Master's Thesis – Master Sustainable Business and Innovation

Reaching a Sustainable Consumer Packaging Industry

A search for a transition towards resource-efficient fast-moving consumer goods packaging of dry goods and cleaning products in the Netherlands

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Abstract

The status quo in the Netherlands in conventional single-use plastic packaging is a situation which poses constraints with goals to reach a Circular economy. The Netherlands is noticing a series of problems associated with single-use plastic packaging including littering, environmental burdens and associated health risk caused by plastics ending up in the environment. A possible solution for such problems would be a transition to Reusable Packaging Systems (RPSs), which are being introduced to the market but seem to remain small-scaled. However, the need to implement such systems is considered to make sense and be applicable for specific product categories. Potential candidates for RPSs include dry goods and cleaning products. This led to the research question: How can the transition from single-use packaging towards reusable packaging systems be realised in the Dutch industry for dry goods and cleaning products? This research took a socio-technical approach with a Muli-level Perspective to examine what constraints the transition from conventional packaging method into resource-efficient RPS models. The current context for RPSs is challenging due to the social norm favouring conventional single-use packaging. Technological advancements in packaging have historically overlooked end-of-life considerations, focusing instead on scaling up. The Dutch FMCGs industry is influenced by broader EU and global packaging trends, complicating national-level transitions to resource-efficient packaging. Proposed goals for circular practices for consumer packaging lack strategy description and an emphasis to reach circularity goals remains on high-grade recycling over RPSs. Retailers face difficulties in negotiating alternatives due to consumer demand for products from powerful multinational producers and a consumer focus on convenience of conventional packaging. High certification costs and the absence of resource-efficiency-focused labels further hinder niche-level alternatives. The circular waste processing system remains focused on recycling with insufficient funding for reuse-oriented collection methods. EU-level packaging regulations do not adequately address product categories viable for RPSs. Consumer acceptance of novel packaging systems remains low, requiring these systems to demonstrate their functionality and sustainable performance benefits. Lack of standardisation appeared a major barrier to scaling RPSs. Future steps should involve more collaborative efforts to standardise packaging, enabling infrastructural developments for scaled RPS implementation. In addition, the development of certification for resource-efficient packaging would support future circular economy goals, benefiting both consumers and retailers. Ensuring clarity on future actions and fostering collective learning through open-sourced methods will be essential for achieving a transition to more resource-efficient packaging.

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Table of Abbreviations

CE - Circular Economy
DRS - Deposit Return Scheme
EC - European Commission
EEA - European Environment Agency
EPR - Extended Producer Responsibility
EU - European Union
FMCGs – Fast-Moving Consumer Goods
ICER - Integral Circular Economy Report
LCA - Life Cycle Assessment
MLP - Multi-Level Perspective
NFD - Near-Field Communication
NGOs - Non-governmental Organisations
NPCE - National Plan Circular Economy
PET - Polyethylene terephthalate
PPWR - Packaging and Packaging Waste Regulation
RPS - Reusable Packaging System
SDG - Sustainable Development Goals
SNM - Strategic Niche Management
SUP - Single-use Plastic Packaging
TMC - Transition Model Canvas

1. Introduction

1.1 Background and problem statement

Currently, our society is dominated by a linear economic system, following a take-make-waste principle. Interestingly enough, this system used to be circular until a linear model took over at the end of the 20th century (Aggeri, 2021). This caused society to use massive quantities of single-use plastics in packaging, leading to a global plastic waste problem (Ma et al., 2020). A major contributor is the industry of Fast-Moving Consumer Goods (FMCGs) packaging; products characterised by being high in demand and low in cost (Ma et al., 2020). The EU formulated the description of packaging as: "products made of any materials of any nature to be used for the containment, protection, handling, delivery and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer" (EEA, n.d.). This shows clear requirements for packaging which plastics can fulfil as they are non-biodegradable, moisture resistant, light weight, and versatile in applications (Babaremu et al., 2023). Therefore, it aligns perfectly with a linear system and became the status quo for FMCG packaging. The industry of plastic packaging is expected to grow to a 492.3 billion dollar global market by 2030 which would add to the existing plastic waste problem (Grand View Research, 2022).

Meanwhile, this industry creates obstacles for reaching the Sustainable Development Goals (SDGs) posed by the United Nations; to be precise SDG 12: Responsible Consumption and Production, SDG 14: Life Below Water, and SDG 15: Life on Land (United Nations, n.d.). These goals are heavily affected by the results of the single-use plastic packaging norm (Bradley and Corsini, 2023). Reaching SDG 12 is hindered by the use of single-use plastics since it complicates reaching resource-efficiency requirements. SDG 14 and SDG 15 remain largely influenced by the amounts of plastic waste that result from single-use packaging ending up in oceans, seas and coastal areas and on land respectively (Ellen MacArthur Foundation, 2019). For such types of plastic packaging, less than a third is well-recyclable (Brouwer et al., 2021). In addition to bad recyclability, infrastructural problems remain in just collection and processing of plastic waste (Bening et al., 2021).

The need to change the single-use packaging norm gained attention in recent years through EC-policies on a Circular Economy (CE) and single-use packaging (EC, 2020; EUR-LEX, 2019). A proposed alternative is implementation of reusable packaging systems (RPSs) (Coelho et al., 2020). Unfortunately, such systemic change meets critical barriers to be implemented at scale. These include costly investments, unaligned stakeholders and the lack of proper infrastructure to function (Muranko et al., 2021). With future goals, there is a legislative need to ensure the packaging system will adopt more sustainable practices in upcoming years (EC, 2020; EUR-LEX, 2019). While posed as a promising alternative (Ellen MacArthur Foundation and McKinsey & Company, 2016; Coelho et al., 2020), implementation of RPSs would require action in the incumbent's regime and the alternative proposing a niche level of the Multi-Level Perspective (MLP) (Geels, 2002). These levels correspond to activities in the conventional system of the incumbents as well as for the alternative reusable packaging models.

1.2 Research gap

Prior research has been published on efforts to tackle the plastic waste problem caused by packaging (Nikiema and Asiedu, 2022; Allison et al., 2022; Phelan et al., 2021). However, the major focus at industry level regains a focus on recycling; a significantly less effective resource preservation strategy opposed to strategies at earlier life stages (Van Buren et al., 2016). An increased awareness of societal need to shift towards a CE in which resources are preserved, caused the interest in reusable packaging models to increase (Coelho et al., 2020). The FMCGs industry is a recurring candidate in studies and grey literature on RPSs, as it is a significant contributor to the plastic waste problem (Ma et al., 2020). Prior research on the FMCGs industry helped categorise the emerging

models in reusable packaging (Muranko et al., 2021; Ellen Macarthur Foundation, 2023).

Bocken et al. (2022) researched drivers and barriers of circular FMCGs business models incorporating a deposit-return scheme (DRS). Additional research focused on barriers for consumers in RPSs (e.g. a lack of variety or reliability on hygienic standards), while including drivers to adopt these systems (e.g. financial benefits and familiarity to the systems) (Miao et al., 2023). The collection of literature on this topic is increasing and gradually addressing more aspects for a transition to RPS models. However, there appears a need to further discover the structural barriers facing RPSs other than DRS (Simoens et al., 2022b). Alternative RPSs are gaining popularity but there remain uncertainties on limits to their performance and scaling capabilities. Additionally, while research on consumer behaviour in models exists (Miao et al., 2023), a study on joint technical and societal requirements for RPSs in cleaning products and dry goods has not yet appeared. Muranko et al. (2024) outlined factors influencing circular consumption behaviour, however a study reasoning consumer choice in respect to what prevents the industry from scaling in FMCG reusable packaging is not available. The way RPS stakeholders observe consumers, and their behaviour would provide insights in the alignment with latest literature on sustainable consumer behaviour.
Finally, what seems to be missing in current literature is where new trends in RPSs would bring added value to the FMCGs industry. It is not examined what subcategories of FMCGs are most suitable for implementing RPSs. At the same time, the importance is stressed to implement RPSs wherever it fits with specified product groups (Ellen MacArthur Foundation and McKinsey & Company, 2016).

1.3 Research aim

These gaps in the literature indicated a need for improved knowledge on resource-efficient packaging models and have led to the following research question:

How can the transition from single-use packaging towards reusable packaging systems be realised in the Dutch industry of dry goods and cleaning products?

This question is further divided into three sub-questions that support the findings in more detail to help answer the main research question:
1. What are the infrastructural barriers to further developing reusable FMCGs packaging systems for dry goods and cleaning products?
2. What are the implications of consumer behaviour and social structure for reusable packaging systems?
3. What actions can be taken to facilitate a transition towards reusable packaging systems within the FMCGs packaging industry for dry goods and cleaning products?

1.4 Scientific relevance

Current literature is complemented by combining the strengths of prior theories and frameworks into a more integral approach. It responds to the call for future research on more reusable packaging models and alternate types of products (Simoens et al., 2022b; Miao et al., 2023). Moreover, it adds to the pressing need for a transition towards more resource-preserving business models. Therefore, this research contributes to academic literature on the necessary pre-conditions to transition single-use packaging systems. To achieve this, the MLP-framework is used to analyse a socio-technical transition (Geels, 2002). This was supplemented with Theories on Lock-in Strategies, Effective Transition Governance and Dilemmas of Scaling Up Sustainable Alternatives (Simoens et al., 2022b; Halbe and Pahl-Wostl, 2019; Augenstein et al., 2020). The strengths allowing the regime to thrive were investigated to identify how business models for FMCGs could be addressed.

RPS alternatives could be considered a niche functioning in a larger system for which single-use

packaging currently poses the norm. An important question is whether realising a transition is required from the niche which would overthrow the status quo. Another possibility to be investigated is whether the regime would have to be destabilised for alternatives such as RPSs to thrive. This research aimed to discover what is required to facilitate a transition with an MLP-approach.

1.5 Societal relevance

This research addresses a multitude of problems linked to the challenges posed by the single-use-packaging based consumption practices. Packaging comprises 39,6% of total plastic demand of which the waste often contains chemical additives harmful to both humans and the environment (Ma et al., 2020). Following the current trend, an additional 12,000 million metric tonnes of plastic waste will be either in landfill or littered by 2050, leading to further deterioration of the environmental condition (Allison et al., 2022). Therefore, this research on more resource-efficient packaging systems directly aids to realising the Sustainable Development Goals; 'Responsible consumption and production', 'Climate', 'Life below water' and 'Life on land'. Aside from resolving obstacles of these SDGs, exposing barriers and forming recommendations to move away from the single-use packaging standard contributes to reductions in pollution, toxicity and resource-scarcity.

2. Theory

This section introduces the theoretical concepts that will jointly form the analytical framework of this research. A visual depiction of this framework is displayed in Figure 1. The FMCGs packaging industry for the selected product groups is considered on the three levels of the MLP-framework. For these levels, the stakeholders deemed relevant are included to gain insights in policy, governance and infrastructural barriers. Later in this study, recommendations are made on the barriers that were found.

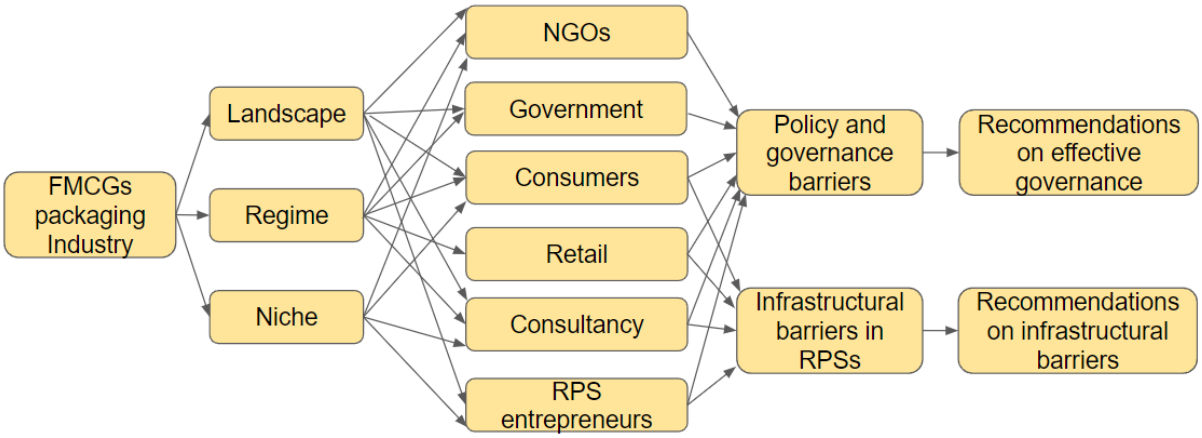

Figure 1. Outline of the research process

2.1 Reusable packaging systems

For RPSs different classifications are found in prior literature and presented by the Ellen Macarthur Foundation. A common typology often referred to in policy making and sustainability reporting by incumbents such as the World Economic Forum is the model posed in Figure 2. It distinguishes 4 main categories of packaging systems in which RPSs can be subdivided.

