 2030. As part of the CEAP, the renewal of the directive (94/62/EC and 2018/852) on packaging and packaging waste (PPWD) sets binding, progressive recycling targets for different packaging materials and obliges member states to set up extended producer responsibility (EPR) systems to make producers cover the costs of waste prevention, collection and treatment, litter clean-up, data gathering, and raising awareness. In 2022, the EC proposed the Packaging and Packaging Waste Regulation (PPWR) to replace the current PPW directive (COM/2022/677). The proposed regulation suggests stricter progressive recycling targets for different materials, requiring all packaging to be recyclable and recycled at scale, as well as setting minimum recycled plastic content targets. What is notable with this proposal is that rather than focusing on recycling, for the first time the EC is proposing quantitative targets not only for packaging waste reduction but also for packaging reuse in certain applications.

Besides the CEAP, the EU Plastics Strategy (COM/2018/28) also directly addresses food packaging. It recognises the importance of plastics in food packaging, as 'plastics help ensure food safety and reduce food waste,' but also clearly points out that packaging is the largest single cause of plastics use and waste. To tackle this problem, the European

Table 2
Key EU policies and instruments addressing plastic food packaging.

EU Strategy or policy framework under the European Green Deal	Targets with relevance to plastic food packaging								
	Replace (fossil-based) plastics	Reduce packaging consumption	Promote reuse	Improve recycling and recyclability	Increase use of recycled materials	Reduce waste or pollution (emissions and/or litter)	Improve overall environmental sustainability	Protect food and reduce food waste	Ensure safety and hygiene
Waste Framework Directive (2008/98/EC)		x	x	x		x			
Packaging and Packaging Waste Directive (94/62/EC and 2018/852)		x	x	x		x			
Proposal for Packaging and Packaging Waste Regulation (COM/2022/677)		x	x	x	x	x			
Circular economy action plan (COM/2020/98)		x	x	x					
Sustainable Products Initiative (COM/2022/142)			x	x	x		x		
Initiative on Green Claims (COM/2022/143)							x		
Policy Framework on Biobased, Biodegradable and Compostable Plastics (COM/2022/682)	x			x		x			
Plastics Strategy (COM/2018/28)		x	x	x	x	x		x	
SUP Directive (2019/904)	x	x	x			x			
Plastics Tax		x		x					
Chemicals Strategy (COM/2020/667)				x					x
REACH (1907/2006)									x
FCM Framework Regulation (1935/2004)				x	x				x
Recycled Plastics in Contact with Food Regulation (2022/1616)				x	x				x
Farm to Fork Strategy (COM/2020/381)		x						x	

Commission has set actions to address the unsustainable consumption patterns with a Single-Use Plastics Directive which aims at reducing plastics littering and pollution through bans, raising awareness, EPR, and consumption reductions obligations. The reduction measures also target single-use food packaging made wholly or partly of plastic and containing food intended for immediate consumption, is consumed directly from the packaging, and is ready to be consumed without any further preparation (European Commission, 2021). While recycling and reuse are clearly identified as the main solutions in EU policies, the regulation also sets boundaries for the CE transformation, as key chemical regulation—including REACH (1907/2006), the Food Contact Materials (FCM) Framework Regulation (1935/2004) and the Commission Regulation on recycled plastic materials (2022/1616)—restricts the use of recycled plastics in contact with food to protect against harmful substances. Currently, for health and safety reasons, the production of recycled materials for contact with food is limited to a handful of mechanical recycling or closed-loop processes.

In line with EU policies, Finnish governance on plastic food packaging (see Table 3) has shifted from merely promoting resource efficiency (Ministry of the Employment and the Economy, 2014a) to recycling and further to circular (bio)economy (Finnish Government,

2021, 2022; Ministry of the Environment, 2022a). Particular to Finland is the central role of the forest industry as an interest group. Following from this, forest-based materials, including those intended for food packaging applications, have been given a significant role both in the national bioeconomy (Finnish Government, 2022; Ministry of the Employment and the Economy, 2014b) and in the national CE strategies (Sitra, 2016). Forest-based materials are also advocated as a solution to the problems caused by fossil-based plastic packages.

Another key feature in Finland is the active use of collaborative governance. In 2018, the Ministry of the Environment initiated a national roadmapping process as part of the implementation of the EU Plastics Strategy. The roadmap process aimed to engage a broad range of actors to find ways to achieve a more sustainable plastics economy. The process involved ministries, key trade and industry associations and research organisations, and created a network of stakeholders implementing the roadmap (cf. Sundqvist-Andberg and Åkerman, 2022), which addresses food packaging by identifying actions needed to improve plastic waste recovery and recycling, invest in biobased material solutions, and reduce the consumption of single-use takeaway food containers (Ministry of the Environment, 2018). In 2022, the roadmap was updated and aligned with the European Green Deal through

Table 3
Key policies and instruments addressing plastic food packaging in Finland.

National Strategy or policy framework Instrument	Targets with relevance to plastic food packaging							
	Replace (fossil-based) plastics	Reduce packaging consumption	Promote reuse	Improve recycling and recyclability	Increase the use of recycled materials	Reduce waste or pollution (emissions and/or litter)	Improve overall environmental sustainability	Protect food and reduce food waste
National Waste Plan		x	x	x		x		
National Waste Act (646/2011, 714/2021)		x	x	x		x		
Decree on Packaging and Packaging Waste (518/2014, 1029/2021)		x	x	x	x	x		
CE Strategic Programme		x	x	x		x		
Business Finland Bio and Circular RDI funding programme	x	x	x	x	x	x		
CE roadmaps (1 & 2.0)	x	x	x	x		x		
Agenda 2030 and Sustainable Development Strategy							x	
Material Efficiency Programme								
Material efficiency commitments I and II	x	x	x	x	x	x	x	x
Plastic roadmaps (1 & 2.0)	x	x	x	x	x	x		
Muovimiljoona piloting funding			x	x	x			
Government Decree (771/2021) on certain plastic products			x			x		
Green Deal Agreement on SUP consumption reduction	x	x	x			x		x
Kokeilunpaikka.fi experimentation support			x					
Bioeconomy strategy	x						x	

implementation of the EU's Plastics Strategy, the SUP Directive, and the national strategic programme on the circular economy. The update highlighted the role of reusable food packaging, which was rather marginal in previous policies and measures. Implementation of the roadmap is supported by small-scale experimentation and piloting funding.

