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The Sustainability Transition in Food Packaging: Landscape Pressures leading to Intra- and Inter-Industry Dynamics

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Abstract: The chapter portrays the changing inter-industry dynamics of the sustainability transition in Finnish food packaging during 2019–2021. The transition is being driven by European and national regulation and consumer pressure. For the transition to successfully push forward, more needs to be known about how different industries are realigning to develop genuine systemic innovations, which enable the re-configuration of food packaging. We use the multilevel perspective (MLP) as a framework for sustainability transition and show how landscape pressures are driving radical changes in inter and intra industry relationships. The transition demands urgent responses, particularly by the food producing industry, which relies on innovation from another industry, that of food packaging material. Critical elements of the inter industry dynamic are the need for cross-industry collaboration, the urgency of one industry versus the risk aversion of the other and creating a common response to exogeneous pressures that have created intra-industry ruptures and inter-industry instabilities.

Keywords: Sustainability transition; Food packaging; Plastics; Multi-level; Pressures, Inter-regime dynamics

1 Introduction

In this chapter, we report on a study which researches into how different industries are reacting and interacting as a result of tighter regulation of the use of plastics and plastic waste in food packaging, and the general transition towards more sustainable food packaging. We specifically study food packaging *related* industries, which encompasses then the material industry producing packaging materials (e.g., plastics, cardboard), the packaging industry producing packages, labelling, packaging machinery, etc. and the food industry producing packaged food. All three industries combine in some form to create, produce and use food packaging. Tighter regulation of and increased public attention on the three industries is causing differing levels of change within these industries and to the relationships between these industries, what we refer to in this chapter as shifting intra and inter industry dynamics.

Our focus is on the external pressures affecting these industries in Finland during the period 2019 to 2023. This period corresponds to a project timetable but is also particularly relevant as it covers a time when Finnish industry in general is severely impacted by EU legislation and the Finnish government's 'Green Deal'. Finland's strong wood-fiber related industry therefore, with a push for new innovations, may well change some of the industry dynamics in food packaging. In addition, Finland has been creating sustainability related innovations in the food industry, and many companies have pledged to meet carbon neutrality or carbon reduction targets. This enabled our study of system-based changes that were happening within the project timeframe.

As a theoretical base and a framework for analysis, we will use the multi-level perspective on socio-technical transitions ('MLP') (Geels 2002; Geels 2011) to conceptualize and understand the transition in Finland towards more sustainable food packaging.

In the following sections, we first introduce the theoretical grounding of our work in the sustainability transition literature. We highlight the contribution that we aim to make to this literature, by illustrating the dynamics across the industries. We then further explain in detail our qualitative study and the data that we gathered. Finally, we present our findings, and discuss how they contribute to the sustainability transition literature.

2 The Multi-Level Perspective

Sustainability transitions have been described as long-term, multi-dimensional processes “through which established socio-technical systems shift to more sustainable modes of production and consumption” (Markard et al. 2012). Such transitions have several features that make them complex: multi-dimensionality, co-evolution, multi-actor and values contestation (Geels 2019).

The Multi-Level Perspective argues that sociotechnical transitions (a radical change from one sociotechnical system to a next) come about through interacting processes within and between the regime, niche and landscape levels (Geels et al. 2018). “The ‘socio-technical landscape’ represents the wider exogenous context of macro-economic trends, deep cultural patterns and macro-political development, which influences niche and regime dynamics while being beyond the control of individual actors” (Barbanente and Grassini 2022).

A regime “comprises a coherent configuration of technological, institutional, economic, social, cognitive and physical elements and actors with individual goals, values and beliefs” (Holtz et al. 2008), which deals with particular societal functions, such as in our case food supply. The regime level is understood as a relatively stable social structure existing between incumbent actors (Geels 2004; Geels and Schot 2007; Markard et al. 2012). Radical changes which may lead to transformations are considered as originating either from the landscape (changes in the practices, norms, and values in society) or from the niche level (socio-technological innovations that challenge the status quo in the regime) (Geels 2010). Niche innovations may challenge the regime successfully when landscape developments put pressure on the regime, leading to tensions and windows of opportunity for these innovations to break through (Fischer and Newig 2016). Subsequent interactions between niches and regimes occur on multiple dimensions and are enacted by actors that negotiate, search, learn, and build coalitions as they navigate transitions (Ingram et al. 2015). It is also assumed that innovative niche level actors challenge the existing regimes, thus destabilizing them (Walrave et al. 2018). Incumbents are seen to then implement solutions that niche actors have developed (Geels and Schot 2007). This categorization between the roles of incumbent and niche actors in transitions has been recently challenged (Loorbach et al. 2010; e.g., Berggren et al. 2015) but is still predominant in many of the theoretical debates as transition studies have largely focused on cases whereby niche-level innovations and landscape pressures have pushed forward changes in a single regime.

This study of *Food packaging transition* lies at the cross-roads of at least, two regimes, the one related to material supply (from raw materials, recovery and recycling) and the one related to the

food supply. Materials producers and food packaging producers operate within the *material regime* which is responsible for developing, producing, and processing cost efficient, well-functioning and environmentally sound packaging for various purposes, including food packaging. Food producers (and food retailers) operate within the *food regime*, which is responsible for producing and delivering nutritious and safe food. Each of these has its own stable structures, practices and relationships. While interconnected, these industries and their encompassing regimes serve different societal functions and have different dominant actors, institutions, infrastructures, markets, and companies.