*Figure 2. Reuse model typology by the Ellen Macarthur Foundation (*Ellen MacArthur Foundation*, 2019)*

To fully grasp the concept of these models a description is provided in this section. Refill-on-the-go is characterised by a system in which consumers make use of their own reusable container brought to a settlement at which content is refilled. Product categories for which such systems are used in

practice would include dried goods such as nuts, grains, rice and other dry goods with a typically long shelf life (Ellen MacArthur Foundation, 2019). Refill-at-home models consist of systems in which customers purchase and refill their own packaging at home with in-store bought amounts. Return-on-the go comprises a system in which the consumer does not become owner of a packaging but is required to hand it in through a scheme, often including a deposit that is returned whenever returned to an associated store or a hand-in location. Common forms of this type of model are found in product categories beverages in returnable cups. Lastly, the typology includes return-from-home models in which the packaging is recollected at their homes after which the packaging is prepared by an external party before being reimplemented into the cycle.

Another division proposed in academic literature by Muranko et al. (2021) developed an overview of different reusable packaging models (Figure 3). It distinguishes two main categories, exclusive and sequential, for which the first can be subdivided into three models and the latter into two models. Consisting of three different models, exclusive reuse models involve the customer-owned packaging. This entails that the customer is responsible for preparing the packaging for reuse (e.g. washing, drying or inspecting the product). These models can be challenging due to the need for a consumer behavioural change. Customers must be willing to prepare it for reuse or deliver the packaging to a pickup-point for the provider to allow preparation. This places the responsibility on consumers and immediately creates a potential barrier for consumers. The first type described by Muranko et al. (2021) does not compose any infrastructural components or cleaning services for the system. The second model has a reuse-enabling infrastructure in addition to a reusable product. Lastly, a model can consist of merely the infrastructure in which consumers can bring their own (reusable) packaging.
Sequential models typically involve the provider owning the packaging and providing access to the customer. The customer uses the packaging and returns it to the provider, who is responsible for preparation for reuse. Sequential reuse models take away the burden from consumers to perform additional actions compared to the linear system. This also causes these models to rely on the provider. The main distinction between the sequential models is that the fourth requires the consumer to make use of the infrastructure to use the functionality of the packaging, while the fifth model delegates this responsibility to the packaging provider.

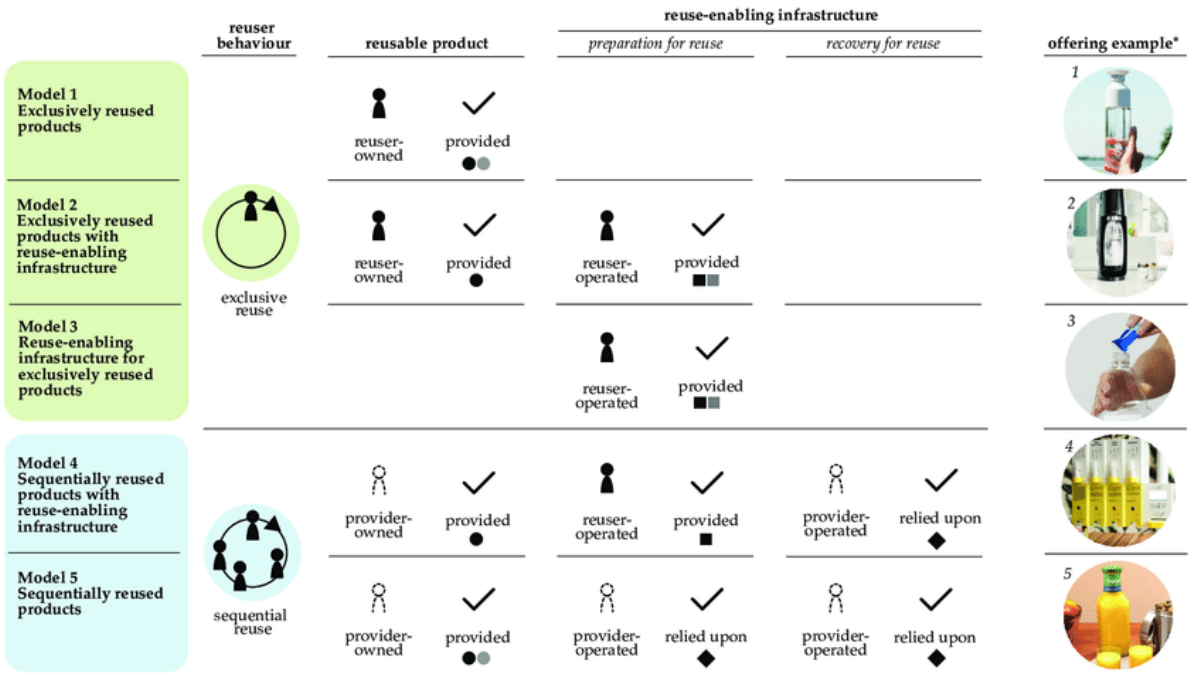

Figure 3: Reusable packaging model types considered for this study (From Muranko et al. (2021))

2.2 Socio-technical systems

By using socio-technical approach, this study can include the social aspects such as consumer behaviour and societal appreciation considered of importance in transition studies (Geels, 2002). These are considered next to the technical design and infrastructural developments for packaging systems forming barriers. Both aspects were considered for incumbent arrangements and emerging novel niche activities. In the context of FMCGs, it is important to recognise the influences forming barriers and present possibilities to gain knowledge and a diffusion of practices that allow novel innovations to scale from a niche to mainstream form.

A shift from a standard in single-use plastic FMCG packaging to reusable models can be considered a socio-technical transformation. Such a transition impacts on a societal scale, which can take an approach to foster a broad dialogue and combine perspectives in societal transformations (Feola, 2014). This typically includes a broad range of stakeholders which build alliances and partnerships for action. Therefore, a perspective is demanded to oversee such stakeholders and form these relationships.

A framework proven suitable to analyse such complex systems in past research is the Multi-Level Perspective theory (MLP) (Geels, 2019). It distinguishes three different levels interacting with each other and jointly forming a socio-technical system (Figure 4). These levels each possess specific characteristics which will now be described in further detail. The landscape level is the broader societal context typically including profound, slow-moving changes that influence the system (Geels, 2002). Such changes are generally path-dependent, resulting from prior choices or events at this level. It includes political developments resulting from legislative decisions such as EU targets transposed into national laws. Opposed to such slow profound changes, there are fast occurring external shocks which have a great, fast-paced effect on transitions (e.g. an economic crisis or pandemic) (Markard and Truffer, 2008).

By using this framework, it allows this study to focus on the main stakeholders present in this

transition and differentiate between the influences each level poses. The regime level can be considered the collection of incumbents within a socio-technical system, encompassing technologies, institutions and stakeholders. Holtz et al. (2008) described the main characteristics of regimes as coherence, stability and autonomy; it is characterised by a well-established structure within the socio-technical system. Its structure often primarily allows incremental change due to its rigid nature facilitated by incumbents (Geels, 2002). For FMCGs packaging, the regime is considered single-use plastic packaging as it dominated the market over the years (Simoens et al., 2022b). The niche level is considered a centre for radical innovations presenting alternatives to the regime. Within this research, the niche would be emerging the alternative RPS models which are posed by the entrepreneurs attempting to mature into the market.

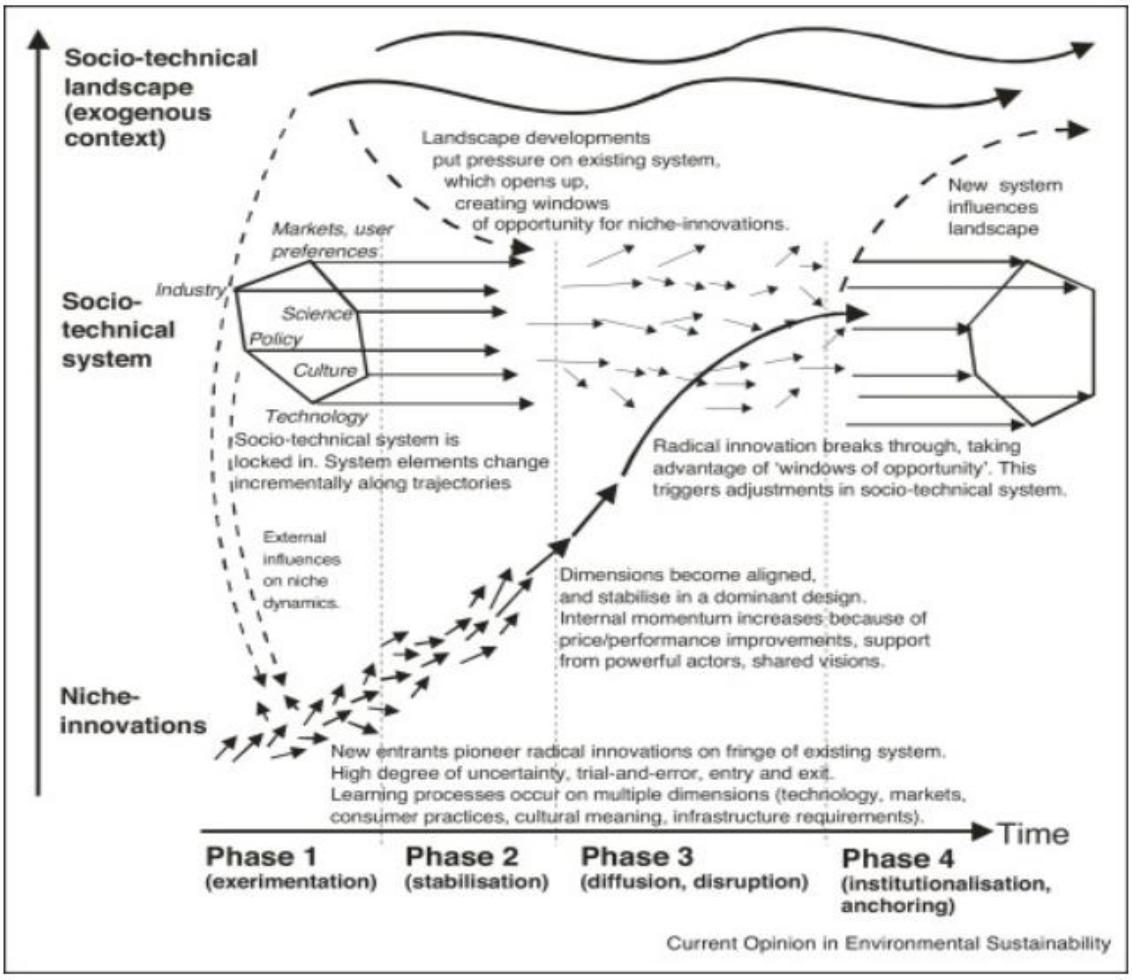

Figure 4: Multi-Level Perspective on Socio-Technical Transitions (from Geels (2019))

To understand the forces forming barriers to change, Theories of lock-in as previously used by Simoens et al. (2022b) helped identify the structure created through current practices in the dominant incumbent form. Providing a more detailed overview of what causes it to reassert its dominance. With an understanding of such interactions, it brought this study closer to identifying potential ways in addressing the root causes of reinforced practices.

In the context of this research, lock-in mechanisms are best described as self-reinforcing feedback loops stabilising the form of a socio-technical system (Klitkou et al., 2015). By doing so, it hinders the development of innovative new entrants into the system. Lock-in mechanisms can be interconnected and mutually reinforcing which provides reason to analyse multiple mechanisms considered to be present in the socio-technical system (Klitkou et al., 2015). Prior literature

identified four main lock-in categories, each containing associated lock-in mechanisms (Simoens et al., 2022b). An overview of these categories is presented in table 1. For these mechanisms, a distinction can be made in shallow and deep properties. Shallow would include the types considered modifiable and mechanistic (Abson et al., 2016). Deep lock-ins are more concerned with affecting information flows, rules, power, norms and values centralised within the system (Abson et al., 2016). Deep lock-ins are arguably more challenging to address as these are intertwined with socio-cultural constructs (Muylaert and Maréchal, 2022). Considering this research however, both typologies were considered of importance in sufficiently understanding the socio-technical system.