While the food packaging system is essentially a socio-technical system, its transformation requires not only innovations and new investments but also changes, e.g., in consumption culture. So far, the activities have focused on improving recycling and waste systems. For example, a research, development, and innovation (RDI) funding programme, Bio and Circular Finland, is the main innovation policy measure supporting CE transformation that also addresses waste management issues relevant to food packaging, such as recycling (Finnish Government, 2021).

Recycling is also a key area of the National Waste Plan, which sets goals to improve packaging waste recycling to reach at least the minimum objectives set by the EU regulation, including the aim to reduce the consumption of single-use plastics food packaging and promote the uptake of reusable food packaging (Ministry of the Environment, 2022a). The National Waste Act (646/2011, 714/2021) and Government Decree on Packaging and Packaging Waste (518/2014, 1029/2021) form the basis of the regulatory approach where emphasis is also put on improving conditions for recycling and meeting the EU-level recycling and reuse goals.

Both regulatory and voluntary governance approaches are used in implementing the SUP directive in Finland. Some of the obligations set by the directive are transposed into national law under the Waste Act. However, the directive's consumption reduction measures are implemented through a voluntary agreement. In 2022, the Ministry of the Environment and four sectoral industry and trade associations signed a Green Deal Agreement on Ambitious and Permanent Reduction in the

Consumption of Disposable Plastic Beverage Cups and Certain Food Packaging (Ministry of the Environment, 2022b). The target is to encourage companies to reduce the consumption of plastic packaging (per unit) and plastics in packaging (per weight) without increasing food loss and waste or compromising food safety. The set of voluntary measures include replacing SUP packaging with easily recyclable reusable portion-sized food containers and plastics-free packaging, as well as placing levies on single-use portion-sized food containers.

The agreement is also linked to two other national collaborative governance arrangements: The Material Efficiency Commitment for the food industry and Society's Commitments related to Agenda 2030 targets. The Material Efficiency Commitment (2019–2021) was set up as a pilot between three ministries and three sectoral industry and trade associations (Anon, 2018). During the first period, companies' food packaging-related activities entailed packaging design and process improvements, including optimisation, lightweighting, and replacing fossil-based plastics with recycled or biobased materials, which improved both material efficiency and recyclability (Finér and Merenheimo, 2020). The second agreement period, during which the participating companies seek to increase packaging reuse, recyclability, and the use of more environmentally sustainable solutions and to reduce plastics consumption, began in 2022.

4.2. Creating conditions for sustainability transformation

In the previous section, we introduced the key policies and instruments addressing the food packaging system. These measures serve as tools for policymakers to guide the transformation. However, the measures can be applied and implemented in various ways and as parts of different modes of governance. Furthermore, as the policy mix is complex and somewhat fragmented, it is unclear how well it manages to create favourable conditions for transformative change. Therefore, in

Table 4
Summary of key elements of transformative sustainability governance regarding plastic food packaging in Finland.

Governance approach	Examples of transformative elements in plastic food packaging governance
Integrative	A comprehensive mix of CE-related policies and instruments that covers the entire life cycle of food packaging from product design (incl., material safety), waste prevention and management (resource efficiency, recycling, reuse) (see also Tables 2 and 3) Policy targets address root causes 1) mounting consumption of single-use packaging due to retail and consumer cultures, and 2) insufficient plastics recycling (see Tables 2 and 3) A systemic approach to environmental challenges; integration of climate governance with CE governance (EU Green Deal, National Strategic CE programme) Multi-level governance: a variety of scales addressed (European, national, regional, municipal, households)
Inclusive	Packaging value chain stakeholders (industrial producers, users and recyclers) are the centre of attention in collaborative governance Collaborative instruments support inclusion by networking actors, enhancing collaboration and deliberation. As an example of building a public-private cooperation network in the implementation of the Plastics Roadmap
Reflexive	Formal and informal impact assessments, mainly ex-post evaluations and consultations, particularly related to EU regulation (e.g., PPWD) Acknowledging the unknown and the need for gathering data in national voluntary agreements (Material Efficiency Commitment, Green Deal Agreement) Awareness of the complexity and systemic nature of challenges present in collaborative measures Receptivity to new knowledge and willingness to redesign policies and activities according to this information (transformative capacity building), particularly related to collaborative instruments (Green Deal Agreement, Material Efficiency Agreement) Collaborative instruments, particularly the Plastics Roadmap, are designed as processes to foster and stimulate deliberation and learning and help in creating a joint understanding and language
Pluralistic	Acknowledging the need for new data and for increasing understanding (Plastics Roadmap, Material Efficiency Agreement and Green Deal Agreement) Considering several perspectives, data and knowledge sources (mainly from science and business communities and sometimes also citizens) (Plastics Roadmap) Collaborative knowledge production, e.g., collaboration with scientists and research projects to strengthen the evidence base (Plastics Roadmap, Material Efficiency Agreement, Green Deal Agreement) Sharing information about recent policy progress, RDI activities, and best practices (Plastics Roadmap) Efforts made to cross administrative silos and facilitate information exchange (Plastics Roadmap)
Anticipatory	Roadmapping (Plastics Roadmap, Sectoral Climate Roadmaps) and mid-term goal setting (National Strategic CE programme, PPWR, SUPD); some targets are more ambitious than others (e.g., packaging recycling), Joint target setting and committing to jointly agreed targets through collaborative instruments (Material Efficiency Agreement, Green Deal Agreement)
Innovative	Policy experimentation: use of voluntary agreements as policy tools to develop and find best practices (Material Efficiency Agreement, Green Deal Agreement) Small wins approach focusing particularly on improving the CE of plastics, including reaching progressive recycling targets Availability of RDI funding in certain areas, e.g., recycling (Business Finland Bio and Circular RDI funding programme) Building and supporting national ecosystems and value chain collaboration (Plastics Roadmap, Business Finland Bio and Circular RDI funding programme) Collaborative instruments foster RDI collaboration and joint project preparations (Plastics Roadmap, Green deal agreement, Material efficiency agreement)

this section we introduce a more in-depth analysis of how different transformative governance approaches are enacted in the existing food packaging governance in Finland, and how key actors perceive these policies to have succeeded in creating favourable conditions for sustainability transformation. The results are summarised in Table 4.