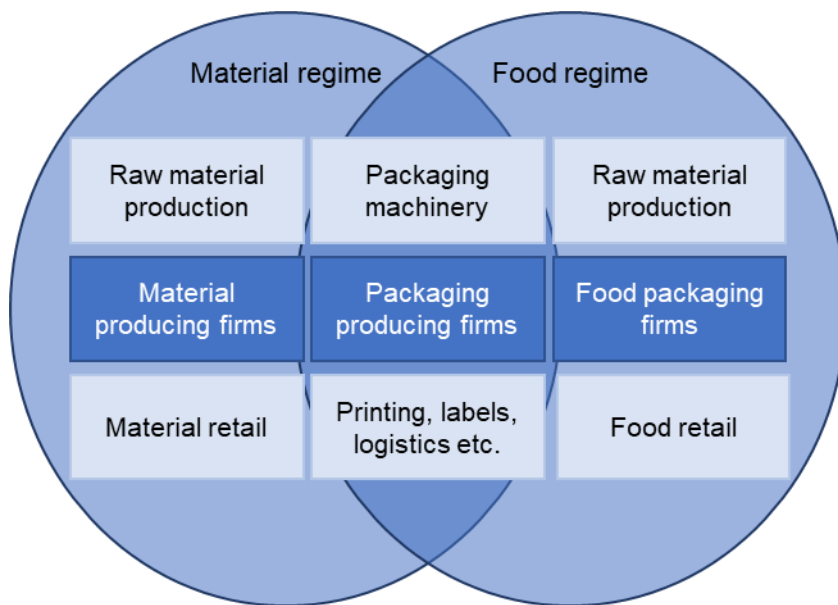


Fig. 1 Regimes effecting food packaging

Systemic, sociotechnical change in food packaging is dependent on or caused by interactions among different regimes and multiple industrial sectors governed by those regimes (Andersen et al. 2020). Food packaging is a multi-industry activity (see also Fig. 1) requiring inputs from packaging material producers, packaging producers and food producers, and this means that the sustainability transition demands changes in both the materials and the food regime.

Sustainability (sociotechnical) transitions are particularly uncertain and tend to take decades to unfold (Köhler et al. 2019). As they have various actors operating in different industrial sectors and multiple interdependent changes between these sectors, when studying cross-industry interaction and activities, the whole division between industry and niche actors becomes much more complex than when dealing with a single industry. Recent research has shown that incumbents in one

industry can have a major role in pushing forward radical niche-level innovations in another industry, thus acting at the margin and at the core simultaneously (Konrad et al. 2008; Lazarevic and Valve 2020), and core actors of one industry may appear as marginal or niche-level players in another industry (even though they may be the sources of disruptive innovations (Geels et al. 2017; Markard 2018; Andersen et al. 2020). Although recognized as important, the dynamics of cross-industry transitions is still a very much an under studied issue in MLP (e.g., Geels 2018) and it is this type of transition that we want to shed more light on in this study.

3 Methodology

When considering the case in its context, we wish to highlight that, as mentioned earlier, food packaging is at the crossroads of three industrial sectors: the sector that produces materials for packaging (e.g., glass, metal, plastic, and wood/fibre-based materials); the sector that uses these materials to produce food packages and finally the food producers, who use the packaging to package their food products. These sectors contribute to two regimes (packaging and food). Another level of complexity in the materials sector is that different types of materials producers are represented by separate industry associations. In the case of Finland, the actors active in the production of plastic packaging gather in the Finnish Plastics Industries Federation, which is a member of the much larger Finnish Chemical Industry Federation. The actors active in the production of fibre-based packaging are then again associating in the Finnish Forest Industries Federation.

The food producers are organized in the Finnish Food and Drink Industries' Federation (ETL). The food retailers gather and meet in the Finnish Grocery Trade Association (PTY). A key regulatory change for the food industry in Finland was the Waste Act of 2011, in which companies were allocated producer responsibility, the obligation to handle the waste management of the products they import or manufacture when these products are discarded, and this obligation also concerns the packaging of such products (Waste Act 2011/646 2011). The food industry companies play a dominant role in defining the specifications for food packaging that the materials producers and packaging producers (sometimes called 'converters') then need to meet. Packages are not at the core of value creation for the food industry, they are considered a cost. The food industry, furthermore, does not have the expertise needed to create novel food packaging solutions. They thus

need to work together and co-create solutions with the actors from the materials and package production industries.

The Finnish Packaging Association functions as a platform for actors from these different sectors to meet and undertakes the role of an intermediary (Kivimaa et al. 2019) in the on-going packaging transformation. They try to cover the entire value chain from material and packaging production and production of packaged goods to distribution, retail and services. Other institutional intermediaries for interaction and collaboration between food and material regimes for the enhancement of sustainable food packaging have formed as a response to the development of regulation, such as the EU plastics strategy (European Commission 2018), EU circular economy action plans (European Commission 2020) and their national implementation in Finland. Another regulation related intermediary object is the 'Plastics Roadmap for Finland' (initiated in 2018). This process, in which both food and material industry actors have had an active role, identified the first steps towards a new, sustainable plastic economy. This process has in many important ways shaped societal discourse and framed the plastics problem in Finland. Similarly, the material efficiency commitment for the food industry (MATSIT, launched in 2019) has been an intermediary object. Here, the interaction is intermediated by a state-owned company Motiva. The material efficiency commitment is a voluntary model of action between the business community (actors from the food and material industries) and the state administration (Ministries of Environment, Economic Affairs and Employment, and Agriculture and Forestry).

For methodological purposes, we conceptualise the food packaging transition as a single case (Yin 2003) representing an example of a sustainability transition pushed fundamentally by landscape pressures. The case is particularly interesting as it presents an example of a cross-regime, cross industry transition. We use this case to understand how organisations acting in these different industries and regimes are experiencing these landscape pressures. We focused on the differences and the reactions to these pressures by the different actors and the consequences of the pressures in terms of internal regime dynamic and cross-regime dynamic.

We focused our analysis specifically on Finland. As mentioned in the introduction, Finland is interesting in this respect because it has a large, and innovative wood-fiber industry. In addition, sustainability is considered important, and waste and material efficiency measures were already put into place to ensure food packaging would become more sustainable.