2.3 Locked into unsustainability

The first category defined as material lock-in, reinforces the dominating technology with economic advantage or technological learning effects (Arthur, 1994). In the case of the FMCGs packaging system, all subparts of this category economies of scale and economies of network could pose as barriers for RPS entrepreneurs. Messner et al. (2020) used this category to show how incumbent practices are strengthened in their work on overproduction and food waste. By mapping the presence of such mechanisms at the incumbent level it allowed this study to learn from infrastructural barriers at play. In case of institutional lock-ins, the reinforcement is caused by factors including joint activities and their benefits (Klitkou et al., 2015). Typical barriers can be identified here for the FMCGs industry on power asymmetries and institutional learning. Behavioural lock-ins are established by a social need for stability and habits (Seto et al., 2016). This is typically observed in a transition where habits and risk aversion are tough barriers to overcome as was considered the case for FMCGs packaging (Barnes et al., 2004). Stakeholders that best observe such mechanisms were used to determine where changes need to be applied to facilitate a transition. Lastly, the discursive lock-in is formed by absence of competitive ideas and challenging actors (Simoens et al., 2022a). In case of FMCGs packaging, powerful incumbent actors can be observed to shape ideas on new packaging models to reassure incumbency.

Analysing lock-ins allowed an overview of the regime and what is enforcing its structure. As the status quo, a regime is situated in a comfortable position which favours incumbents in various manners. This results in the unwillingness of a regime to change. Highlighting the most influential parts on maintaining business practices and examining how these barriers can be addressed within the regime contributes to developments in the transition process.

While barriers in the current system could be addressed with regime mechanisms, the niche was able to gain from reflecting on these mechanisms and how this affects performance. The mechanisms help by presenting weak points that need to be addressed by a change at niche level such as addressing the missing actor relating to the network economies. Another opportunity found in a mechanism typically functional for a niche actor which should be reinforced to accelerate the transition process.

Table 1: Lock-in categories and their mechanisms (Adjusted from Simoens et al. (2022b))

Lock-in Category	Lock-in Mechanism	Property
Material	Economies of Scale	Shallow
	Technological learning	Shallow
	Network Economies	Shallow
Institutional	Collective Action	Deep
	Institutional Learning	Shallow/Deep
Behavioural	Habituation	Shallow/Deep
	Risk Avoidance	Shallow/Deep
	Social Structure	Deep
Discursive	Unchallenged Ideas	Deep
	Co-optation	Deep

2.4 Effective transition management

Merely pointing out the barriers and agency options for niche innovations was considered insufficient to determine what is required for a transition to resource-efficient FMCGs packaging. A framework is required to help design a transition at governance level for which this research used the Framework on Effective Governance Transition (Halbe and Pahl-Wostl, 2019).

Halbe and Pahl-Wostl (2019) proposed a comprehensive framework emphasising multi-level engagement, learning-oriented strategies, participatory involvement and impact-driven tactics. The four-step framework was previously used to facilitate sustainable innovations (Halbe and Pahl-Wostl, 2019). The first step highlights the importance of a clear vision. While the need for more sustainable packaging is recognised, there is absence in targets for RPSs in various FMCG categories, unlike recycling targets (Van Buren et al., 2016). The second step involves analysing the current system, uncovering barriers and exploring potential changes. The well-structured system of single-use packaging poses numerous barriers for newcomers, requiring an exploration to uncover possibilities for a transition. The third step focuses on creating a well-founded design, defining stakeholder roles, decision-making processes, and monitoring mechanisms. For instance, it considers improving decision-making for retail stakeholders, the role of knowledge institutes and how policymakers monitor sustainability efforts. Meeting these prerequisites leads to a fourth step in implementing the governance process.

Throughout these steps, recognizing the multifaceted nature of the transition underscores the need for collaboration, creativity, experimentation, adaptive capacity, and long-term solutions among multiple stakeholders. This governance-level framework provides a roadmap to address challenges in transition governance for achieving sustainable innovations in FMCG packaging. An additional step in this theory was added as it is of importance to improve the governance process and apply improvements where these are needed (table 2).

Table 2: Categories of Theory on Effective Governance Transition (Halbe and Pahl-Wostl, 2019)

Steps	Actions in corresponding step
Step 1	Defining goal and scope
Step 2	Mapping the landscape
Step 3	Identifying frontrunners and intervention points
Step 4	Designing a governance process and fostering multi-level learning
Step 5	Monitoring and evaluation

There are different dynamics in sustainable transitions that should be taken into consideration when it comes to scaling practices. Augenstein et al. (2020) states three dilemmas that should be considered in transitioning sustainable change. These include the balancing of mainstream and niche alternatives, maintaining sustainability and dealing in power dynamics. Increasing the scale of sustainable initiatives typically comes with challenges attributed to the balancing of regime and niche. Niche entrepreneurs are attempting to position themselves in an incumbent dominated FMCGs industry. In the upcoming future, a balance in between incumbents using the conventional single-use packaging systems and the novel alternatives including RPSs will develop. While such a balance must be formed, there was a need for clarity on how power differences between incumbents and RPS entrepreneurs affects the dynamic in the FMCGs industry. This is why the power dynamics present in a system were considered. Scaling sustainable practices should be aware of the developments maintaining a sustainable advantage and not causing additional problems with novel practices. A recurring theme for RPSs would be the additional environmental burden entering into play, caused by challenges in transport and cleaning packaging. Therefore, this was an aspect to consider in researching a possible transition process.

2.5 Niche Management

To formulate recommendations on a transition, an initial understanding on what mechanisms cause an innovation to be successful at niche level and what causes it to further successfully diffuse at regime level. In this case, there were emerging reusable packaging models at niche level in the face of well-established dominant single-use packaging practices for FMCGs. The concepts on the theory of Strategic Niche Management (SNM) were therefore considered applicable for the trajectory of emerging innovations in terms of influencing capabilities and the agency of the relevant stakeholders (Schot and Geels, 2008).

SNM underscores the significance of aligning a niche environment with its developmental state, which enables it to exert influence on other levels. Smith and Raven (2012) identified three functional properties—shielding, nurturing, and empowerment—as integral to niches, each having distinct requirements and characteristics. For instance, shielding is essential to protect the technology from the regime attempting to shape it. SNM involves three key processes for analysing and attributing success or failure to niche technologies. The first process entails creating future expectations to promote progress by aligning clear goals. Success at this phase is measured by the available tangible results. The second step emphasises a need to establish social relationships among stakeholders, a crucial aspect at early development stages. The final process revolves around idealising learning processes on various topics, encompassing technical and societal aspects of technology embedding. This facilitates adjustments to underlying assumptions and fosters a willingness to embrace change (Raven et al., 2010).

3.Methodology

3.1 Research outline

This research took on a qualitative form to discover how a transition towards RPSs can be achieved in the FMCGs packaging industry for subcategories dry goods and cleaning products. To do so, the state of this system was mapped out with relevant stakeholders. A case study research design was considered the best fit as it has proven particularly useful to obtain in-depth appreciations of a phenomenon in its real-life context (Crowe et al., 2011). The Multi-Level Perspective framework was used to include all stakeholders deemed relevant at corresponding levels. The results that arose from both desktop research and semi-structured interviews were incorporated into a Transition Model Canvas (TMC) created by Van Rijnsoever and Leendertse (2020) to allow an overview of barriers present for included stakeholders. With a clear overview of the system, the possibility arose to formulate recommendations for a transition with knowledge on the Theory on Effective Governance Transition (Halbe and Pahl-Wostl, 2019) and the Theory on Strategic Niche Management on recommendations to overcome structural barriers.

3.2 Data collection

The data in this study originated from different sources subdivided with help of the MLP-framework. This framework describes how stakeholders can be subdivided in their corresponding levels and how relationships in between these stakeholders are formed. Therefore, the division was made for the data collection method. Desktop research on both academic and grey literature constituted the ground layer of this research. However, the available data was continuously improved throughout the research in an iterative process to incorporate new insights and apply improved requirements (e.g. refine the kind of interview questions formulated for stakeholder categories).

3.3 Operationalisation

The research question was dissected into segments to operationalise theoretical concepts and corresponding data collection methods. The first sub-question addresses infrastructural barriers in the socio-technical FMCGs packaging system by employing the MLP-framework across three levels. Categories of lock-ins guided the formulation of semi-structured interview questions for different stakeholder types. An overview of selected concepts per stakeholder group is presented in table 3. Government stakeholders were included, and questions were formulated with help of the Theory on Dilemmas of Scaling Up Sustainable Alternatives and the Theory on Effective Governance Transition (Augenstein et al., 2020; Halbe and Pahl-Wostl, 2019). NGOs were included as these would prove insightful to analyse the concepts of behavioural and discursive lock-in theory supplemented with concepts of the Theory on Effective Governance Transition (Halbe and Pahl-Wostl, 2019). The included consultancy actors were involved in projects to implement sustainable (consumer) packaging. The interview questions were formulated derived from concepts of the lock-in Theories on material, institutional and discursive lock-in. This was complemented with concepts of the Theory on Dilemmas of Scaling Up Sustainable Alternatives (Augenstein et al., 2020). For RPS entrepreneurs the concepts of material, institutional, and discursive lock-ins were used to formulate guiding questions. Interview questions for retail stakeholders included concepts of institutional, behavioural, and discursive lock-in mechanisms. Consumer perspectives, considered at both niche and regime level were included through insights of the interviewed stakeholders. This was complemented with prior research in consumer behaviour on sustainable and eco-conscious behaviour.

The interviews first used selected general questions posed to get an understanding of the interviewees perspective and expertise on either regime or niche level FMCGs packaging systems in the Netherlands. An interview guide was created per stakeholder which would be most suitable in terms of included operationalised topics. From these topics, questions were created which suited each interviewees expertise best and gained as many insights as possible from the interviews. An

overview of what topics were addressed can be found in table 3 and examples of topic questions assigned to theoretical topics for stakeholders are included in table 4, 5, 6, 7 and 8 of Appendix I.

Table 3: Operationalisation of main theoretical concepts considered for interview guides

Stakeholder	Theoretical concepts for interview
Government	Dilemmas of Scaling Up Sustainable Alternatives, Theory on Effective Governance Transition
NGOs	Behavioural and Discursive lock-in, Theory on Effective Governance Transition
Consultancy	Dilemmas of Scaling Up Sustainable Alternatives, Material, Institutional, Discursive lock-in
RPS entrepreneurs	Material, Institutional and Discursive lock-in
Retail	Institutional, Behavioural and Discursive lock-in

The findings were incorporated in the Transition Model Canvas (TMC) as designed by Van Rijnsoever and Leendertse (2020). It outlines the key element and interactions characteristics of a transition. The overview distinguished the strengths at the niche level and the vulnerable points of both incumbents and external stakeholders. The emerging findings can be used to provide recommendations for development of the niche level in a possible transition. In a broader perspective, insights can aid to show how effective governance can be realised. Further arising barriers within regime level could be analysed on where change in such systems would empower developments in a transition.

3.4 Sampling strategy

This work focuses on the FMCG subcategories dry goods and cleaning products. These were deemed suitable for RPSs as they typically have a long shelf life and there already is niche level entrepreneurial activity in offering RPSs for these subcategories (Ellen MacArthur Foundation, 2023). To gather the data for desktop research, academic search engines such as Science Direct and Google Scholar were used with specified search terms (e.g. "reusable FMCG packaging transition," "FMCG packaging in the Netherlands''). For the interviews, a non-probability sampling approach is justified as it helps to gain profound insights from relevant actors (Clark et al., 2021). The number of interviews that were conducted was based on the point at which data saturation was reached due to the repetition of results.