According to the analysis of policy documents and expert interviews, all the major transformative governance approaches, including integrative, inclusive, pluralistic, reflexive, anticipatory, and innovative, are in active use in Finland. The main emphasis seems to be on inclusive, pluralistic, and reflexive approaches building on collaborative governance, while innovative and anticipatory approaches are used less. Integrative approaches are also vital, as the CE policies and related instruments address not only the entire life cycle of packaging, but also different temporal and geographic scales. Furthermore, there is an increasing need for tighter integration particularly of climate governance with CE governance. Despite the broad application of transformative approaches, our informants nonetheless held contradictory views on how well the adopted governance measures had managed to provide a basis for transformative change. Five key issues were identified that had significantly affected the ability of policies to boost transformation: the directionality of policies, policy coherence, addressing uncertainty, effectiveness vs. incrementalism, and innovativeness.

4.2.1. Directionality and addressing the root cause: contestations over problems and solutions

Two of the key aspects needed for governance to be transformative are directionality (Weber and Rohrer, 2012), meaning that the intended direction of transformation should be relatively clear to engaged actors, and that the root causes of unsustainability are addressed (Visseren-Hamakers et al., 2021). The review of various policies and governance approaches clearly shows that these have not been fully met. The sustainability goals, which should guide the direction of the transformation, range from solving the problems of plastic pollution

to reducing the consumption of packaging and combating climate change. Thus, the goals may be mutually contested (Tables, 2 and 3). Several industry representatives expressed concern over conflicting pollution reduction and climate targets, for example related to a shift to packaging reuse, as exemplified here:

‘[Single-use] plastic packaging is now being replaced with packaging with a larger carbon footprint than the plastic packaging it replaces. What, then, is the primary problem that should be solved—if it is global warming and carbon footprint, then they should be the main drivers, even if there is concern about plastics in the ocean. Which problem should be solved?’ (Interviewee 4)

Several interviewees underline that the root cause of environmental problems is uncontrolled and mounting consumption of single-use plastic packaging due to retail and consumer cultures. In addition, insufficient plastics recycling also exacerbates environmental problems. The good performance and low price of plastics makes them ideal for food packaging, but the price does not cover the cost of all negative externalities caused by packaging waste, as highlighted by an interviewee.

One of the key directives, SUPD, was set to combat plastics pollution and to address the increase in single-use packaging. The regulatory process and implementation have, however, not yet created favourable conditions for food packaging actors to innovate new solutions. In Finland, several interviewed industry representatives expressed acute frustration over this process, which they see as not complying with the EU’s evidence-based policymaking ambitions. One of the challenges has been the initial ambiguity of definitions, such as which types of food packaging are categorised as SUP packaging. There are also concerns over problem shifting, for example if one type of single-use packaging is replaced by another type of single-use packaging without reducing its total material use.

4.2.2. High complexity and uncertainty challenge policy coherence

Governance of plastic food packaging entails a comprehensive mix of policies, as well as mandatory and voluntary measures (Tables 2 and 3) covering the entire life cycle of food packaging from product design and material safety to waste management, including resource efficiency, recycling, reuse, and waste and pollution prevention. Plastic food packaging is governed primarily through CE policies and instruments, yet only a handful of instruments directly govern or regulate food packaging or consider the role of food packaging in the food value chain.

The vast, constantly evolving policy mix is overwhelming industry stakeholders: *'Now, because of CEAP and SUPD, we have been spinning like in a washing machine for three years. Regulation and initiatives are coming from all directions and yet no one understands the big picture.'* (Interviewee 1). Several interviewed policy officials also agree with the challenge of keeping track of regulatory changes and endure the uncertainties that policy changes bring:

'It's a challenge to really know exactly what is also happening in other commissions' initiatives. We are doing our best, but it is a challenge because also they are working under a lot of time pressure and things are changing. So, we are doing our best, but, for example, we have just recently realised that some measures that we are considering on packaging waste prevention and reuse might really need to be part of the sustainable products initiative.' (Interviewee 2)

Thus, the rapidly evolving policy mix has created a demand for integrative approaches across multiple levels of governance (Table 4). The need for integrative approaches is likely to increase, as the process of incorporating climate and biodiversity governance into CE and packaging governance is still in its infancy:

'The confusion [among stakeholders] exists partly because this journey has begun—climate effects must be taken into consideration, and biodiversity must be considered. The same issues will be addressed through different legislation in slightly different ways, but they will still be brought to the fore. After all, this is still in progress and the need for information is also quite significant when we start comparing different material solutions during their entire life cycle ...' (Interviewee 3)

4.2.3. Uncertainty creates demand for collaborative governance

Regardless of integrative efforts (Table 4), the contested sustainability goals and evolving regulation create uncertainties for food-packaging value-chain actors who are key to realising systemic changes (cf. also Sundqvist-Andberg and Åkerman, 2022). This raises the importance of the inclusive, reflexive, and pluralistic governance approaches shown in Table 4. In Finland, these approaches are an integral part of collaborative governance which entails multi-stakeholder roadmapping and implementation processes, such as the Plastics Roadmap, and more formal voluntary agreements between ministries and industry and trade organisations, such as the Material Efficiency Commitment and the voluntary agreement in the national implementation of the SUPD.

Collaborative measures are favoured by both public and private organisations to engage packaging value chain actors (e.g., industrial producers, users, and recyclers) in setting goals and finding ways to reach them, as well as enhancing collaboration, knowledge exchange, and deliberation. Yet ensuring sufficient engagement and inclusion can be challenging in practice: *'[Voluntary commitments] are quite challenging from the inclusion point of view—who is involved, who might be unknowingly or unwillingly left out, or who will leave themselves out.'* (Interviewee 9). Nevertheless, in Finland, key value chain actors seem to be active across several, simultaneously occurring collaborative processes. However, the inclusion of consumers and citizens is still marginal, and citizens are perceived more as an object of actions or influence than as active stakeholders. Only one of the instruments, the Plastics Roadmap process, entailed the use of public consultations and a citizen panel.

Regarding the directionality of sustainability transition (see 4.2.1), besides various policy goals, another challenge shared by several interviewed stakeholders is difficulty knowing what 'more sustainable' food packaging is. Voluntary agreements and commitments form a key experimental policy tool that is used to gather information, create understanding of sustainability issues, and develop further policies and measures to foster transformation. For example, in existing commitments, the first actions include data gathering to better understand both the problem (e.g., volumes of single-use plastic packaging consumption) and potential solutions (e.g., sustainability impacts of alternative packaging solutions) before setting binding targets, which in turn supports evidence-based policymaking. Thus, collaborative instruments are designed to acknowledge the unknown.