We undertook 32 semi-structured interviews (Silverman 2020) with a variety of stakeholders. These interviews were conducted online through videoconferencing (Mason 2018) and face-to-face meetings. The stakeholders we interviewed were either involved the material regime (material producers and packaging producers - converters of material into packages, as well as their trade associations), the food regime (food producers, processors and retailers, as well as their trade associations), or they would be active in both these regimes (ministries, packaging association and producer responsibility organizations). Interviewees were most often either CEOs (small firms), sustainability managers (bigger firms), or experts related to sustainability of food packaging. Table 1 gives an overview of the data collected.

Table 1 Data collected

	Materials regime	Food regime	Both regimes
Interviews, number	12	13	7
Interviews, total length	599	786	442
Documents, number	22	52	34
Document, number of pages	2,002	5,349	1,131

In addition to and in preparation for the interviews, we collected and analysed secondary data (Largan and Morris 2019), documents related to the regulatory changes affecting the food packaging field, both policies already implemented and policies under preparation. We also collected and analysed annual sustainability reports of key companies involved in the food packaging field published between 2015 and 2020 as well as policies or strategic plans developed by these companies in this period in relation to the sustainability transition of food packaging. In the content and timeline analysis (Silverman 2020) of these documents we looked at how, over the period of five years, the sustainability focus changed in relation to food packaging. We created short summaries of key facts from the reports for each player and used these to prepare our interviews. The interviews were recorded and transcribed. The transcripts of the interviews were analysed utilizing NVivo software. First order codes were attached based on relevance to the overall transition in food packaging. A second level of coding was then conducted based on more specific

relevance to the transition framework of the MLP. The third level of coding looked for data that referred to the changing dynamics between the levels and regimes caused by external (and sometimes internal) pressures. These codes were then apportioned to MLP levels and finally to particular cross industry pressures (see Fig. 2 for coding details).

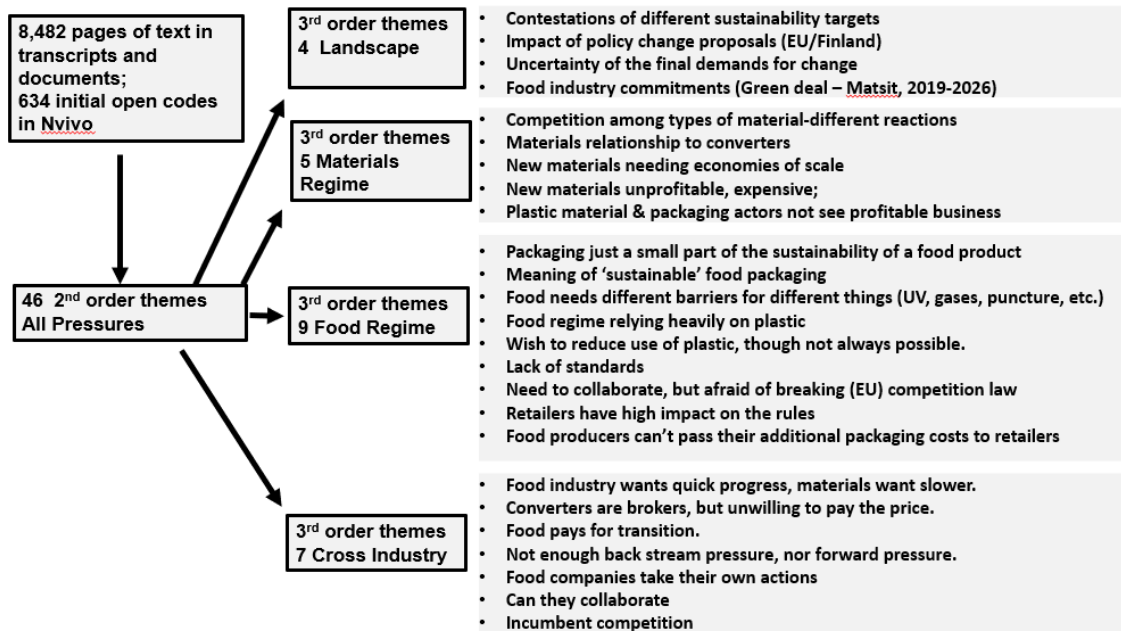


Fig. 2 Coding details

4 Landscape Pressures

In this study, the affective landscape includes exogeneous environmental and cultural events like marine littering as well as macro-economic trends like the drive towards material efficiency and the concept of the circular economy. At the same time macro-economic and macro political trends have been pushing the move away from non-renewable resources such as fossil based materials amidst the pressures created by calls for climate change.

While material efficiency and the general ideas of a circular economy received attention in many annual reports from 2015 to 2017, the (marine) littering issue came to centre stage in 2018. The European Union packaging directives of 2018 and 2019 were keenly felt by our interviewees. For the food industry in Finland, climate change and material efficiency had been on their agendas already earlier in the decade. Amongst other things, the food industry had been pushed by

government initiatives such as MATSIT to start acting, particularly in preventing food loss, as food loss results in high CO2 emissions.

Food packaging, and particularly plastic packaging, with its wide variety of optional protective layers, had been a key tool in preventing food loss and reducing CO2 emissions. Particularly amongst Finnish food producers, with most food sold in large supermarkets, plastic, with its specific properties, is not necessarily considered “the enemy”. Furthermore, it is highlighted that packaging, especially when considering becoming carbon neutral is only a small element. This kind of understanding, that packaging has minor impact on global warming, is in line with the current scientific knowledge (e.g., Silvenius et al. 2014).