This study used interviews from different stakeholder groups relevant for the development of RPS. This included stakeholders active in policymaking or institutes related to the Dutch government deemed responsible for reaching a Circular economy. Entrepreneurs that were involved in RPSs at the niche level were included and would also be essential to include due to their insights in the encountered barriers in practice. Two consultancy actors were interviewed, which were involved in projects implementing reusable packaging strategies in different forms for incumbents such as retail. NGOs active in the Netherlands are included to assess their stance on where change needs to come from and to determine how these stakeholders influence the transition. Retail was included as it is considered an important part for Dutch FMCGs packaging. It possesses both the main platform for incumbents using conventional packaging and a future opportunity due to scaling and legitimacy reasons for niche players. All stakeholders included in the interviews were given specific coding to ease the analysis in future sections and to safeguard confidentiality and anonymity. An overview of the stakeholder categories that were included can be found in table 9 in Appendix II.

3.5 Data analysis

This research adopts both inductive and deductive strategies to address the research question, focusing on understanding how current stakeholders align with existing models in the transition towards reuse models for FMCGs. Inductive insights from desktop research and interviews shape the observed barriers and potential drivers.

NVivo (version 14.23.2) was used to analyse the transcribed interviews with open coding in steps. First, deductive coding assigned the coded segments taken from the transcript to predefined topics selected from the theoretical framework to provide a comprehensive overview. Once data saturation was reached, these themes were further grouped together into common insights. Lastly, in the results section, these grouped concepts were elaborated upon with their corresponding levels in the MLP. An example of this coding method is presented in table 10, found in Appendix III, for which the transcript text was intentionally left undescribed for privacy reasons.

The data from the interviews combined with desktop research findings collectively formed the data collection in the results section which was included in the TMC. The outcomes revealed key barriers and potential drivers. At a later stage, this study was able to formulate recommendations from these results. Points identified as barriers and drivers will inform effective governance strategies, specifying stakeholder roles, decision-making processes, and monitoring mechanisms. In addition, for the niche level, this study provided recommendations on further actions to aid in maturing and scaling the practices of RPS entrepreneurs.

3.6 Reliability and validity

For all forms of data collection, clarity was required on the process which resulted in certain trajectories. This entails an overview of the search terms and selection criteria. An example of these selection criteria was derived from the extensive review of peer-reviewed articles. For the interviews, the topic list of interview questions and an anonymised list of interviewees was described to ensure repeatability and credibility (Bryman, 2016). To ensure an understanding of the results that arose, the collection of data had to continue until data saturation was reached, which was the case when no novel insights were gained, and repetition occurred. A minimum of 12 in-depth interviews was considered required in any case if due to time or resource constraints additional interviewees could not be collected (Guest et al., 2006).

Additional testing of the alignment on theory was done through comparing collected desktop research data with output of interviews to verify the overall validity. For interview output, the coding was linked to the theoretical concepts which would make it replicable by others. These resulted in themes and relationships relating to the interviews. Unavoidably, there are limitations to this research which are addressed accordingly within the discussion section.

3.7 Ethical issues

Ethical considerations could be made in terms of using interviews for data collection. There was a need to state that there is informed consent of the interviewee for data collection, handling, and storage (Bryman, 2016). The participants are presented and asked to comply with a form of consent as posed by the Utrecht University's standard informed consent form for interviews (Appendix IV). This was deemed to be upheld by the researcher to always uphold the integrity of the agreement.

4. Results

The data related to constraints and drivers for stakeholders was organised with the MLP-structure. This section outlines the landscape in which the socio-technical system is operating, after which the regime's scenery is described. The section on the niche level describes the findings for RPSs and the related entrepreneurial components. All components are then implemented into corresponding subparts of the TMC.

4.1 Landscape

4.1.1 Current status of the Dutch CE for packaging

Interviewees presented their thoughts on the main goals relating to Dutch CE-targets. More specifically, the goals to halve primary abiotic resources consumed by 2030 and reach a functional CE by 2050 (Ministerie van Algemene Zaken, 2023b). How these goals can be reached by prioritising a reuse strategy was further discussed with interviewees. All interviewees were considered aware of the differences in R-strategies. While there was no full alignment in the interviewees' responses, it appeared each interviewee had points of improvement to address for the CE progress. As this question was rather broad, it presented insights into different directions.

For the status in reaching a CE, interviewee G3 referred to the PBL Netherlands Environmental Assessment Agency, the institute on strategic policy analysis on environment, nature and spatial planning. As part of the Ministry of Infrastructure and Water Management it is tasked with analysing the status of a CE transition in the Integral Circular Economy Report (ICER) (Hanemaaijer et al., 2023). The report states a range of 50-65% of plastic packaging waste being incinerated in the Netherlands. At the time of writing, the overall amount of plastic packaging continued to increase and approximately 18% was recycled into new packaging (Hanemaaijer et al., 2023). The same percentage of plastic packaging was downcycled to low grade applications (e.g. park benches and traffic bollards). This is the result of contaminated waste streams and inefficient sorting processes. Material efficient packaging aiming to narrow the loop are observed alongside experimentations to close the loop with mono-material. Current Extended Producer Responsibility (EPR) structure aiming to hold producers accountable for collecting and processing their waste results in a need to gather quantities rather than qualitative plastic waste streams. The flaws in the recycling system are described to decrease trust in recycled streams such as PET. Finally, barriers to reach a CE were considered a lack of long-term vision and an underrepresentation of alternate resource-efficient R-strategies that make up the R-ladder (figure 5). Different strategies with differing time spans set targets, but no overarching vision to reach circularity in packaging.

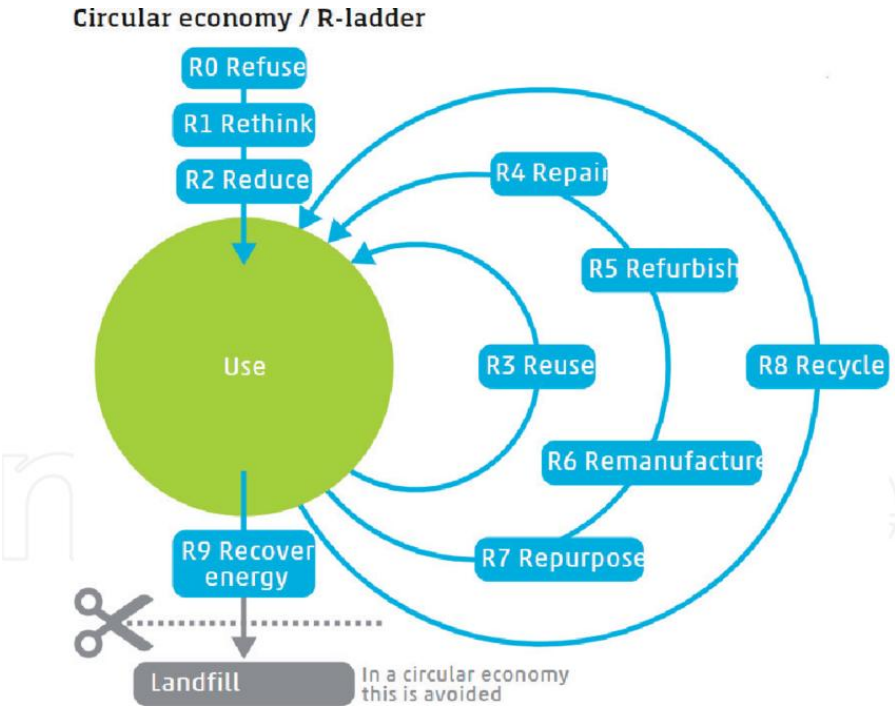

Figure 5: The R-strategies which are included to reach a CE (PBL Netherlands Environmental Assessment Agency, 2017)

Currently, a relatively limited budget would be assigned to overall funding to reach the Dutch CE (G3). This was attributed to packaging not being regarded as main environmental burden of a product-packaging combination (G3). Consumer handling of the product was considered to have more of an environmental burden (G3, E3). There are however increased numbers in circular packaging initiatives despite limited funding (G3, E2, N2).

The CE goal for 2030 was considered insufficiently specified, resulting in the creation of the National Circular Economy Programme 2023-2030 (NPCE), which will be further explained in section 4.1.2 (C1, G2). At a national government level, it was considered difficult to track CE performance for packaging (G2). As sustainability is considered an abstract concept, especially for consumers (E3), but even more so at a policy-level. The implementation of R-strategies in policy-creation in 2019 (G2) aimed to conceptualise CE components. Institutionalisation of the R-strategies occurred at governance level and allowed implementation of actionable `knobs', grouped in the categories: reducing, substituting, extending product lifetime and high-grade processing (Ministerie van Algemene Zaken, 2023b). In practice, improved high-grade processing with recycling gains most focus (G3, N1, N2, R1).

The work method in the Dutch government was considered a barrier to implementing strict top-down regulations. The French government introduced strict minimum percentages of reusable packaging in retail surfaces (N1, G2). Similar Dutch top-down policies were considered difficult to implement due to a differing nature in policy-creation process (G2). The Dutch Ministry of Infrastructure and Water Management, therefore tasked a mapping of the landscape in retail for the possible implementation of reusable packaging in the Roadmap Reuse 2030 for Dutch Supermarkets (C1, G2). This investigates willingness and ability to collaborate between stakeholders in Dutch supermarket settings (C1, G1, G2).

The progress towards a CE was considered affected by the Dutch position in the EU-market, which often overreaches on a global scope (G1, E1). This emphasises the importance of EU-standards for Member State alignment in reaching targets and possibly limiting the possibility to set ambitious

targets as an individual country.

NGOs stressed the need to accelerate the pace at which regulations are designed to bring about change for a CE (N1, N2, N3). Regulations would increase efficiency with long-term circularity strategies assigned to packaging of specified product groups. Dry goods and cleaning products are not considered, as regulations focused on FMCG subcategories such as takeaway food and beverages in the Single-Use Plastics (SUP) directive. However, these are considered relevant categories to include for their potential in RPSs (e.g. return from home for takeaway meals and return on the go for beverages).

4.1.2 Regulations and targets

The main EU-regulations relating to resource-efficient packaging appeared to be the Packaging and Packaging Waste Regulation (PPWR) and the SUP-directive. The PPWR is a legislative framework designed to reduce packaging waste and promote recycling and reuse across the EU by setting design requirements, recycling targets, and market restrictions (EUR-LEX, 2024). The SUP-Directive aims to prevent and reduce the environmental impact of single-use plastics causing littering; it initially focused on reducing the impact plastics found on European beaches (EUR-LEX, 2019). Additionally included products are beverage containers, packets and wrappers and carrier bags. The SUP-Directive does not include FMCGs categories cleaning products and dry goods.

The PPWR requires companies to offer a percentage of specified product categories in reusable or refillable packaging by 2030. A 10% minimum is set for beverages and takeaway meals. E-commerce and other transport packaging gained a minimum percentage of 40% to be implemented by 2030 (EUR-LEX, 2024). The Dutch government presented its position on the PPWR proposal, noting questionability on the amount of attention on dealing with RPS of producers outside the EU and addressing a need to include more product categories (Ministerie van Algemene Zaken, 2023a). Civil society stakeholders, including NGOs, highlighted the potential of DRSs to pave the way in reuse strategies for Member States. In this case, glass is considered low hanging fruit for a transition to reusable packaging. Critique was expressed on incoherence in timing of regulating, unclear exemptions and confusing exemptions for a take-back obligation (Schwizgebel et al, 2024).

Member States can exempt companies from reuse targets when in compliance with three conditions (EUR-LEX, 2024). Firstly, the member state must surpass the recycling targets by at least five percent above the 2025 target and be expected to exceed the 2030 target. Secondly, able to demonstrate being on course for waste prevention targets. Thirdly, the company to be exempted must adopt a corporate waste prevention and recycling plan. All requirements for an exemption on reuse targets have no linkage with reuse itself, which would not necessarily stimulate reusable alternatives. Problematic about this formulation is an absent limitation in which companies can be exempt from reuse targets. Whenever a company would perform well on recycling targets, while neglecting reusability targets, it would obstruct developments for resource-efficient packaging.