4.2.4. Effectiveness of policies and governance approaches

The PPW and SUP directives are key regulatory instruments of sustainability governance of packaging, in which extended producer responsibility schemes form a key implementation measure. Despite the recent and significant changes in national EPR schemes, the effectiveness of producer responsibility for reducing packaging consumption or waste has been limited. As indicated by an interviewee, while the eco-modulation of producer responsibility fees, i.e., rewarding the use of recyclable packaging materials, acts as an incentive, it might not be effective enough to reduce consumption. Up until the recently proposed Packaging and Packaging Waste Regulation, quantitative regulatory targets and measures focused on improving packaging waste recycling, as pointed out here:

'There is still a contradiction in the EU's approach to plastic packaging. When the EU develops legislation, it sets recycling requirements for packaging. It does not set [quantitative] requirements for reusability or packaging reduction.' (Interviewee 4)

Due to the uncertainties and complexities of sustainability transformation, a focus on deliberation and small wins seems to prevail. (Table 4). Despite providing evidence and a better understanding of packaging sustainability issues, voluntary agreements have not been effective in pushing the change forward. For example, the leading industry organisation representing the packaging sector seems to have played a wait-and-see game. Instead of actively driving the change to reduce SUP consumption or support reuse, the organisation remains passive. A similar attitude is seen in food companies, none of which so far have made company-specific agreements under the national voluntary agreement implementing the SUPD. This puts pressure on policy-makers to start using stringent legislative instruments.

To summarise, while several policy measures have been set to reduce the consumption of food packaging (Tables 2 and 3), their transformative power to curb the growing consumption of single-use packaging has been weak.

'It's happening but it's not happening enough, because while we are doing all this, packaging is still increasing in terms of the generation in absolute numbers, and this is not only related to more consumption. It's also more packaging per capita, so really in absolute and relative terms we are consuming more packaging.' (Interviewee 6)

4.2.5. Transformativeness: reactive rather than anticipatory and innovative

National waste legislation and related EPR schemes have been evolving to better address the polluter-pays principle and improve recycling in particular. While EPR schemes have succeeded in complying with previous recycling targets, reaching upcoming targets for plastics packaging is considered demanding, as exemplified here:

'In the next two years, it will be quite a hassle to go through all these changes. Even one of them would have been quite big but having three or four big changes at the same time: increasing the Ecopoint [collection] network, starting residential collection and participating

Table 5
Examples of reinforcing and impeding interactions in the joint implementation of transformative approaches in food packaging governance.

Joint implementation	Benefits of joint implementation (Reinforcing interactions)	Challenges and trade-offs in joint implementation (Impeding interactions)
Regulatory and collaborative governance modes	Developing best practices to advance transformation Implementing binding regulation through voluntary and collaborative measures can help stakeholders to find and develop best practices. Setting binding targets (e.g., SUPD and proposed reuse targets in PPWR) can motivate stakeholders committed to voluntary agreements to initiate joint research on developing a packaging reuse system (e.g., Green Deal Agreement).	Low effectiveness and slow progress if stakeholders are not committed and motivated to transformation Implementation of binding regulation through voluntary means may be slow and remain insufficient, if stakeholders use voluntary measures to play 'a waiting game' (e.g., packaging reuse/Green Deal Agreement).
Reflexive, inclusive, and pluralistic approaches	Supporting transformative capacity building Joint implementation can foster learning and transformative capacity building, furthering an understanding of what sustainability is in the context of plastics food packaging transformation.	Increases understanding and capacities, but not necessarily incentives, for taking informed action While collaboration can increase stakeholders' understanding of sustainable packaging and its complexities, willingness to act upon it may remain limited.
Inclusive, innovative, and anticipatory approaches	Helps build networks and RDI collaboration opportunities Inclusion of key stakeholders in collaborative measures can help initiate RDI collaborations and joint project preparations (e.g., Plastics Roadmap, Green Deal Agreement).	Conflicting interests may hinder ambitious target setting Broad inclusiveness may hinder ambitious target setting and renewal, if participants feel that the targets contradict their interests (e.g., Plastics Roadmap, Green Deal Agreement).
Integrative, anticipatory, and innovative approaches	Supporting development of future-oriented policy mixes and experimentation Helps develop policy mixes that support both exnovation (e.g., reduction of single-use packaging consumption) and innovation (mainly recycling) needed to comply with upcoming regulatory targets. Use of participatory roadmapping (Plastics Roadmap) can enable goal setting, support implementation of EU strategies, and identify RDI-related needs and actions.	Institutional ambiguities and limited directionality can lead to reactive rather than proactive governance Constantly and rapidly evolving EU environmental policies and failures in policy integration have created uncertainties and led to reactive governance – complying with near-future policy targets and regulation (mainly recycling and EPR) while proactive governance, building on anticipatory and innovative approaches and measures, has attracted less attention.

in the costs, the covering litter clean-up costs and the definition of the service package coming from the SUP [directive]. So, I would say that these are really big changes.' (Interviewee 4)

The current governance is thus reactive and leans strongly on complying with recycling policies, while anticipatory and innovative approaches are limited (Table 4). For example, impact assessments rely on ex-post evaluations, while ex-ante assessments related to new, suggested policies are still missing. In addition, current EPR schemes do not foster innovation or renewal, as the main incentive for stakeholders is to comply with rising recycling targets at minimum cost.

The role of innovative approaches and innovation policies is recognised as important by many interviewed stakeholders, who emphasised that reaching policy targets, such as those addressing recycling and reuse, requires RDI activities and stakeholder collaboration. In Finland, RDI funding is more available for issues like plastics recycling, including building national ecosystems, and value chain collaboration. Then again, packaging reuse has attracted relatively little research interest and funding. While some funding of experimentation and research exists around packaging reuse (Tables 3 and 4), current innovation policy incentives have been insufficient to initiate a more radical, system-level transformation, like a shift from a single-use to reusable packaging system would be. However, in 2023, driven by the voluntary Green Deal Agreement and proposed PPW regulation, key sectoral associations from the retail and food sectors started to prepare a joint research project in collaboration with research organisations and companies to investigate and develop a system for reusable take-away food packaging. Despite the recent progress, innovation policy measures for food packaging are still incoherent and further resources are needed to reach the policy targets.