[...] we discovered that actually 55-60% of the carbon emission is coming from the ingredients, that is farming, and then only maybe 5% from our own products and then 5% from the packaging materials, so even if we do the packaging now this needs many other [actions to become carbon neutral] (R25, Sustainability Director, food producer)

The large media attention on marine littering and then the swift move by the EU towards developing regulation, restricting single-use plastics, forced the food industry to reconsider and re-evaluate their current practices around the packaging of their products:

[...] this whole packaging issue came very strongly in 2018. So it was kind of like a heavy booster around Europe at the same time, and then quite many retailers and suppliers... started to do, or take actions towards the packaging or sustainable packaging, and launches new initiatives in this field. So, it was really like a wave that passed the whole Europe (R20; Sustainability Director, retailer)

The growing consumer and general societal perception in Finland that plastic food packaging is a threat to the environment is forcing food producers and retailers to reappraise their corporate values and take action to support a certain brand image focused towards ‘sustainability’. Family-owned and cooperative firms perceive the need to take actions to move forward in terms of sustainability. As one interviewee recalled about their joining a family firm in the food industry:

...colleagues that I met, they mentioned sustainability or environment at some point. So, it was really noticeable that it is like in the DNA of [our company] and the

[owning] family. It's a family-owned company and we don't have the pressure of quarterly [market reporting] (R1; Sustainability Director, food producer)

A certain amount of *contestations of different sustainability targets* (e.g., Smith et al. 2010) began to occur. If actors concentrated on CO2 emissions, then food loss would be their highest priority, but in most cases, this meant using plastic packaging. When looking at the environmental impact, particularly (marine) littering, plastics should be replaced by other materials. If plastics were still used, then solutions would need to be found to make the use of plastic packaging more sustainable; for example looking to replace oil with pulp fibre as the key component in the production of plastic, looking for new biodegradable pulp based plastic options, and/or looking for better plastics recycling options.

These two industries, the plastic and the pulp and paper industries compete as material providers for several different fields including for example, construction, and packaging. This competition has been further intensified due to the EU plastics policies, i.e., Plastics strategy (European Commission 2018), single-use plastics directive, EU Circular Economy Action Plan (European Commission 2020), which have created a potential for pulp fibre-based materials producers to gain a competitive advantage in, for example, certain single-use-package item markets.

5 Material Industry Dynamics

The push toward material efficiency and away from non-renewable resources (oil-based plastics), as well as the marine litter dilemma, hit the plastics material sector particularly negatively.

And when it comes to the plastic industry, I think, I feel that at this point they... [...] have gotten their feelings hurt, I mean, plastic has made out to be this demon that it's really not (R16; CEO, packaging producer)

The plastic material production and packaging actors do not yet see a profitable business in producing more "sustainable" materials. It is an industry built on high volumes and low margins, and it has been focused on optimizing processes and internal efficiencies versus innovating to create non-plastic or bio-plastic materials. The product development reaction has been to maintain current product portfolios and look for more sustainable types of plastic as its most radical solution:

They are selling bulk with very low margins. [...]. So, they don't necessarily have the knowhow and expertise how to sell [a premium, innovative] material. But if we redesign the plastic itself, so that we can keep the applications, logistics, the production as it is today, that is the most efficient way to go big, go global, and achieve the scale (R16; CEO, packaging producer)

The push by the EU to regulate single-use plastic (the SUP-directive) worried the actors in the fibre-based materials sector. Especially, the uncertainty around how the use of dispersion coatings or laminated plastic films, which are used to ensure sufficient barrier properties in fibre-based packages, would be treated:

Well, eventually the start-up of the whole project in a way was coming from the SUP-directive, as well as the micro plastic restrictions, as well as the understanding that we are facing these things together for the whole industry (R1; Sustainability Director, materials, producer)

Food producers are still hesitant over a move away from plastic packaging and indeed they have challenges defining what can be achieved by sustainable packaging:

Depends on products, because there are some products that, at the moment, there isn't a good solution to replace it with a monomaterial, or we can't downgauge at the moment, or there just isn't a substitute, like polyamide in a sausage package is not replaceable at the moment. We don't have a solution that would allow us to use such a thin material with such a capacity to stretch, with such puncture resistance. There isn't any, so we can't substitute it at the moment (R6; Marketing and Packaging Director, food producer)

In the materials industry plastic suppliers feel more pressure than fibre-based suppliers, but both do not yet see how to supply new materials profitably:

There are some challenges with using biomaterials in food packaging. Not many materials are food-grade or durable enough to protect the products during transportation.....whenever new biomaterials are identified, the environmental efficiency of the entire production chain must be verified (R23; Sustainability Director)

Fresh business avenues have opened for the fibre-based materials sector. Fibre-based material producers can see that there will be, at some future point, a large market opportunity to challenge fossil-based plastic packaging with their innovative materials based around wood fibres:

The world has changed, definitely, and there are companies who have recognized that this is, uh, actually this is not a threat, this is a huge opportunity. They want to be part of it, they want to be the first one to... to make... to kind of like, to create the innovations, to commercialize the innovations, and to make a profit out of it (R16; CEO, packaging producer)

An internal driver within the materials industry is the need for economies of scale. Both plastic and fibre-based materials producers have been high volume-low margin businesses where any new products need large production volumes for them to be economically feasible (as we noted above):

But also one thing, what is the driver here, is really to create this kind of economic of scale, for... already existing packaging as well as these new innovations what's coming on, and really to do this existing and new fibre based solutions to make transition for the plastic, from plastic, possible (R16; CEO, packaging producer)

This dilemma is reflected within the cross-industry dynamics and leads to a key question concerning who amongst the inter industry actors will pay for the costs of the transition. As with the large material producers, the material converters also face this dilemma, in that new material usage will require changes to packaging machinery and their own internal processes:

Because we cannot drive them as fast as we do with, let's say polyethylene or polypropylene, and... and then we say to customers, okay, we need three times the price, because the... raw materials are more expensive, the manufacturing is much slower, it's not so efficient. (R2; CEO, packaging producer)

The power to direct the transition and to move quickly in terms of researching, developing, and bringing novel solutions to market lies firmly with players in the materials production sectors. As the forestry companies are huge multinationals, the converters are pressured to do their will rather than the other way around:

the raw material producers, they have all the power. And the converters between, they do as they are told, basically (R16; CEO, packaging producer)

Internally then within the industry there is competition around the future for food packaging between plastics and fibre. As mentioned also above, neither branch of the industry (nor the converters) yet feel that they can profitably supply the needed new materials. There are tensions around who should push and who is pushing the transition and who will ultimately pay for new packaging solutions.