On a national level, the NPCE sets targets for packaging and disposable products to reach circular packaging practices by 2030 (Ministerie van Algemene Zaken, 2023b). The program expects ambitious reuse goals on EU-level through EU-standards specifying the required number of rotations and hygiene requirements. The Dutch government finances independent research on models and requirements for reusable packaging in supermarkets and industrial-scaled cleaning for reusable packaging (C1, G1, G2). The NPCE would aid entrepreneurs with circular business models. What this aid would look like in practice, however, is not clearly defined. Supermarkets and producers are invited for a sector-wide approach to introduce reusables. Both retail and consumers are expected to adopt these changes (Ministerie van Algemene Zaken, 2023b). In the case of supermarkets, sharing the risk in such developments is a requirement to participate. Stricter EPR should provide

incentive to producers in showing improvements in circular packaging (Ministerie van Algemene Zaken, 2023b)

4.1.3 Consumer uptake of novel regulations

Milieucentraal (2024) showed how for SUP-regulation products, consumers are responding to requirements to bring their own reusable cups for takeaway beverages. It appears consumers do not require it as a necessity. However, half are willing to consider it, mainly for environmental and financial reasons. Single-use plastic (SUP) cups remain popular due to convenience and forgetfulness about reusable options. The main barriers to adopting reusable cups pose the difficulty in cleaning and simply forgetting them. In addition, only 10% of Dutch consumers use their own reusable containers for takeaway. It appears consumers are most open to aluminium and cardboard alternatives, while taxed plastic packaging is least favourable. Those who use reusable containers do so to reduce waste and for environmental gains. Consumers value alternative packaging options at takeaway spots but face hurdles in lack of availability and extra waste at their homes.

For the near future, e-commerce is considered a viable candidate for reusable packaging implementation due to its potential in return-logistics through delivery (N2, C1). Moreover, when applied as such, the focus lies on the functional role of the packaging shape, deeming marketing elements of lesser importance (N2). This will prove useful for design challenges expected in RPSs compared to conventional standards of in-store bought products.

4.2 Regime

4.2.1 Reinforcement of conventional packaging

All interviewees recognised the status quo in packaging being conventional single-use for the majority of FMCGs in the Netherlands. Different notions on what reinforces this status quo came forth during the interviews.

The dominant position of conventional packaging is reinforced by several factors which included certification labels. The certification labels on specific product requirements are considered expensive which obstructs niche entrepreneurs from obtaining them. These include eco-certifications on sustainable packaging choices considered costly investments for niche-level entrepreneurs (E3, G3). On the other hand, such certifications would not sufficiently specify the order of magnitude in environmental burden or resource-efficiency to give a representative image on the performance of the product's packaging (N1, N2, E3).

The conventional supermarket concept was considered a reinforcing factor by multiple stakeholders on why consumers developed the habit of fast-paced overconsumption for which waste can be discarded with no further consideration (R2, N3, E2, G1; Kunamaneni et al., 2019). Habituation is typically challenging to address, particularly when uncertainties are present in alternatives or consumer expectations are misaligned (G1, N3). Typically, consumers stick to the conventional system to comply with societal norms (N1, N2, G2). This is reinforced by stubbornness of Dutch consumers in refusal to bring their own packaging (N1, R2).

The importance to remain developing high-grade recycling was emphasised throughout the interviews (C2, G2, N3). However, an optimised recycling system would not suffice to address single-use packaging problems in environmental impact, resource-inefficiency and littering (C2, G2). Considering the Dutch status as one of the leading actors in European recycling, the latest reporting indicated 50-60% of plastic packaging being incinerated (Hanemaaijer et al., 2023). It is questionable whether recovering energy should be an included R-strategy for the CE; as least favourable strategy in resource-efficiency terms, it should be avoided (N2).

Prior to plastic waste streams arriving at recycling or incineration plants, challenges arise in collecting waste streams at the municipal level. As each municipality is enabled to determine waste collection methods, the differences result in contaminated waste streams unfit for recycling (N3). Verpact (formerly Afvalfonds Verpakkingen) is assigned the legal responsibility to reach recycling targets posed by the Dutch government (N3). Recently, the collective organisation of Dutch municipalities denounced its trust in Verpact's functionality to reach its targets (N3). Upcoming packaging material in tetra packs and multilayered refill-pouches magnify the difficulties resulting in substandard recycling rates (C2, E2). Another barrier was found in glass collection; as glass for recycling gets funding from Verpact (E1), no such funding exists to collect for reusable purposes. This poses a barrier for initiatives aiming to compete with incumbents through circular alternatives. These common practices reinforce business as usual at regime level for conventional packaging systems.

4.2.2 Infrastructural barriers at regime level

The status quo in FMCGs packaging resulted in fast-paced consumption and general overconsumption (E3, N1, N3). An automated packaging system of the regime was enabled by great scale and catalysed by technological advancements including plastics, robotics, detection and camera technology (C2, E1). Automating this system allowed transforming a homogeneous bulk of a producer into heterogeneous single-use products. An essential difference with RPSs is noticed here as the end-of-life is not thoroughly considered by producers (E1). This requires different stakeholders in the packaging system to act on products' end-of-life stage. Changes in the dynamic of this system quickly result in novel challenges and serious investments (R1, C2, E1). Conventional packaging requires less intensive involvement with specific network actors to improve packaging quality or return-logistics as it would for RPSs (R1, E1, E2).

An additional barrier in the regime is the difference in power dynamics between small-sized Dutch retailers and Multinationals offering conventionally packaged products (R1). A selection of Dutch retailers has been increasingly ambitious in their sustainability performance (C1, C2). There is a limited influence to be exerted on Multinationals in requirements from Dutch retailers (R1). Conventional packaging producers are particularly reluctant to keep their packaging to incorporate shapes, colours and logos as patented marketing tools (N3).

Any alternative systems require an optimised design performing at a competing level with the conventional system (E2, E3, G1). The conventional system, however, does not take complications into account which RPSs aim to address. A recurring example was cleaning products of Multinationals, including Unilever and P&G selling diluted cleaning products filled in Single-use plastic bottles outsourced to third-party factories (E3, C1, C2). The vast majority in the composition of these products is water, resulting in tremendous profits at scale. The lacking need for innovativeness and craftsmanship in this process along with extremely low production costs does not give incentive to incumbents to change their practice (E3). It also exemplifies how consumer convenience in fast-paced consumption and comfort to immediately use bought products is incorporated in incumbent products.

A selection of stakeholders deemed RPSs not ready for mass consumption due to the lack of proper infrastructure such as return-logistics required to become operational (R1, G1, G3, C2). A crucial part of RPSs, as the return rate requires 90-95% to retain impact on the environmental burden assigned to conventional packaging (C2).

4.2.3 Influence of changing regulations and resistance

Incumbent's sustainability targets remain highly dependent on regulations at both national and EU level (R1, G2, N1, N2). Some retailers appear increasingly focused on sustainable progress, while

held-back ambitions in targets on topics as reuse remains difficult to address (C1, R1, R2). There is a vivid change occurring in regulations aiming for the better, but through vagueness and exemptions risking it to be for the worse. Throughout the process of regulation development, a powerful lobby of Multinationals repeatedly tries to affect these with adjustments, resulting in a slowed process and weakened finalised regulations (N1, N3, E3).

Trends can be identified at regime level which respond to novel regulations and pressure exerted on the packaging system by stakeholders. These trends predominantly include reducing the amount of packaging, using alternative material and focusing on recyclability through mono-material and incorporating recycled content (C2, E1, E3, R1). Simultaneously, there is increased consumer awareness and willingness to adopt sustainable options in packaging (E2, N1, N3, R2). Nevertheless, consumers require clarification to distinguish marketing efforts promoting sustainability and resource-efficient products or services. Large industry polluters can obtain green certifications for their packaging whilst promising future efforts in recyclable or reusable packaging (E3, N1). The focus remains on recycling, as alternate resource-efficient forms of packaging are rarely chosen by incumbents (N1, R1).

Regulations such as the SUP-Directive and PPWR are however unequipped for regulation avoiding practices with clever detours in packaging design. This makes it possible to substitute single-use plastic packaging types with alternative materials not included in regulations. For example, the SUP-Directive requiring a tax for single-use hard plastic caused Fast Food suppliers to change sauce containers to soft plastic sachets for which the tax would not apply (N3). Consequently, resulting in similar littering practices with novel packaging types. Once a plastic tax would be implemented, it is considered unlikely to make a noticeable impact on consumers due to the low financial incentive (N3). More clarity in targets for the industry seems necessary. Certainly, for official targets, but the industry would have to take responsibility for reaching its self-imposed targets to avoid misleading the public (E3, N2, N3)**.** An example shows Unilever adjusting 30 % reduction in virgin plastic footprint by 2026 and 40% by 2028 from an initial 50% reduction by 2025 (Davies, 2024). Additionally, Unilever's 100% reusable, recyclable, or compostable plastic packaging goal was postponed from 2025 to 2030. Similar statements with a summation of circular strategies occur. Such targets are not helpful as either strategy would be optional and no further explanation on problem addressment is provided.

These changes aim to comply with regulations while resembling conventional packaging standards as closely as possible (E3, N3). A trending change in packaging material is the shift towards tetra packs (N1, N3). Critical notes from interviewees expressed how tetra packaging is difficult to recycle due to its mixed material composition. A combination of plastic, cardboard and aluminium, which could be described as a “monstrous hybrid” contaminating waste streams of recyclable plastics by mixing organic and technical components (McDonough and Braungart, 2010) (E1, N1, N2). A similar situation is observed in refill-pouches for cleaning products introduced by Dutch retailers. If this constitutes multilayered packaging it is considered a downgrade compared to recyclable mono-material packaging such as PET bottles (C2, E3). The previous packaging would be composed of less material and pouches pose difficulty in recyclability due to a multi-layered plastic composition (C2, E3). At the same time, the refill aspect gives a misleading consumer experience to having purchased a more resource-efficient form of packaging.

4.2.4 RPSs at regime level

A recurring topic throughout the interviews was the “Bruine Nederlandse Retourfles” (BNR) (C1, C2, E1, G1, N3, R1). The concept was introduced in the 80’s by “Nederlandse Brouwers”. This Dutch overarching organisation includes 13 Dutch Brewers and set a high-grade standard for glass beer bottles in the Netherlands (Nederlandse Brouwers, n.d.). It controls the regulation on the production

process, sales and bottle usage. Over the years it resulted in a RPS for glass bottles which rotate up to 40 cycles before being recycled. The industry possesses its own washing facilities and coordinates the return-logistics in compliance with clients. It exemplifies a fully automated process in cleaning able to address food safety requirements and broken deterioration. The key takeaway from BNR on its potential for novel sequential RPSs would include for a large-scale adoption to occur RPSs should have privatised, optimised infrastructural components. Ideally, this includes a standardised form that considers alternative material to plastics (e.g. glass). Furthermore, it should allow diversified labelling with this included material. By realising this, it would make it feasible for incumbents in addition to making packaging relatable to consumers.

Other than the BNR, interviewees mentioned alternatives in RPS models for retailers. These occurred primarily in trial-and-error pilot form (C2, G2, N1). Current practices aim to improve the system whilst operating at small-scale. Furthermore, it aims to experiment with consumer experience and potential interest in similar systems for future reference (C1, G2, N1). Refillable stations for dry goods in selected supermarkets of Albert Heijn and high-tech refillable stations for cleaning products in Lidl supermarkets pose examples for RPSs in retail (C1, C2, G2, N1, R1,). As this was deemed a positive development to notice uptake occurring at an incumbent level, the consecutive stage would be a collective development of RPS. Once retail or niche entrepreneurial initiatives grow without alignment there is a risk for a diversified selection of RPSs which will likely continue facing difficulty in scaling

Interviewee R2 incorporated a sequential RPS for dry goods in Dutch supermarkets which seemed to have surpassed pilot trails. There was a notable difference in system built-up. The packaging is prefilled and incorporates a DRS. After in-store collection, the glass jars are transported to a washing facility, stored at a distribution centre and pre-filled before delivery for retail. Following this structure, the system closely resembles the conventional supermarket system with an added requirement to recollect jars. This system assumed the success of Belgian retail stores familiar with refillable packaging and adjusted to Dutch consumers by simplifying variety in packaging containers (R2). At the current stage, Dutch consumers are considered to require assistance in switching to RPS by simplifying a diverse range of packaging containers (C1, G2, N1).

Challenges in retail setting RPSs caused refillable pilots requiring consumers to fill their dry goods to malfunction frequently (G2). Refilled packaging in such systems would be more expensive for specific products compared to conventional alternatives. This may vary by supermarket, as a niche entrepreneur with a refillable packaging store claimed prices to match conventional packaging retail prices (E2). An acknowledged barrier for this system was product specific limited assortment (E2). The refillable cleaning product system would be too space consuming for the supermarket surface in addition to the need to sell large quantities to break even with investments for such a system to become interesting (C1, R2). The hesitant nature of consumers to fill their packaging and thus deviating from the norm in grocery shopping was dubbed a factor obstructing consumers to adopt the alternative (G2, N1, N2).