5. Discussion: benefits and challenges of applying principles of transformative governance in practice

While joint operationalisation and implementation of different governance approaches to address the root cause of unsustainability is suggested as a prerequisite for governance to be transformative (Visseren-Hamakers et al., 2021), the reality is more complex. The exercise of categorising existing governance efforts under the six transformative approaches showed that all these governance approaches are actively

applied in the current plastic food packaging governance in Finland. Our stakeholder interviews also clearly showed that despite this, the key actors found the transformative power of existing policies to be limited for various reasons. One reason appears to be particularly the joint implementation and following interplay between different types of policies, which may either strengthen or weaken each other. To get a clearer understanding of this interplay, we have identified the benefits and trade-offs of joint implementation in Table 5.

Table 5 shows that there are several benefits in applying the principles of transformative governance. For example, inclusiveness through participatory processes helps combine multiple perspectives and enhance deliberation, reflexivity, and reflexivity. This is clearly needed to tackle the uncertainties caused by contested sustainability goals and changing regulation. There is also evidence that collaborative governance, characterised by inclusive, reflexive, and pluralistic approaches, can improve the capacity building needed for developing and implementing further transformative policies and measures. Furthermore, our analysis indicates that there are benefits in implementing regulatory measures through collaborative governance, as collaborative, voluntary measures create conditions for stakeholders to jointly find and develop best practices for achieving regulatory targets. Furthermore, collaborative governance has facilitated the building up of new networks and inclusion of novel players, which will open new perspectives in the established field of food packaging.

Our analysis also showed that although the principles of transformative governance are actively applied in Finland, their ability to create conditions for sustainability transformation have been limited. The simultaneous implementation of different approaches has created impeding interactions that challenge the joint implementation and effectiveness of efforts, as shown in Table 5. For example, contradictory stakeholder interests hindered achieving the instrumental purposes of voluntary, collaborative measures. This is in line with previous findings in the collaborative governance literature (Hysing, 2020). The obstructive effect of contradictory interests is seen particularly when implementing the SUP directive through voluntary agreement. While collaboration can increase stakeholders' understanding of sustainable packaging and its complexities, willingness to act upon it remains limited. The gap between increasing understanding and taking action in the context of conflicting interests is also indicated in a recent study by Phelan et al. (2022). Similarly, previous research has also shown that

innovative, radical approaches to achieving ambitious environmental targets are not likely to be emphasised in collaborative processes that aim at building consensus and joint targets (Newig et al., 2018; Qi and Ran, 2023). This inability to adopt genuinely innovative approaches was also reflected in our results. Our study thus confirms the claims that advocating radical change through collaborative governance is not easy, as systemic change often means that some existing players and modes of production will be phased out.

Furthermore, our results show that institutional ambiguities and limited directionality have led to reactive rather than proactive governance. Anticipatory and innovative approaches play only a minor part in the comprehensive mix of policies and instruments, which are set to address an undesired direction of change, i.e., growing environmental problems caused by increasing packaging production and consumption. While policies aim at addressing the root cause of the problems caused by food packaging, the analysis shows that there are still significant gaps between current policy goals and actions, in line with recent findings by Calisto Friant et al. (2021) and Fitch-Roy et al. (2020). In addition, there are coordination challenges between sectoral, like agro-food and waste policies, and cross-cutting, like innovation and CE policies. This is problematic, as directionality and alignment between multiple, overlapping policies and policy goals is needed for transformation (Markard et al., 2020). This failure also affects the success of governance efforts towards inclusive and pluralistic approaches, if several key players in the packaging sector or food system or providers of new innovative food delivery solutions, for example, are not fully engaged in the process.

While setting increasing recycling targets and monitoring the performance of waste and recycling systems have advanced sustainability transformation, there is a risk that if the focus is mainly on implications rather than root causes, the transformation will be slow. Significant rethinking and redesigning of existing food production, delivery, and consumption systems and related food retail and consumption cultures would be needed to support and drive an uptake and upscale of reusable packaging systems. Overall, policymaking and sustainability governance could entail even more ambitious, visionary approaches by making better use of experimentation, innovation, modelling, and ex-ante impact evaluations, as also pointed out by Jacob and Ekins (2020). Finally, the analysis shows that applying principles of transformative governance as suggested by Visseren-Hamakers et al. (2021) is necessary, but not effective enough to create conditions that encourage and motivate key actors to advance in sustainability transformation. Clearly, the tensions between collaboration, learning, consensus, and innovative governance should be more systematically investigated in the transformative sustainability governance literature.

6. Conclusions

The mapping of policy measures and use of transformative governance analysis frame showed that:

- Plastic food packaging governance is both reactive and transformative in its move towards a circular economy, as it fosters packaging recycling but does not yet sufficiently address the root cause of plastics pollution and thus contributes more to weak than strong sustainability.
- Innovation policy measures need to be strengthened to create social, technological, and business innovations, related experiments, and investments to advance food packaging sustainability.
- Further actions are necessary to reduce plastic packaging consumption, not only through material efficiency measures, but also by transforming current retail and consumption cultures.

- Regulatory measures play an important role in this by setting quantitative targets for packaging reuse and fostering the development of nationwide packaging reuse and refill systems.
- To shift from reactive to proactive governance, more emphasis is needed on anticipatory approaches, like carrying out ex-ante impact evaluations when designing new policies and regulation.
- Integrative governance also should be strengthened to improve directionality and policy coherence, especially as the scope of the EU's policies addressing food packaging is widening from safe CE to climate change mitigation and biodiversity protection.

Finally, while the theory-driven analytical frame building on the work of Visseren-Hamakers et al. (2021) enabled analysing the transformativeness of current governance, the frame also has limitations and weaknesses. The results show that applying principles of transformative governance is necessary but not sufficient in practice for creating the conditions for sustainability transformation. Further work is needed particularly to improve the operationalisation of different approaches. In addition, most of the original approaches, including reflexive, inclusive and pluralistic, are part of collaborative governance. When jointly implemented with innovative and anticipatory approaches, these approaches may in the best case help advance transformation but may also risk slowing down progress, particularly in the case of low directionality and policy integration. While joint implementation of different approaches and modes of governance is necessary, the importance of an individual approach to transformation may be context specific. Furthermore, joint implementation is not always easy and may in the worst case even weaken the transformative power. There is clearly a need for more research on how to overcome the impeding interaction between different transformative approaches. As regards food packaging governance, comparative studies between different EU member states could shed new light on context-specific differences in the implementation of EU policies through different transformative governance approaches.