6 Food Industry Dynamics

The drive towards increased material efficiency is leading to a variety of different actions amongst food producers. Some food producers act quickly to replace plastic food packaging completely, e.g. dry goods. For other food producers their main goal is the reducing of plastic usage:

our biggest goal is reduction – not replacing (R23; Sustainability Director, food producer)

For meat processors the emphasis is mostly on avoiding food loss and waste by prolonging shelf-life and ensuring food safety, which can be achieved only by using plastic packaging, as pointed out by a respondent:

Plastics are not going away...for some products plastic cannot be substituted (R6; Marketing and Packaging Director, food producer)

For the actors in the food industry, different landscape pressures led to differing perceptions of what was meant by ‘sustainable’ food packaging and differing reactions as to how they would then define ‘sustainable packaging’ for themselves:

actually, we have two bigger commitments. One is that we are going towards circular economy, and another is that we are minimizing the climate impact. So, from those point of views, we are... we are describing to ourselves and try to, of course, to describe to our customers, what is sustainable packaging. And... it’s not a really... easy job (R21, Packaging Director, food producer)

The lack of common or standard reactions (due to product packaging differences) amongst food producers has led to each food company trying to find solutions of their own. This has meant also that the food producers are not collaborating to create cumulative demands for the supply of novel materials towards the materials producers. Some form of standards or standardisation of packaging solutions would lead to higher volume demands from the food producers and therefore greater influence to push for change (though as we can see, some food producers would like to enact change more quickly than others).

There is further the fear amongst food producers that EU competition law would punish them for colluding together to create new food packaging formats:

So it comes directly from the competition law, what we are able to do and what we are not able to do, and what we can discuss or what we cannot discuss. (R24; Sustainability Director, retailer)

Food producers that relied heavily on plastic for packaging, such as meat and coffee producers, were worried, especially by the rapid and severe reactions from regulators, particularly the EU's initiative to regulate single-use plastics. This worry also shines through from the following statement by one of these players in the food industry:

We don't live without plastic (R6; Marketing and Packaging Director, food producer)

These companies took actions to push back against the idea that plastic is always bad for the environment, or that their food packages end up in the wrong place, by focusing on persuading consumers and employees that a high percentage of plastic packaging was being collected:

And this video is about [...] recycling. We said that already now 99 percent of our packages can be sorted to recycling bins, and we said that if the plastic [...] package is not a trash serving, it extends the shelf life of the [product], reducing food waste and so on (R23; Sustainability Director, food producer)

Finally, plastics in food packaging applications and regulatory complexity around the use of plastics is perceived to hinder change for all food producers who would like to use or re-use plastic materials:

Recycled plastic is not allowed to be used in food packaging, except for deposit bottle systems, (and) is a thing that limits its use quite a lot. You will not be able to meet the hygiene requirements. This is such a broad entity that when you change one thing, you should constantly understand how all other legislation affects whether it is possible to achieve some change. (R29; CEO, recycling company)

Some food producers believe that there is a power inequality regarding their relationship with the major food retailers in the food chain and that the power to enact change does not lie with them as food producers. Their perception is that food retailers overpromise on their own retailer goals to reduce plastic usage and then they make greater demands on the food producers to enact the necessary changes that would meet retailer promises:

Even more terrible thing is that the top management of the big global brand owners do not understand anything about packaging either.(...) They look at David Attenborough films with turtles having plastic bags on their heads and after that they go and design corporate policies and release statements which promise that they give up plastics by 2025, which is so incredibly stupid statement that these people should be sent to stand in the middle of a market square with a hat of an ass on their heads claiming that they are stupid. (R11; Chairperson, association)

However, one of the two largest food retailers in Finland thought that it was not their responsibility to drive change. Change should be driven by food producers:

Brand owners should bring along new solutions (R24; Sustainability Director, retailer)

This contestation of who should or could drive the transition is reinforced by food retailers also insisting that costs, incurred by food producers in pushing the transition, are not passed on. Retailers are not willing to take the costs of the changes needed in novel food packaging solutions (which would push them to increase retail prices to the consumer) and therefore any extra novel packaging costs would remain with the food producers and further squeeze food producer margins:

What comes to our own private label products, yes, we have lots of responsibility. We are able to pressure the supply chain. But what comes to branded products... A-brands, we... it's a totally different world. We don't have that much impact... impact on that (R24; Sustainability Director, retailer)

The food industry would like to act quickly to push the transition forward. They feel that they cannot do this in unison due to their competitive cultures, business histories and European anti-trust regulations. There is a perception that retailers want to give responsibility to push the transition to the food producers and that food producers should also fund the innovation that is needed.

7 Cross-Industry Dynamics

The tensions upon and within the three industries are reflected in the cross-industry dynamics. When comparing the different industries, we see that food producers, would like to move more quickly. When possible, due to their primary focus on sustainability of packaging, the food industry actors, as customers of the packaging industry, demand novel sustainable materials to be used in food contact. By doing so they also take part in changing the market balance between the different actors in the packaging industry. As one interviewee from the packaging industry highlights:

of course, more and more... customers are also interested in, um... kind of, again, getting rid of the virgin fossil materials, but maybe getting recycled materials, also plastics, recycled plastics in and so on (R19; Packaging Director, packaging producer)

Thus, the food packaging change is being “pushed” by the food industry (retailers and food producers) backstream towards the packaging industry:

Brand owners push change when it suits them (R18; Sustainability Director, materials producer)

Converters, who operate in between materials producers and food producers in the food industry, seem to experience much less pressure than materials producers, and they do this by adopting the mindset that they are acting as ‘brokers’ between food producers and materials producers. They are not bound to one specific type of material, and are willing to think with their customers about potential solutions:

[...] we are converter, so our role is not to... let’s say, we are not... trying to lead [...] the change. We let the brands to do that stuff. Brands tell us what they want to have,

and we a little bit [...] spar around that, okay, what is possible (R22; CEO, packaging producer)

They also are willing to test and try new materials for their customers, but if these materials do not run optimally in their machines, the food industry player will need to pay the price difference. The assumption being made is that food producers will pay for the transition. As one of the interviewees highlighted:

There are all kinds of issues in terms of production. And if we say to brands that hey, if you want to try it out, we are open to any kind of test trials, for any kind of materials. But very often the issue comes that we say that the... the price tag is different (R22; CEO, packaging producer)

It is also clear from interviews that food industry actors believe that the pressure on the materials industry to change, is not strong or heavy enough yet to push them towards the needed innovations:

There is not enough pressure backwards on material suppliers to change (R17; Sustainability Director, food producer)

The food industry is focused generally on being agile, listening to consumers and finding quick solutions. Their perception is that the materials industry is much slower to move and they themselves hold power through access to the raw and treated materials that are used for food packaging. Many food producers themselves have made clear and public commitments to be 'plastic free' or 'fully recyclable' by 2025, even though currently the materials needed for such change do not exist. They are frustrated with pace of change undertaken by the materials suppliers.

A large, international food industry actor was driven to take significant steps to take the power back into their own hands by initiating a material or packaging innovation centre in-house. This highlights the frustration more generally sensed when discussing with food industry actors:

we have put a lot of money, developed a pouch which is multi-layered, mono-material pouch and should be able to recycle (R25; Sustainability Director, food producer)

The pressure being experienced from the landscape and the intra- and cross-industry dynamics in the food packaging field is driving industry and field changes, albeit at different speeds. The key

challenge to be met is whether the key actors of these two industries can collaborate to develop common advantageous solutions quickly enough:

And that, that also shows that the... packaging companies are really, they are really... they try to... contact us as much as possible, but sometimes of course we have to remember that we are doing the milk products, we are not doing the packages. So that's why we... we have to say quite often no thanks, we don't have time (R21; Packaging Director, food producer)

I, I think the... the challenge is somewhere in the supply chain. That we are not getting offered from our suppliers, our producers... new materials or new solutions enough. They, even though we would be demanding, but like... there is not coming that much any new... materials or packaging solutions, actively from our suppliers (R24; Sustainability Director, retailer)

There are reasons that challenge the capacity of the actors of the studied industries to collaborate. We have noted that within the food industry, key actors believe that EU competition law restricts their ability to develop common standards and solutions. In that same industry, sustainability as a brand element may give a competitive advantage and historically food production and retailing have been extremely competitive sectors. This lack of collaboration negates the possibility to increase pressure on the material producers to develop the needed materials solutions more quickly.

Finally, competition within the materials industry between plastics and fibre is also something that negates collaboration.

I mean especially when we are working with the big, established companies... a lot of times many of the companies, they say that they do R&D, but in fact they don't. (...) Their R&D work is, it's just optimizing the existing process. (R16; CEO, packaging producer)

Everybody talks about collaboration... but real collaboration, it's... it doesn't happen that much. (R16; CEO, packaging producer)

8 Discussion and Conclusion

In this study we aimed to explore the changing dynamics between separate Finland based industry regimes as they sought to transition towards more sustainable packaging for food products. The changing dynamics have been caused by external or exogeneous events to these different regimes. These events: marine plastic littering, EU sustainability goals and EU plastic directives, have created a strong pressure to transition towards more sustainable food packaging.

From a theoretical standpoint, sustainability transition cases where systemic, sociotechnical change is dependent on or caused by interactions between multiple regimes and therefore multiple industrial sectors within those regimes is still a very much an under studied issue (e.g., Geels 2018; Andersen et al. 2020). We add to the literature on cross-regime sustainability transitions by exploring and explaining the pressures to transition which are exogeneous to the regimes, intra the regimes and also inter the regimes. In our study, the most powerful cross regime/cross industry pressure comes from the food to the materials regime. The issue here is that the food regime has an existential need to transition urgently as they have producer responsibility through EU law for the packaging transition. The materials regime does not, and therefore the food regime is being forced to pay for the innovations that need to quickly take place in the other (materials) regime. This has driven one of the largest food producers to enter a completely different industry (materials) in order to progress and guarantee that they will meet legal packaging requirements.

As discussed earlier, the sustainability transition of food packaging in Finland is clearly a regulation and policy driven issue which has not yet created significant bottom-up momentum. Our study indicates how demanding it is to push sustainability transitions from the top down. It can be understood as an example of a “transformative environmental policy” (Jacob and Ekins 2020) which is still looking to find an adequate policy-mix. Such policy-mix would need to take into account the desire to shape a more sustainable future alongside the necessity to deliberate between different actors and take account of their varying interests and mutually incompatible sustainability goals.

Transformative policies always aim for creative destruction (Kivimaa and Kern 2016) which potentially causes tensions and mistrust between actors, as our study shows. Though much of the theorising in MLP focuses on how niche-level innovations and newcomers disrupt the incumbent industries within the regime, our findings show that pressure to change on the regimes is strongly

driven by regulation, environmental policies and increasing public awareness of environmental problems, rather than being pushed forward through niche-level innovations. This is also the case with many other sustainability transitions (see e.g., Jacob and Ekins 2020).

These pressures can hit incumbent players in the regimes in diverse ways, which, in fact are the key dynamics of sustainability transitions. In our case, the food industry is under much more pressure to act, but at the same time is heavily dependent on the materials industry, to develop and innovate new sustainable packaging materials. In cross-industry transitions, industries are dependent on one another to move forward, but these dependencies are not necessarily equal. This means that the situation can be exploited by the materials industry in the sense that the food industry is forced to move forward quickly with sustainable packaging changes.

The food industry is looking for new *package* solutions, package per package. This means low volumes, and much higher prices. These are autonomous innovations (Bohnsack et al. 2020), even though they are often cross-industry projects, including a material producer, a packaging company and a food producing brand owner. This also means that the frustration within the food industry is building. While some food industry players highlight that they are not packaging experts, and have no wish to get into this business, as mentioned above, one of the food industry players has made a move to take innovation and development into their own hands. Thus, in cross-industry and multi-industry situations, the differences in which landscape pressures are experienced, can become a creative force that pushes actors to find solutions (Kivimaa and Kern 2016).