While there is pioneering activity at retail settings, it would often be unable to implement RPSs whenever desired systems at retail settlements. This was attributed to poor negotiating conditions of retailers with, often Multinational, producers (E3, N1, R1). Stakeholders in retail settings are expected to uphold a standard consumers grew accustomed to (G1, N1, R1). Misinformation and unclarity in packaging comparisons is an additional challenge for retail trying to introduce circular packaging practices (E2). Such unclarity results in current developments seeming inefficient and no further examination for RPS models. To switch, the benefits of the system should outweigh any seeming consumer inconvenience (C2, E3, N1, R2).

4.3 Niche

4.3.1 Current status for entrepreneurial activity

There appears an increased interest for RPSs in the Netherlands, however the scale for such systems remains limited for dry goods and cleaning products (E2, N1, R2). Particularly beverage and e-commerce packaging applications are expected to increase in the future due to the focus of the PPWR (EUR-LEX, 2024). The regulation aims at 10% reusable packaging for both categories by 2030, 40% by 2040 for beverages and 50% by 2040 for e-commerce (EUR-LEX, 2024). The inclusion of e-commerce is up taken as a goal for Versnellingshuis Nederland Circulair; an independent chain director operating in collaboration with the Ministry of Infrastructure and Water Management (G2; Versnellingshuis Nederland Circulair, 2024). It gains governmental funding to promote circular practices by using a network of 80 partners consisting of innovation platforms, financial service providers and advisory bureaus to accelerate circular businesses of small-to-medium sizes (Versnellingshuis Nederland Circulair, n.d.). Each year 5 complex projects are considered 'Moonshot Project' which aim to solve problems in the chain of a specified theme to enforce collaboration and alignment for this sector to develop industry wide circular practices (G2; Versnellingshuis Nederland Circulair, 2024).

Additional positive developments for entrepreneurs at niche level are noticeable changes occurring in the number of pilots that are considered by smaller-scale retailers (E2, N1). The future importance of biodegradable plastics was stressed, while currently not suitable as a widely applied alternative to conventional packaging (C2, N2, N3). This could prove useful in replacing conventional packaging for product categories not eligible for RPS models.

Stakeholders promoting RPSs at niche level are however required to continuously convince consumers of their product being of high-grade standard (E1, E3). It would indeed have to outperform the conventional system in durability with a competitive price and an additional environmental benefit. Only when this happens, a change in habits of consumers was determined to be possible (C1, E1, E3, G1, G3).

4.3.2 Missing elements at niche level

The stakeholder interviews resulted in points of improvement required for RPS entrepreneurs at niche level. Most challenging models of RPSs are considered the sequential models due to their requirements for cleaning and return-logistic (C1, E1, G1, R1). A quick return rate is required for return on the go models to have the capacity to circulate packaging. The capex-intensity of investments in RPS models (e.g. return on the go) make it challenging to progress in developments (C1, E1, R1). Tying into this difficulty, changing regulations lack clarity on the direction and focus of future packaging developments, further obstructing capital intensive investments (N3, R1)
The absence of standardisation for RPSs packaging was a recurring element missing at niche level (C1, E1, G1, R1). Currently, niche entrepreneurs should make use of creative marketing to distinguish from conventional packaging (E3, N3). Fragmented types of packaging pose a barrier for scalability and would specifically aid incumbents in the industry back-end (C2, R1, G1). The current step in the creation of a Roadmap Reuse for Dutch supermarkets aims to unveil how this should be implemented (C1, G2). To implement a norm efficiently, it could be realised with a European, CEN standard after which standards can be passed down to institutes at national level such as the NEN (G2). At the consumer level, a norm can provide convenient additions opposed to heterogeneous conventional packaging (e.g. stackability or foldability) (C2, R2). For the industry however, it is a crucial element for return-logistics, collecting methods and intensive collaboration in RPSs. Particularly for sequential models it would require a high degree of standardisation.

It remains unclear what actors are expected to facilitate scaling by uptake of collection, washing and storing. The Ministry of Infrastructure and Water Management currently funds research on making

reuse feasible, both economically and ecologically. Regarding the Roadmap Reuse 2030 for Dutch Supermarkets, the possibility remains that the free market is responsible for the uptake (G2). In which case, incumbents are currently unlikely to change due to a regulation-driven nature (E3, N2, R1). At a niche entrepreneurial level, it is considered challenging to facilitate this without supporting regulations and financial aid (E1). If facilitated by the Dutch government, there is uncertainty on what actor would be appointed (C1, N3). The implementation of return-logistics in deposits on Aluminium cans proved lacking in performance for a sudden large-scale implementation of DRS (C2, N3). Recollecting systems in retail were initially unfit to process this with existing infrastructure for collecting PET-bottles and the BNR (N3). Similar errors would have to be averted at an early stage for RPSs. More prevalent interaction and collaboration between small-scaled entrepreneurs currently incorporating such DPRs could aid and allow institutional learning for differing models.

Research on reusable rice packaging showed how the global warming impact and fossil fuel depletion appeared higher until a preset of conditions was met (Thomassen et al., 2024). This would require optimising return rates and numbers of cycles of sequential RPSs. Yet, addressing food waste could play a vital factor in reducing impact and therefore must be considered in packaging design of RPSs (G3). This design should simplify the reuse concept and make it clearly distinguishable from conventional packaging (Thomassen et al., 2024). Simultaneously, intuitive instructions and clear communication on usage will prove beneficial to adoption rates (Miao et al., 2023). A recent study indicated how Dutch consumers would be open to returnable (DRS) packaging for dry goods (Miao et al., 2023), particularly since consumers are familiar with a DRS for retail beverages (Miao et al., 2024).

Furthermore, problems could arise in a scaled setting; high intensity packaging cleaning could damage types of plastic packaging it appears (Noyan and Boldizar, 2024). This presents uncertainty on the optimal conditions required for cleaning RPSs. The cleaning process within a reuse system's cycle is a crucial component of the system which could potentially affect shelf life, food hygiene and sensory standards (Licciardello, 2024). Consequently, providing a reason for aligning packaging designs to ensure damage-free packaging and coordinating conditions for industrial level cleaning.

Raible et al. (2024) described what should be addressed for consumers to handle RPSs in a correct manner. The role of product satisfaction is highlighted, in which loyal customers result from hassle-free system usage. Conversely, a negative consumer experience is likely to cause consumers to switch to conventional packaging. Therefore, it should be ensured that RPSs perform smoothly from the moment of implementation as was also emphasised by interviewees (E3, R2). Another role deemed crucial for consumer system usage is the demand elasticity translating into the costs for consumers. The consumer sensitivity to pricing directly influences demand and will have to be examined for specific product groups to measure when consumers are willing to adopt (Raible et al., 2024).

4.3.3 Promising developments for niche activity

While advanced technological developments were considered an element keeping the regime intact, it could also pose a driver for RPS development. The difficulty assigned to label or market standardised designs of RPSs can be overcome with technical knowledge from existing systems such as labelling (E1, N1, N3). Packaging and brand positioning are considered highly synergistic (C2); therefore, this should gain attention for novel RPSs in efforts to improve aesthetic design. It is considered to improve brand image along with the incorporating of smart systems in returnable or refillable packaging (Ellen MacArthur Foundation, 2019).

Considering the state-of-the-art technological capabilities, it could facilitate the use of heterogeneous packaging in well-functioning return-logistics and cleaning (E1, N3). The

implementation of high-tech installations throughout the retail sector was however questioned to be too costly of an endeavour (C1, R1). A gradual scaling with simultaneous improvement of such systems might be preferred. In turn, this would pose difficulty for the RPS scaling possibilities.

The potential of smart systems with QR-codes or NFD-chips pose input to increase the scale of RPSs (Ellen MacArthur Foundation, 2019). It was questioned whether advanced technology is desired rather than implementing RPSs placing most of the handling packaging with consumers (e.g. refill-at-home or refill-on-the-go) (C1, N1). This was expected to thrive in a system less prone to errors with limited high-end technology.
Alternative delivery models for cleaning products are a promising development occurring more frequently in both niche entrepreneurial and retail settings. Such delivery models allow consumers to become familiar with resource-efficient forms such as concentrates and solid forms. As an additional benefit, these forms allow the use of different packaging materials opposed to liquid form (C2). These alternate forms would make RPSs more financially feasible for niche entrepreneurs as scaling such forms are typically easier to scale in addition to allowing packaging reduction (E3).
The inclusion of retailers setting sustainability goals beyond requirements appears a hopeful development as retail was considered a key stakeholder in scaling RPSs (C1, E1, G2, N1, R2).
Like the potential in retail logistics, the trend in online purchasing was considered a potential driver in return-logistics of RPSs (C1, G1, N2). In case producers are situated in the Netherlands, it would be more feasible to develop RPSs with return-logistics, storage and washing facilities operating in a close vicinity (E1, R2).
Developments in institutional learning were noticeable as tenders for niche entrepreneurs gathered increasing investments (N2). In addition, Dutch financial institutions appear increasingly critical on environmental performance, hinting at hopeful developments for investment possibilities in resource-efficient strategies (N2).

4.3.4 Points of action regarding consumers

It is questionable whether problems RPSs aim to address are considered problems which consumers themselves would act on. As littering, resource efficiency, and environmental burden are widely recognised, the consumer may not feel obliged to address these (E3, N3). Even when consumers would feel required to address this problem on an individual level consumers might not act according to societal or personal beliefs (Wu and Chen, 2014). Consumer reuse behaviour appears heavily influenced by social factors (Babader et al., 2016). Attitudes relating to environmental orientation pose a good indicator in predicting reuse behaviour. It is considered relevant to predict and better understand consumer's reuse behaviour as current LCA models state a required number of cycles for reusable packaging to have environmental improvement over single-use (Corona et al., 2024). This absence of reuse behaviour could prove key in a fair comparison between conventional and RPSs for specified product groups. De Canio et al. 2024 found how the concept of alternative packaging free products finds its benefits in personal and social norms, along with environmental concerns. As packaging free products closely resemble the exclusive RPS models due to the reuse component and no further actions as is the case for sequential packaging, this would uphold for RPSs models too. The barriers for packaging free products mainly consist of product availability and cost. Institutions and policymakers should promote sustainable behaviour in society to ensure familiarity with this option while retail and producers take on the role in offering these alternatives.

Most consumers remain unfamiliar or uncomfortable with RPS models. This is particularly difficult when challenges persist at the back-end systematics of novel RPSs. Therefore, these are expected to be implemented in a clever fashion addressing consumers positively, celebrating the benefit of resource-efficient packaging (E2, E3, N1). This ties into the norm early adopters of RPSs must deviate from to use the system. The novelty of RPSs to consumers still pose uncertainties in food safety and cleanness, which further obstructs adoption rates (E2, G2, N1).

Increased awareness should focus on clarifying the order of magnitude for R-strategies' impact on environmental burden, resource efficiency and ultimately reaching a CE. Currently, it appears a select targeted group of consumers is reached with companies implementing RPSs (E2, R2, N1, N2). Aside from such awareness, a scaled RPS in a retail setting would complement the requirements to outcompete single-use packaging standards.

4.4 Transition Model Canvas

This section presents the outcomes included in the TMC (figure 6). An enlarged version is added in Appendix V.