CRedit authorship contribution statement

Henna Sundqvist: Conceptualization, Formal analysis, Methodology, Visualization, Writing – original draft, Writing – review & editing.
Maria Åkerman: Conceptualization, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

Acknowledgements

An early, work-in-progress version of the analysis frame was presented at International Sustainability Transitions (IST) conference in 2023. We wish to thank the interviewees for their valuable input. The work was supported by the Strategic Research Council of the Academy of Finland [grant numbers 320215 and 346596]. This support is greatly appreciated.

Appendix A

Table A.1
List of interviewees.

Type of organisation	Interviewee role	Year
Ministry 1	Programme Manager	2019 and 2022
Ministry 1	Senior Ministerial Adviser	2019 and 2022
Ministry 1	Ministerial Adviser	2020
Ministry 2	Chief Specialist	2020
Ministry 2	Ministerial Adviser	2020
Ministry 3	Ministerial Adviser	2020
Sustainable development company	Senior Expert	2020
Sustainable development company	Expert	2020
Sustainable development company	Expert	2020
Industry association 1	CEO	2020 and 2022
Industry association 2	CEO	2020 and 2022
Industry association 3	Expert 1	2020
Industry association 3	Expert 2	2022
Industry association 4	CEO	2020 and 2022
Industry association 5	Manager	2020
Industry association 6	CEO	2022
Industry association 6	Director	2022
Producer responsibility organisation 1	VP	2020
Producer responsibility organisation 1	Expert	2022
Producer responsibility organisation 2	CEO	2020
Research organisation 1	Senior Scientist	2020
Research organisation 1	Vice President	2020
Research organisation 2	Senior Scientist	2020
Research organisation 3	CEO	2020
European Commission	Policy officer 1	2021
European Commission	Policy officer 2	2021

References

- Anon, 2018. Elintarvikealan Materiaalitehokkuussitoutus 2019-2021. https://www.motiva.fi/files/19648/Elintarvikealan_materiaalitehokkuuden_sitoutus_2019-2021_-_Sopimus.pdf.
- Calisto Friant, M., Vermeulen, W.J.V., Salomone, R., 2021. Analysing European Union circular economy policies: words versus actions. *Sustain. Prod. Consum.* 27, 337–353. <https://doi.org/10.1016/J.SPC.2020.11.001>.
- Chaffin, B.C., Garmestani, A.S., Gunderson, L.H., Benson, M.H., Angeler, D.G., Arnold, C. A., Tony), Cosens, B., Craig, R.K., Ruhl, J.B., Allen, C.R., 2016. Transformative environmental governance. *Annu. Rev. Environ. Resour.* 41, 399–423. <https://doi.org/10.1146/annurev-environ-110615-085817>.
- Chakori, S., Russell, R., Smith, C., Hudson, N.J., Abdul Aziz, A., 2022. Taking a whole-of-system approach to food packaging reduction. *J. Clean. Prod.* 130632 <https://doi.org/10.1016/J.JCLEPRO.2022.130632>.
- Dörnyei, K.R., Uysal-Unalan, I., Krauter, V., Weinrich, R., Incarnato, L., Karlovits, I., Colelli, G., Chrysochou, P., Fenech, M.C., Pettersen, M.K., Arranz, E., Marcos, B., Frigerio, V., Apicella, A., Yildirim, S., Poças, F., Dekker, M., Lahti, J., Coma, V., Corredig, M., 2023. Sustainable food packaging: an updated definition following a holistic approach. *Front. Sustain. Food Syst.* 7, 1119052 <https://doi.org/10.3389/fsufs.2023.1119052>.
- Eckersley, R., 2021. Greening states and societies: from transitions to great transformations. *Environ. Polit.* 30, 245–265. <https://doi.org/10.1080/09644016.2020.1810890>.
- Edmondson, D.L., Kern, F., Rogge, K.S., 2018. The co-evolution of policy mixes and socio-technical systems: towards a conceptual framework of policy mix feedback in sustainability transitions. *Resour. Pol.* 48 <https://doi.org/10.1016/j.respol.2018.03.010>.
- Finér, A., Merenheimo, T., 2020. Elintarvikealan Materiaalitehokkuuden Sitoumuksen Tulokset 2019 Elintarvikealan Materiaalitehokkuuden Sitoutus : Ensimmäinen Tulosraportointi. https://www.motiva.fi/files/18108/Elintarvikealan_materiaalitehokkuuden_sitoumuksen_tulokset_2019_-_Yhteenveto_sitoumuksen_raportoinnista.pdf.
- Finnish Government, 2022. The Finnish Bioeconomy: Strategy Sustainably towards Higher Value Added. Publications of the Finnish Government, p. 5, 2022. <http://urn.fi/URN:ISBN:978-952-383-579-5>.