This more modest sociotechnical change might result in significant structural changes and important environmental benefits. In practice, this shift may be even faster than radical transition as it draws its power from the resources, knowledge, and capital of existing large players. As highlighted by recent studies (Smink et al. 2015; Bohnsack et al. 2020), there can be a very quick shift when one of the central incumbent players makes a move and, because of this, other key players move as well.

Connected to this, Gallo and Christensen (2011) hypothesized that larger and publicly owned firms would engage more in sustainability related issues. They concluded that “other factors” must play an important role. Our study seems to indicate that one such factor could be timeframes. For example, *privately owned firms* feel less pressure to show short-term results, and this gives, in our study, family-owned and cooperative firms, the possibility to have a longer time frame in their return on investments. This differing time perspective may also be of significance in transitions. As

our study does not provide the possibility to look at this in more detail, it would be well worth exploring this in future research.

Our case clearly indicates some of the shortcomings of sustainability transitions literature, in that most studies do not capture the tensions, dilemmas and complex relationships between the various industry actors, even as they work to overcome the major challenge of systemic innovation (Bohnsack et al. 2020) rather than mere stand-alone projects.

In many cases, sustainability goals are contested, which makes it difficult to define what the direction of transition should be, to really be sustainable (e.g., Smith et al. 2010). Cross-industry interaction may cause difficulties in defining which changes will in fact advance sustainability, as the sustainability is viewed from the viewpoint of different societal functions, that of material and that of food. For example, solving one sustainability problem may cause negative environmental impacts in another part of the system as is the case with diminishing the usage of plastic in food packages vs. minimizing food loss. Innovations reducing the carbon emissions for packaging materials could increase the sustainability of the material industry, while it may at the same time diminish the sustainability of the food industry if such materials would increase food loss and waste, which reduces material efficiency and increases CO₂ emissions.

The contested sustainability goals and the fact that transition necessarily leads to winners and losers also makes the definition of sustainability targets a politicised issue, which still, despite the long-term critique (e.g., Meadowcroft 2011) often remains an under-recognised issue in transitions literature (Kenis et al. 2016). Food packaging is an integral, but at the same time a marginal part of both the packaging and food industries. It is a cost factor for the food industry. And when it comes to sustainability, the food industry is much more concerned with preventing food waste. This puts emphasis on the need for a more reflexive approach to cope with or solve the *contestations of different sustainability targets* (e.g., Smith et al. 2010) related to food packaging.

We suggest that in order to successfully push forward the renewal of food packaging, more needs to be known about how firms' interests and strategies, in the different industries, can be aligned and more systematic programmes should be launched to align those interests for joint innovation. In order to develop genuine systemic innovations, which enable the re-configuration of food packaging as part of novel food production, delivery and materials production solutions, there is a need for cross-industry collaboration and innovation at the company level. However, pressures from

the landscape have created instabilities and ruptures in the materials, packaging and food industries. Serious attempts to create a cross-industry transition arena (Loorbach and Rotmans 2010), for actors to envision a more sustainable plastic economy, have been made as part of the national plastics roadmap, and food packaging has been introduced as one issue to be addressed in this process. The transition to a more sustainable plastic economy requires trust between engaged actors, shared envisioning, resources, experimentation and the will and ability to share risks.

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9 References

Andersen AD, Steen M, Mäkitie T et al (2020) The role of inter-sectoral dynamics in sustainability transitions: a comment on the transitions research agenda. *Environ Innov Soc Transit* 34:348–351. <https://doi.org/10.1016/j.eist.2019.11.009>

Barbanente A, Grassini L (2022) Fostering transitions in landscape policies: a multi-level perspective. *Land Use Policy* 112:105869. <https://doi.org/10.1016/j.landusepol.2021.105869>

Berggren C, Magnusson T, Sushandoyo D (2015) Transition pathways revisited: established firms as multi-level actors in the heavy vehicle industry. *Res Policy* 44(5):1017–1028. <https://doi.org/10.1016/j.respol.2014.11.009>

Bohnsack R, Kolk A, Pinkse J et al (2020) Driving the electric bandwagon: the dynamics of incumbents' sustainable innovation. *Bus Strat Env* 29(2):727–743. <https://doi.org/10.1002/bse.2430>

European Commission (2018) Plastic waste: a European strategy to protect the planet, defend our citizens. Press Release 16 Jan 2018. https://ec.europa.eu/commission/presscorner/detail/en/ip_18_5. Accessed 15 Jun 2024

European Commission (2020) A new Circular Economy Action Plan for a cleaner and more competitive Europe. EUR-Lex Document 52020DC0098. https://eur-lex.europa.eu/resource.html?uri=cellar:9903b325-6388-11ea-b735-01aa75ed71a1.0017.02/DOC_1&format=PDF. Accessed 15 Jun 2024

Fischer L-B, Newig J (2016) Importance of actors and agency in sustainability transitions: a systematic exploration of the literature. *Sustainability* 8(5):476. <https://doi.org/10.3390/su8050476>

Gallo PJ, Christensen LJ (2011) Firm size matters: an empirical investigation of organizational size and ownership on sustainability-related behaviors. *Bus Soc* 50(2):315–349. <https://doi.org/10.1177/0007650311398784>

Geels FW (2002) Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Res Policy* 31(8–9):1257–1274. [https://doi.org/10.1016/S0048-7333\(02\)00062-8](https://doi.org/10.1016/S0048-7333(02)00062-8)

Geels FW (2004) From sectoral systems of innovation to socio-technical systems: insights about dynamics and change from sociology and institutional theory. *Res Policy* 33(6–7):897–920. <https://doi.org/10.1016/j.respol.2004.01.015>

Geels FW (2010) Ontologies, socio-technical transitions (to sustainability), and the multi-level perspective. *Res Policy* 39(4):495–510. <https://doi.org/10.1016/j.respol.2010.01.022>