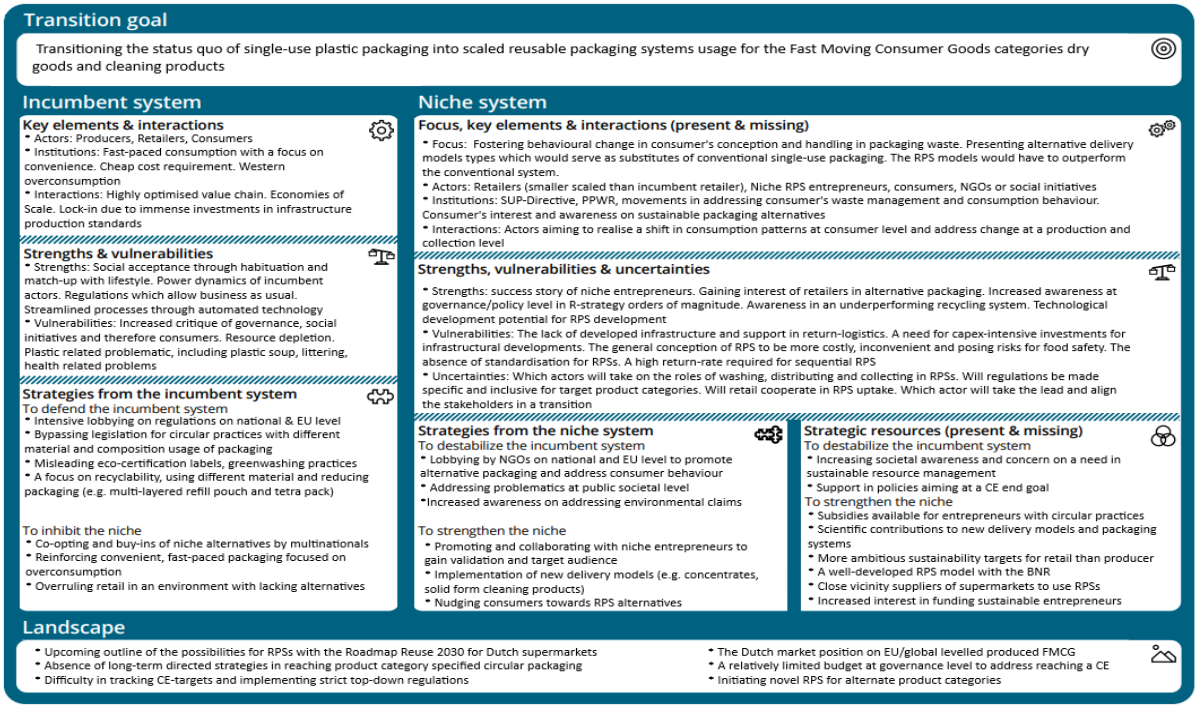

Figure 6: Outcome of the TMC used from Van Rijnsoever and Leendertse (2020)

4.4.1 Incumbent System (TMC)

According to the TMC, the incumbent system is characterised by interplay of producers, retailers and consumers posing as main actors. Institutions typically observed in the system are considered producers that manufacture goods at scale which allows cost efficiencies. Retailers distribute these goods to consumers who demand convenience and affordability (E2). Institutions support this system with the convenience and cheap costs associated with overconsumption in Western societies (E2, N2). The interactions within this system are marked by a highly efficient value chain which can leverage its economies of scale. These are a result of prior investments in the infrastructural and production standards which create a lock-in scenario that continuously reinforces the incumbent's system.

The strengths of this system are to be found in the norm of social acceptance; it aligns seamlessly in the modern lifestyle, supported by powerful incumbent actors and regulations that allow the status quo to act (E2, N1, N3). Automated technology's streamlined processes further seem to enforce this system. However, vulnerabilities are emerging, such as increased scrutiny over governance and social initiatives, resource depletion, and the growing problem of plastic pollution, which includes the infamous plastic soup, littering, and health issues associated with excessive use of (single-use) plastic packaging.

To defend itself, the incumbent system is facilitated by intensive lobbying of Multinational incumbents, which influence regulations at both national and EU-level (N1, N2, N3, E3). For passed legislation in circular practices, it can alter the material and composition of packaging to persist in using conventional packaging. Misleading eco-certification labels which resemble greenwashing practices are additional tools obstructing requirements for effective sustainable packaging (E3). This is further enforced by a focus on recyclability and reducing packaging in regulations (e.g. multilayered refill-pouches and tetra packs). Incumbents may co-opt or buy into niche alternatives, reinforcing the convenience and fast-paced nature of packaging that encourages overconsumption which is seen in retail practices piloting RPSs. Powerful incumbent producers of packaging prevent retail from exerting influence over reusable packaging requirements whenever these would be requested in Dutch retail settlements (N1, N2, E3).

4.4.2 Niche System (TMC)

The niche system focuses on behavioural change in consumer attitudes and practices regarding packaging waste. There are novel delivery models that could replace conventional single-use packaging in applications of RPSs to outperform the conventional system (C1, N3). The actors in this system include smaller-scale retailers, niche RPS entrepreneurs, consumers, and NGOs or social initiatives. The SUP-Directive and PPWR, along with movements to address waste management and consumption behaviour, support this system. The interactions involve these actors collaborating to shift consumption patterns at the consumer level and drive change in production and collection practices. Since the niche is still developing, while some elements are present, widespread consumer adoption and enabling infrastructure are still lacking.

The strengths of the niche can be found in the hopefulness of RPS entrepreneurs and their steady growth in success stories, for the new-delivery model cleaning products that are increasingly popular (C2, E3). At the same time, retailers appear increasingly interested to trail such sustainable alternatives, as it is also reflected in a growing awareness at the governance and policy level about the importance of resource-efficiency strategy (R1, R2). The limitations of the current recycling system and the potential for technological advancements prove hopeful for further development of Reusable Packaging Systems (RPS). However, there are vulnerabilities which are faced at the niche level. Due to the lack of infrastructure for return-logistics which would require capital-intensive investments, the niche is not suited to develop such a system without further aid (E1, R1). There's a general perception that RPS are costlier, less convenient, and potentially riskier in terms of food safety which poses a barrier for consumer adoption rates (C1, E2, E3). The absence of standardisation for RPS and the requirement for a high return rate for sequential use also poses significant challenges (C2, R1).
The uncertainties in the system revolve around what actors will coordinate these developments, in particular the development for sequential packaging models to ensure washing, distributing, and collecting of RPS models. The questions remain whether regulations will be tailored and inclusive for specific product categories, whether retail will cooperate in adopting RPSs and which actor will emerge to lead and align stakeholders in this future transition.

To destabilise the incumbent system, NGOs remain actively lobbying at national and EU-levels to promote alternative packaging solutions and influence consumer behaviour (N1, N2). Within a societal context, this stakeholder group aims to bring the problematic aspects of current packaging practices to the public's attention and increase awareness on packaging related environmental claims. To strengthen the niche, there is a push to promote collaboration with niche entrepreneurs to gain validation and reach the target audience. Most promising strengths would lie in the new delivery models, such as concentrates and solid-form cleaning products, that are being implemented for which consumers should be actively nudged towards such RPSs (C1, C2, E3).

An increased societal awareness of concerns on sustainable resource management is further supported by policies aiming to gradually reach a CE (G3). Subsidies are available for entrepreneurs' practising circularity; however, it remains unsure whether these are properly distributed (C1, E2). Scientific contributions on the other hand allow better recognition and increased knowledge on new delivery models which aid niche entrepreneurial activities (C1, E3). Retailers are setting more ambitious sustainability targets than producers, and a well-developed RPS model with the BNR as an ideal example of what would be possible with collective action at a retail level (R1, R2). Possible future potential would lie in close vicinity suppliers to supermarkets to utilise RPS (E2, R2).

4.4.3 Landscape (TMC)

The landscape level is shaped up by the social norm in single-use packaging because of the linear-economic system in which consumers consider recycling a suitable end-of-life option (Kunamaneni et al., 2019). However, there appears an interest for future possibilities since the Roadmap Reuse 2030 for Dutch supermarkets is requested by the Ministry of Infrastructure and Water Management to examine the possibilities for reuse as an R-strategy in Dutch supermarkets (C1, G2). The Dutch market's position in the FMCGs industry appears to quickly take an EU-level or even a global scope, posing difficulties in addressing sole Dutch packaging standards in the wide-reaching recognition and implementation of conventional packaging systems (G1, G2). The absence of long-term directed R-strategies and the lack of requirements for category-specific circular packaging seem to pose additional barriers in facilitating a transition (N1, N2). Moreover, a limited funding at the Dutch governmental level inhibits reaching a CE altogether, but for packaging as this is just a segment of what the CE should entail (E2, N3). Tracking CE targets and implementing strict top-down regulations remains challenging, as does the initiating of novel RPS for alternative product categories.

5. Discussion

5.1 Implications of research

The dominant structure of the conventional system makes it particularly challenging for niche developments to overthrow the regime in a transition to Reusable Packaging Systems (RPSs). This difficulty is partly due to the social norms deeply rooted in the linear economic system of FMCGs. To facilitate this transition, it is necessary to dismantle the barriers of the current regime while simultaneously improving alternatives arising at the niche level.

This research found that stakeholders who would coordinate the transition lack efficiency in developing RPSs in addition to uncertainty regarding what should lead the transition differing between the expectations from government action and institutions and the ability of the free market to take such a lead in transitioning. For RPSs to scale into maturity, the free market is expected to drive technological and infrastructural breakthroughs. However, incumbents are unlikely to develop and implement changes without regulatory mandates, while niche entrepreneurs who are more likely to act on this, require supportive regulations to thrive.

Included stakeholders appeared to have mixed feelings about the attribution of technological developments to facilitate a RPS transition. A complex system that is highly different from the conventional packaging system at retail level could hinder consumer adoption rates. At the same time, such innovativeness could pose as solutions for heterogeneous packaging recollection. The actual contribution of technological advancements is likely to be context dependent. For simpler systems, such as exclusive RPS models where packaging remains consumer-owned, overengineering would be detrimental. Conversely, for sequential RPS models, technological advancements can optimise the collection, washing, and return logistics. Experience with RPSs and Deposit Return Schemes (DRS) in beverages demonstrates how this can be attributed with use of sensors, cameras, and automated enhancements.

Regulations would have to be specifically aligned with circular business practices to enable niche development. Developing certification labels focused on reusability rather than recyclability or broad sustainability claims would benefit RPS business practices. These certifications would facilitate better monitoring for policy and regulations. Once implemented, certified products and services could more clearly be distinguished for eligibility for subsidies to support infrastructural investments in RPSs, benefiting both retail and entrepreneurial stakeholders.
If national or EU-level regulations are to drive the development of RPSs, an inclusive approach across FMCG subcategories is needed. This approach should consist of rigid, long-term goals with a strategic action plan capable of withstanding intermediate detours in conventional packaging, such as tetra packs or multilayered refill pouches. The focus should be on addressing conventional packaging at its core and promoting a reuse end-of-life strategy.
At EU-regulation level, the SUP-Directive and the PPWR do not equally consider the possible packaging materials or product categories for RPSs. For instance, plastic packaging is heavily emphasised, while glass seems rather overlooked for future improvements and inclusion in circular strategies. Moreover, regulations should move beyond material substitution and focus on shifting consumer behaviour towards more sustainable products and services. This would underscore the added benefit of packaging in more resource-efficient manners which reach beyond merely the improved packaging composition.

When reflecting on sub-question 1 regarding infrastructural barriers, several points indicate where these barriers are currently situated. Collective action is imperative for RPSs, as their effectiveness will be limited if secluded RPSs aim to take on the mainstream form in an empowerment stage of niche alternatives (C1, G2). Entrepreneurs would benefit from equivalent developments to

accelerate the process and gain institutional recognition. Standardising would be obstructed if individual practices are unaligned (R1, G3), thus considered an infrastructural barrier.

The network of RPSs requires additional system components compared to recycling, requiring more intense collaboration (C1, E1, R1). Missing actors in the value chain to address washing and logistical steps in sequential RPSs are major challenges. Addressing this helps balance niche and regime capabilities. Entrepreneurs addressing infrastructure gaps for RPSs should be considered by retail, promoted by NGOs, and supported through regulations (e.g., funding for collecting reuse packaging from Verpact). A potential policy intervention could be financial support from Verpact for return logistics and possibly washing.

The strategic processes for niche development should focus on nurturing and empowerment, originating from SNM theory (Schot and Geels, 2008), as the current RPS alternatives seem to require a more mature state and afterwards aiming enter the market as mainstream forms. Nurturing the niche focuses on socio-technical performance, encompassing technology functionality, building supportive networks, and increasing overall capability (Smith and Raven, 2012). Empowerment in niche development prepares RPSs for competitiveness with the mainstream market, encountering difficulties in regulations not including product categories considered in this research.

For retail stakeholders, considering models for specific product groups is crucial. Prefilled, refillable packaging appears suitable for large-scale adoption as it aligns with the conventional supermarket concept in meeting consumer demand (R2, E2, N1, G2). For cleaning products, new delivery models allow more suitable implementation of exclusive packaging systems, which would not require washing facilities or return logistics as would be the case for sequential RPSs of dry goods (E3, C2). Including niche entrepreneurs to gain insights into developments outside the retail environment allows for considering unconventional approaches in packaging delivery. The logistical basis to scale for additional retailers capturing a larger market share could be developed in collaboration with retail.