- Finnish Government, 2021. New Directions: the Strategic Programme to Promote a Circular Economy. (in Finnish). Publications of the Finnish Government, 2021:1. <http://urn.fi/URN:ISBN:978-952-383-658-7>.
- Fitch-Roy, O., Benson, D., Monciardini, D., 2020. Going around in circles? Conceptual recycling, patching and policy layering in the EU circular economy package. *Environ. Polit.* 29, 983–1003. <https://doi.org/10.1080/09644016.2019.1673996>.
- Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. Adaptive governance of socio-ecological systems. *Annu. Rev. Environ. Resour.* 30, 441–473. <https://doi.org/10.1146/annurev.energy.30.050504.144511>.
- Glass, L.-M., Newig, J., 2019. Governance for achieving the Sustainable Development Goals: how important are participation, policy coherence, reflexivity, adaptation and democratic institutions? *Earth Syst. Gov.* 2, 100031 <https://doi.org/10.1016/J.ESG.2019.100031>.
- Haddad, C., Nakić, V., Bergek, A., Hellsmark, H., 2022. Transformative innovation policy: a systematic review. *Environ. Innov. Soc. Transit.* 43, 14–40. <https://doi.org/10.1016/j.eist.2022.03.002>.
- Hajer, M., 2003. Policy without policy? Policy analysis and the institutional void. *Pol. Sci.* 36, 175–195. <https://doi.org/10.1023/A:1024834510939>.
- Hsieh, H.F., Shannon, S.E., 2005. Three approaches to qualitative content analysis. *Qual. Health Res.* 15, 1277–1288. <https://doi.org/10.1177/1049732305276687>.
- Hysing, Erik, 2020. Designing collaborative governance that is fit for purpose: theorising policy support and voluntary action for road safety in Sweden. *J. Publ. Pol.* 42 (2), 1–23. <https://doi.org/10.1017/S0143814X2000029X>.
- Jacob, K., Ekins, P., 2020. Environmental policy, innovation and transformation: affirmative or disruptive? *J. Environ. Pol. Plann.* 22, 709–723. <https://doi.org/10.1080/1523908X.2020.1793745>.
- Kelemen, E., Subramanian, S.M., De Vos, A., Amaruzaman, S., Porter-Bolland, L., Islar, M., Kosmus, M., Nakangu, B., Nuesiri, E., Robles, G.A., Yiu, E., Emerton, L., Zolyomi, A., 2023. Signposts on the road toward transformative governance: how a stronger focus on diverse values can enhance environmental policies. *Curr. Opin. Environ. Sustain.* 64, 101351 <https://doi.org/10.1016/j.cosust.2023.101351>.
- Kern, F., Rogge, K.S., Howlett, M., 2019. Policy mixes for sustainability transitions: new approaches and insights through bridging innovation and policy studies. *Resour. Pol.* 48, 103832 <https://doi.org/10.1016/j.respol.2019.103832>.
- Kivimaa, P., Kern, F., 2016. Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. *Resour. Pol.* 45, 205–217. <https://doi.org/10.1016/j.respol.2015.09.008>.
- Köhler, J., Geels, F.W., Kern, F., Markard, J., Onsongo, E., Wiecek, A., Alkemade, F., Avelino, F., Bergek, A., Boons, F., Fünfschilling, L., Hess, D., Holtz, G., Hyysalo, S., Jenkins, K., Kivimaa, P., Martiskainen, M., McMeeke, A., Mühlemeier, M.S., Nykvist, B., Pel, B., Raven, R., Rohracher, H., Sandén, B., Schot, J., Sovacool, B., Turnheim, B., Welch, D., Wells, P., 2019. An agenda for sustainability transitions research: state of the art and future directions. *Environ. Innov. Soc. Transit.* 31, 1–32. <https://doi.org/10.1016/J.EIST.2019.01.004>.
- Lange, P., Driessen, P.P.J., Sauer, A., Bornemann, B., Burger, P., 2013. Governing towards sustainability—conceptualizing modes of governance. *J. Environ. Pol. Plann.* 15, 403–425. <https://doi.org/10.1080/1523908X.2013.769414>.
- Loorbach, D., Frantzeskaki, N., Thissen, W., 2011. A transition research perspective on governance for sustainability. In: *European Research on Sustainable Development*. Springer, Berlin Heidelberg, Berlin, Heidelberg, pp. 73–89. https://doi.org/10.1007/978-3-642-19202-9_7.
- Lorek, S., Fuchs, D., 2013. Strong sustainable consumption governance – precondition for a degrowth path? *J. Clean. Prod.* 38, 36–43. <https://doi.org/10.1016/J.JCLEPRO.2011.08.008>.
- Markard, J., Geels, F.W., Raven, R., 2020. Challenges in the acceleration of sustainability transitions. *Environ. Res. Lett.* <https://doi.org/10.1088/1748-9326/ab9468>.