Geels FW (2011) The multi-level perspective on sustainability transitions: responses to seven criticisms. *Environ Innov Soc Transit* 1(1):24–40. <https://doi.org/10.1016/j.eist.2011.02.002>

Geels FW (2018) Disruption and low-carbon system transformation: progress and new challenges in socio-technical transitions research and the Multi-Level Perspective. *Energy Res Soc Sci* 37:224–231. <https://doi.org/10.1016/j.erss.2017.10.010>

Geels FW (2019) Socio-technical transitions to sustainability: a review of criticisms and elaborations of the Multi-Level Perspective. *Curr Opin Environ Sustain* 39:187–201. <https://doi.org/10.1016/j.cosust.2019.06.009>

Geels FW, Schot J (2007) Typology of sociotechnical transition pathways. *Res Policy* 36(3):399–417. <https://doi.org/10.1016/j.respol.2007.01.003>

Geels FW, Schwanen T, Sorrell S et al (2018) Reducing energy demand through low carbon innovation: a sociotechnical transitions perspective and thirteen research debates. *Energy Res Soc Sci* 40:23–35. <https://doi.org/10.1016/j.erss.2017.11.003>

Geels FW, Sovacool BK, Schwanen T et al (2017) The socio-technical dynamics of low-carbon transitions. *Joule* 1(3):463–479. <https://doi.org/10.1016/j.joule.2017.09.018>

Holtz G, Brugnach M, Pahl-Wostl C (2008) Specifying “regime” — A framework for defining and describing regimes in transition research. *Technol Forecast Soc Change* 75(5):623–643. <https://doi.org/10.1016/j.techfore.2007.02.010>

Ingram J, Maye D, Kirwan J et al (2015) Interactions between niche and regime: an analysis of learning and innovation networks for sustainable agriculture across Europe. *J Agric Educ Ext* 21(1):55–71. <https://doi.org/10.1080/1389224X.2014.991114>

Jacob K, Ekins P (2020) Environmental policy, innovation and transformation: affirmative or disruptive? *J Environ Policy Plan* 22(5):709–723. <https://doi.org/10.1080/1523908X.2020.1793745>

Kenis A, Bono F, Mathijs E (2016) Unravelling the (post-)political in transition management: interrogating pathways towards sustainable change. *J Environ Policy Plan* 18(5):568–584. <https://doi.org/10.1080/1523908X.2016.1141672>

Kivimaa P, Boon W, Hyysalo S et al (2019) Towards a typology of intermediaries in sustainability transitions: a systematic review and a research agenda. *Res Policy* 48(4):1062–1075. <https://doi.org/10.1016/J.RESPOL.2018.10.006>

Kivimaa P, Kern F (2016) Creative destruction or mere niche support? Innovation policy mixes for sustainability transitions. *Res Policy* 45(1):205–217. <https://doi.org/10.1016/j.respol.2015.09.008>

Konrad K, Truffer B, Voß JP (2008) Multi-regime dynamics in the analysis of sectoral transformation potentials: evidence from German utility sectors. *J Clean Prod* 16(11):1190–1202. <https://doi.org/10.1016/j.jclepro.2007.08.014>

Köhler J, Geels FW, Kern F et al (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>

- Largan C, Morris T (2019) *Qualitative secondary research: a step-by-step guide*. SAGE Publications Ltd., London
- Lazarevic D, Valve H (2020) Niche politics: biogas, technological flexibility and the economisation of resource recovery. *Environ Innov Soc Transit* 35:45–59.
<https://doi.org/10.1016/j.eist.2020.01.016>
- Loorbach D, Rotmans J (2010) The practice of transition management: examples and lessons from four distinct cases. *Futures* 42(3):237–246. <https://doi.org/10.1016/j.futures.2009.11.009>
- Loorbach D, van Bakel JC, Whiteman G et al (2010) Business strategies for transitions towards sustainable systems. *Bus Strat Env* 19(2):133–146. <https://doi.org/10.1002/bse.645>
- Markard J (2018) The next phase of the energy transition and its implications for research and policy. *Nat Energy* 3:628–633. <https://doi.org/10.1038/s41560-018-0171-7>
- Markard J, Raven R, Truffer B (2012) Sustainability transitions: an emerging field of research and its prospects. *Res Policy* 41(6):955–967. <https://doi.org/10.1016/j.respol.2012.02.013>
- Mason J (2018) *Qualitative researching*, 3rd edn. SAGE Publications Ltd., London
- Meadowcroft J (2011) Engaging with the politics of sustainability transitions. *Environ Innov Soc Transit* 1(1):70–75. <https://doi.org/10.1016/j.eist.2011.02.003>
- Silvenius F, Grönman K, Katajajuuri J-M et al (2014) The role of household food waste in comparing environmental impacts of packaging alternatives. *Packag Technol Sci* 27(4):277–292.
<https://doi.org/10.1002/pts.2032>
- Silverman D (2020) *Interpreting qualitative data*. SAGE Publications Ltd., London
- Smink MM, Hekkert MP, Negro SO (2015) Keeping sustainable innovation on a leash? Exploring incumbents' institutional strategies. *Bus Strategy Environ* 24(2):86–101.
<https://doi.org/10.1002/bse.1808>

Smith A, Voß JP, Grin J (2010) Innovation studies and sustainability transitions: the allure of the multi-level perspective and its challenges. *Res Policy* 39(4):435–448.

<https://doi.org/10.1016/j.respol.2010.01.023>

Walrave B, Talmar M, Podoyntsina KS et al (2018) A multi-level perspective on innovation ecosystems for path-breaking innovation. *Technol Forecast Soc Change* 136:103–113.

<https://doi.org/10.1016/j.techfore.2017.04.011>

Waste Act 2011/646 (2011) 17.6.2011. <https://www.finlex.fi/fi/laki/ajantasa/2011/20110646>.

Accessed 15 Jun 2024

Yin RK (2003) *Case study research: design and methods*, 3rd edn. SAGE Publications, Thousand Oaks (CA)