- Marsh, K., Bugusu, B., 2007. Food packaging? Roles, materials, and environmental issues. *J. Food Sci.* 72, R39–R55. <https://doi.org/10.1111/j.1750-3841.2007.00301.x>.
- Miller, M., Steele, C., Horn, D., Hanna, C., 2018. Marine debris trends: 30 Years of change on ventura county and channel island beaches. *West. North Am. Nat.* 78, 328e340. <https://doi.org/10.3398/064.078.0308>.
- Ministry of the Employment and the Economy, 2014a. National Material Efficiency Programme - Sustainable Growth through Material Efficiency. Concern 8/2014. Publications of the Ministry of Employment and the Economy. https://tem.fi/documents/1410877/3323088/Sustainable_growth_through_material_efficiency/fd454ebd-49a7-4675-af0d-a897b5aec87a.
- Ministry of the Employment and the Economy, 2014b. The Finnish Bioeconomy Strategy: Sustainable Growth from Bioeconomy. https://biotalous.fi/wp-content/uploads/2014/08/The_Finnish_Bioeconomy_Strategy_110620141.pdf.
- Ministry of the Environment, 2022a. From Recycling to Circular Economy - National Waste Plan to 2027 (in Finnish). Helsinki. <http://urn.fi/URN:ISBN:978-952-361-266-2>.
- Ministry of the Environment, 2022b. Muovisten kertakayttoisten annospakkausten kulutuksen vahentamista koskeva green deal -sopimus. <https://ym.fi/documents/1410903/33891761/Muovisten+kertak%C3%A4ytt%C3%B6isten+annospakkausten+v%C3%A4hent%C3%A4mist%C3%A4+koskeva+green+deal+-sopimus.pdf/aa4e7d4-291c-6ce7-0734-937267710ee7/Muovisten+kertak%C3%A4ytt%C3%B6isten+annospakkausten+v%C3%A4hent%C3%A4mist%C3%A4+koskeva+green+deal+-sopimus.pdf?t=1646654311311>.
- Ministry of the Environment, 2018. Reduce and Refuse, Recycle and Replace – the Plastics Roadmap for Finland. <https://muovitiekartta.fi/userassets/uploads/2019/03/Reduce-and-refuse-recycle-and-replace.-A-Plastics-Roadmap-for-Finland.pdf>.
- Newig, J., Challies, E., Jäger, N.W., Kochskaemper, E., Adzersen, A., 2018. The environmental performance of participatory and collaborative governance: a framework of causal mechanisms. *Pol. Stud. J.* 46, 269–297. <https://doi.org/10.1111/psj.12209>.
- Newig, J., Voß, J.-P., Monstadt, J., 2007. Editorial: governance for sustainable development in the face of ambivalence, uncertainty and distributed power: an introduction. *J. Environ. Pol. Plann.* 9 (3–4), 185–192. <https://doi.org/10.1080/15239080701622832>.
- Patterson, J., Schulz, K., Vervoort, J., van der Hel, S., Widerberg, O., Adler, C., Hurlbert, M., Anderton, K., Sethi, M., Barau, A., 2017. Exploring the governance and politics of transformations towards sustainability. *Environ. Innov. Soc. Transit.* 24, 1–16. <https://doi.org/10.1016/j.eist.2016.09.001>.
- Phelan, A., Meissner, K., Humphrey, J., Ross, H., 2022. Plastic pollution and packaging: corporate commitments and actions from the food and beverage sector. *J. Clean. Prod.* 331, 129827. <https://doi.org/10.1016/j.jclepro.2021.129827>.
- Qi, H., Ran, B., 2023. Paradoxes in collaborative governance. *Publ. Manag. Rev.* 1–26. <https://doi.org/10.1080/14719037.2023.2196290>.
- Rijke, J., Farrelly, M., Brown, R., Zevenbergen, C., 2013. Configuring transformative governance to enhance resilient urban water systems. *Environ. Sci. Pol.* 25, 62–72. <https://doi.org/10.1016/j.envsci.2012.09.012>.
- Rhein, S., Sträter, K.F., 2021. Corporate self-commitments to mitigate the global plastic crisis: recycling rather than reduction and reuse. *J. Clean. Prod.* 296, 126571. <https://doi.org/10.1016/j.jclepro.2021.126571>.
- Rogge, K., Pfluger, B., Geels, F., 2020. Transformative policy mixes in socio-technical scenarios: the case of the low-carbon transition of the German electricity system (2010–2050). *Technol. Forecast. Soc. Change* 151, 119259. <https://doi.org/10.1016/j.techfore.2018.04.002>.
- Saldaña, J., 2021. *The Coding Manual for Qualitative Researchers*. Sage Publications Ltd., London, United Kingdom.
- Salo, H., Berg, A., Korhonen-Kurki, K., Lähteenoja, S., 2022. Small wins enhancing sustainability transformations: sustainable development policy in Finland. *Environ. Sci. Pol.* 128, 242–255. <https://doi.org/10.1016/j.envsci.2021.11.024>.
- Schot, J., Geels, F.W., 2008. Strategic niche management and sustainable innovation journeys. *Technol. Anal. Strateg. Manag.* 20, 537–554. <https://doi.org/10.1080/09537320802292651>.
- Sitra, 2016. Leading the Cycle Finnish Road Map to a Circular Economy 2016–2025. Helsinki. <https://www.sitra.fi/app/uploads/2017/02/Selvityksia121.pdf>.
- Stirling, A., 2006. Precaution, foresight and sustainability: reflection and reflexivity in the governance of science and technology. In: Voss, J., Bauknecht, D., Kemp, R. (Eds.), *Reflexive Governance for Sustainable Development*. Edward Elgar Publishing Limited, Cheltenham, UK, pp. 225–272.
- Sundqvist-Andberg, H., Åkerman, M., 2022. Collaborative governance as a means of navigating the uncertainties of sustainability transformations: the case of Finnish food packaging. *Ecol. Econ.* 197, 107455. <https://doi.org/10.1016/j.ecolecon.2022.107455>.
- Termeer, C.J.A.M., Metzke, T.A.P., 2019. More than peanuts: transformation towards a circular economy through a small-wins governance framework. *J. Clean. Prod.* 240, 118272. <https://doi.org/10.1016/j.jclepro.2019.118272>.
- Trubetskaya, A., Scholten, P., B. V., Corredig, M., 2022. Changes towards more sustainable food packaging legislation and practices. A survey of policy makers and stakeholders in Europe. *Food Packag. Shelf Life* 32, 100856. <https://doi.org/10.1016/j.fpsl.2022.100856>.
- Visseren-Hamakers, I.J., 2018. Integrative governance: the relationships between governance instruments taking center stage. *Environ. Plan. C Politics Space* 36, 1341–1354. <https://doi.org/10.1177/0263774X18803634>.
- Visseren-Hamakers, I.J., Razzaque, J., McElwee, P., Turnhout, E., Kelemen, E., Rusch, G. M., Fernández-Llamazares, A., Chan, I., Lim, M., Islar, M., Gautam, A.P., Williams, M., Mungatana, E., Karim, M.S., Muradian, R., Gerber, L.R., Lui, G., Liu, J., Spangenberg, J.H., Zaleski, D., 2021. Transformative governance of biodiversity: insights for sustainable development. *Curr. Opin. Environ. Sustain.* 53, 20–28. <https://doi.org/10.1016/j.cosust.2021.06.002>.
- Voß, J.-P., Bauknecht, D., Kemp, R., 2006. *Reflexive Governance for Sustainable Development*. Edward Elgar, Cheltenham.
- Walker, B., Holling, C.S., Carpenter, S.R., Kinzig, A., 2004. Resilience, adaptability and transformability in social-ecological systems. *Ecol. Soc.* 9.
- Weber, M., Rohrer, H., 2012. Legitimizing research, technology and innovation policies for transformative change: combining insights from innovation systems and multi-level perspective in a comprehensive ‘failures’ framework. *Resour. Pol.* 41, 1037–1047. <https://doi.org/10.1016/j.respol.2011.10.015>.
- Westley, F., Olsson, P., Folke, C., Homer-Dixon, T., Vredenburg, H., Loorbach, D., Thompson, J., Nilsson, M., Lambin, E., Sendzimir, J., Banerjee, B., Galaz, V., van der Leeuw, S., 2011. Tipping toward sustainability: emerging pathways of transformation. *Ambio* 40, 762–780. <https://doi.org/10.1007/s13280-011-0186-9>.
- Williams, H., Wikström, F., 2011. Environmental impact of packaging and food losses in a life cycle perspective: a comparative analysis of five food items. *J. Clean. Prod.* 19, 43–48. <https://doi.org/10.1016/j.jclepro.2010.08.008>.
- Wolfram, M., 2016. Conceptualizing urban transformative capacity: a framework for research and policy. *Cities* 51, 121–130. <https://doi.org/10.1016/j.cities.2015.11.011>.
- Wolfram, M., Borgström, S., Farrelly, M., 2019. Urban transformative capacity: from concept to practice. *Ambio* 48, 437–448. <https://doi.org/10.1007/s13280-019-01169-y>.
- Yin, R.K., 2014. *Case Study Research: Design and Methods*, fifth ed. SAGE Publications, Thousand Oaks, CA.