Another barrier posed by the regime is the current EPR-structure, which needs revision on collection methods (E1, N3). For example, directing funding to the recollection of glass packaging eligible for reusability, similar to funding for recycling purposes, is necessary. The current EPR system remains focused on recycling practices, which lack high-grade recycling performance (Hanemaaijer et al., 2023).

Considering the second sub-question on social norms and consumer behaviour, there are several factors that affect the transition to RPSs for selected product categories. Tackling the norm of discarding packaging after single-use is expected to face resistance, as transitions rarely occur smoothly, especially when addressing consumers on an individual level (N1, G2, G3). Methods to ease this transition could include developing strategies to reach R-strategy goals without combined industry-level options, while nudging and incentivizing consumers at retail settlements.

As recycling is widely accepted, consumers perceive it as a sustainable end-of-life option, perhaps even preferred over RPSs (Kunamaneni et al., 2019). A widespread understanding of the underperformance of the recycling system, the percentage of waste, and increased packaging consumption should gain more attention. For RPSs, increasing consumer acceptance can involve communicating the environmental benefits of novel systems. EU-regulation on generic environmental claims is already a promising tool to identify false or misleading claims, if implemented correctly. This requires a transparent, fair comparison between the incremental improvements in single-use packaging and the incorporation of RPSs.

Consumer perception is heavily influenced by packaging design and marketing. Reuse behaviour requires increased availability and compatibility with conventional systems. Clear instructions for RPSs and providing product information are key to improving this behaviour (Miao et al., 2023). Changing consumer behaviour is no linear process with immediate success but rather a long-term gradual improvement. This nature of transitions should be respected. It is crucial to reach groups beyond environmentally aware consumers to ensure collective action for a transition to circular packaging alternatives. Continuous feedback loops stimulating incremental improvements would be beneficial at early transitioning stages (C1, E3, R2).

Presenting future difficulties to consumers regarding increased resource usage, which cannot be sustained, might be necessary to convince the retail client base of the need for change. Self-interest might be the tipping point for widespread interest in RPSs. As the change in social norms and habituation is a crucial factor, a well-functioning RPS is unattainable without iterative consumer feedback (C1, E3, N1). NGOs should raise awareness, the Dutch government should recognize this need, and retail should embrace and implement RPSs from niche entrepreneurs and ideally address their own standards. To ensure continued usage of RPSs, a positive association with the process is required. When presenting consumers with alternatives, the added value should be clarified. Additionally, it is imperative for the usage of the products to remain clear and easy at consumer level. Misuse has led consumers to revert to conventional packaging after using RPS alternatives, stressing the need to prevent such situations in future scaling of RPSs (N1, R2, E2).

5.2 Recommendations

The third sub-question in this research aimed to discover actions that could facilitate the transition to RPSs for selected product categories. This section formulates recommendations for future steps that could be beneficial for this transition.

There is an apparent need for more coordinated activity with collective learning, particularly for infrastructural developments. This requires alignment with properly allocated investments that supplement each other's components. A possible actor to fulfil this role could be a government-appointed institution such as Versnellingshuis Circulair. This institution would need to set up a joint program focusing on collective possibilities in infrastructure development. Having completed similar projects on different product groups, such a project could help overcome infrastructural barriers. For niche entrepreneurs to reach a mature state, it will be necessary to incorporate RPSs in retail settings such as supermarkets. There is potential for sequential RPSs to be incorporated as private label standards in retail, leveraging pooling and logistical capabilities of retailers to place standardised RPSs on the market.
Focusing on private labels would offer the benefit of independence in standardisation at an early stage of the transition. Additionally, private label products are typically the most affordable in Dutch supermarkets, an important detail due to pricing being an important factor for consumer choice in grocery shopping (E3, G2, R1, R2). This strategy would further aid in increasing adoption rates. Moreover, as private label products are not typically considered sustainable alternatives, including RPSs for these products could address a different group of consumers. Once implemented, this strategy can be associated with the sustainable concept retailers aim to aspire. An important note is the need for this packaging to be prefilled. Consumers who purchase private label products are expected to focus more on price and the product itself, so the packaging must closely resemble the conventional supermarket concept.

When considering packaging standardisation for RPSs for dry goods and cleaning products, this should be done on a widely recognized platform. At EU-level, this is considered the CEN (G2), but further incorporating standards in an ISO-form would ensure consistency and thoroughness for RPSs.

Typically, these standards are developed with industry experts, governments, and consumers for alignment. Adherence to an ISO-standard broadens possibilities for market access, allowing stakeholders to invest more confidently in future scaling.

The potential for cleaning products might be most promising for the near-future maturing stage. The alternative delivery models in concentrate or solid forms can be delivered in refill-at-home or refill-on-the-go models. The prior seems to have preference as the concept more closely resembles the conventional supermarket concept. Cleaning products being non-perishable make it a viable option for exclusive packaging models.

There are apparent financial incentives (G1) for circular practices at niche level. As the strategy for circular practices is not clearly defined; consequently, funding of such practices should be assigned more efficiently. One possible direction for funding is the verification process of certification labels, which are considered too costly for niche entrepreneurs (G3). A reusable certification label would help assign funding to the most promising stakeholders aiming to incorporate RPSs. It should be showcased how entrepreneurial alternatives excel in resource efficiency compared to conventional plastic packaging, which leads to microplastics, littering, and dependency on fossil resources. Such a certification label could further help include the right stakeholders in a joint program as proposed by Versnellingshuis Circulair.

If incumbents at regime level develop missing or underperforming infrastructural components, social initiatives, including NGOs, will play a role in expressing the need to act. Often proposed as the main component (E2, N1, N2, N3), changes in regulations to add product groups and materials will be beneficial. However, sole implementation will not sufficiently tackle the problem.

To address barriers associated with social structure and consumer behaviour, consumers need to become familiar with resource-efficient alternatives. To realise this, a choice could be presented at retail settlements, clarifying the similarity in performance and differentiation in environmental output between conventional and RPS models. Nudging techniques could steer consumer behaviour in retail by highlighting the functionality of alternatives (N1). The element of functionality should be stressed more than resource-efficiency benefits. Aside from showcasing product usage with identical or improved ease, the cost difference between conventional and RPS packaging could be presented with external pricing for the product's end-of-life costs at retail stores. Any doubts regarding food safety must be addressed accordingly by installing cleaning infrastructure in retail settings and instructing consumers on how to reuse packaging.

5.3 Limitations of research

Weak points in this research could be considered the way incumbent producers are included. As these were challenging to reach for in-depth interviews, the data on these stakeholders had to originate from the desktop-research. By including a more personal touch with interviews this research would have benefited from insights which would be underexposed with the current strategy.

The research could have benefited from the inclusion of empirical data on consumer acceptance rates in RPSs for the considered product groups. As the focus for RPSs remains on product categories including take-away and beverages, documentation on Dutch consumer stance on alternate product groups was not present at the time of writing. Due to time constraints, this was not included while the research would certainly benefit from its inclusion.

Lastly, the EU-regulation on PPWR was only accepted recently. How this will be implemented in the Netherlands as a member state is uncertain. Particularly since the project on a Roadmap Reuse for

Dutch retailers is still in progress to outline the possibilities to the ministry of Infrastructure and Water Management, there might be outcomes that can affect the eventual implementations of the PPWR in particular.

5.4 Directions for future research

It remains unclear what direction and future action will come from the government for alternative packaging models. Political interests and compliance with EU-regulations such as the PPWR and SUP-Directive were described as a limiting factor to what Dutch policy can contribute for RPS development. It remains a form of speculation on how the government will contribute.

There are differing reasons provided by the included NGOs on the main problem for society which RPSs aimed to address. This ranged from littering, health risk associated with current plastics to the environmental deterioration. Further research would aid in understanding what the most influential problem is in the social norm. Research that would gather data on the main reason for which consumers would consider transitioning to sustainable alternatives would indeed help to place emphasis on social awareness creation for a possible RPSs transition. This could be sought for in additional research as to what way is most efficient and should gain more priority at this time to get consumers interested in wanting to improve.

The novel targets on reusability for beverages and e-commerce are an interesting development to research in the future. While developments for these specific categories will be insightful on its own due to the impact of these product categories, it might provide insights as to what should be implemented or avoided for the product categories included in this study. In addition to these categories, there are still potential product categories that could be considered for RPSs. The focus on such potential product groups could focus on non-perishables products such as cosmetics or long-lasting products such as frozen foods.

The included FMCGs categories compose of many different subgroups of products for both included types. Further research could dissect the product categories into smaller segments to ensure that more specified RPS models can be assigned for either dry goods (e.g. herbs, rice, flour) or cleaning products (e.g. detergents, soaps, dishwasher tablets).

6. Conclusion

This study explored the potential for resource-efficient FMCG packaging by transitioning to Reusable Packaging Systems (RPSs), focusing on the Dutch market for dry goods and cleaning products. To understand the requirements for replacing the current single-use plastic packaging system, a socio-technical transition approach using the Multi-Level Perspective (MLP) framework was considered. Data from semi-structured stakeholder interviews across the three MLP-levels revealed infrastructural and social barriers to this transition.

Plastic remains a highly suitable material for retail packaging, but its valuation and the externalities for specific product groups, such as cleaning products and dry goods, need reconsideration. The current context for RPSs is challenging due to the social norm favouring single-use packaging. The Dutch FMCG industry is influenced by broader EU and global packaging trends, complicating national-level transitions to resource-efficient packaging. Circular practice goals often lack focus, emphasising recycling over alternatives. Retailers face difficulties in negotiating alternatives due to consumer demand for products from powerful multinational producers and the convenience of conventional packaging. High certification costs and the absence of resource-efficiency-focused labels further hinder alternatives occurring at a niche level. The circular waste processing system remains focused on recycling, with insufficient funding for reuse-oriented collection methods. This inefficiency underscores the need for alternative R-strategies, including RPSs. Technological advancements in packaging have historically overlooked end-of-life considerations, focusing instead on scaling up. EU-level packaging regulations, from which Dutch targets are derived, do not adequately address product categories viable for RPSs. Alternatives to single-use plastics, such as tetra packs and multi-layered refill pouches, present recycling challenges. Consumer acceptance of novel packaging systems remains low, requiring these systems to demonstrate their functionality and sustainable performance benefits. Lack of standardisation is a major barrier to scaling, as heterogeneous packaging cannot be efficiently collected within Dutch retail practices. Potential solutions include delivery models like solid or concentrated cleaning products.
A coordinating actor for future developments is absent, and regulations do not clearly define resource-efficient alternatives for consumers. Social awareness regarding the importance of resource-efficient packaging needs to be addressed.
Future steps should involve collaborative efforts to standardise packaging, enabling infrastructural developments for scaled RPS implementation. An independent chain coordinator could play a crucial role if strict regulations are absent. Developing certification for resource-efficient packaging would support future circular economy goals, benefiting both consumers and retailers. Retailers could leverage positive brand images associated with sustainable packaging.

In conclusion, various barriers must be addressed before a scaled implementation of RPSs can be realised. Ensuring clarity on future actions and fostering collective learning through open-sourced methods will be essential. While promising initiatives are emerging, achieving a transition will require a system that outperforms the well-established conventional model, deeply integrated into societal routines and generating significant profits for the incumbent system. The future of FMCGs packaging will compose of a variety of circular strategies of the R-ladder. The key to reaching a CE is to have each implemented form at a developed state by the time implementation starts at scale. Therefore, a need remains to develop and consider RPSs where possible when novel applications are prepared to be implemented within a hopeful near future of resource-efficient packaging.

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Appendices

Appendix I

Table 4: Interview guides example stakeholder group "RPS entrepreneurs"

Theoretical concept	Subject	Question
General starting questions		Could you introduce yourself in terms of your background, expertise, interest and current projects?
		Do you think the Netherlands is on track to reach its goal to half its resource input by 2030? - And in terms of a CE by 2050? - Would you consider reusable packaging systems able to tackle this problem for certain consumer goods? - If so, which ones? - If not, why so?
Material	Scale Economies	How does scale affect your product/service? - What challenges arise in scaling for your company and how does it affect your ability to develop and reach a larger market?
	Technological Learning Effects	Compared to conventional packaging do you feel a need for more involvement of reusable packaging systems to contribute to its development? - Could you give examples of learning procedures that have positively influenced the reusable packaging system you are involved with?
	Network Economies	Do you feel like there is a difference in network (involvement) for reusable packaging systems compared to conventional packaging?
	Adaptive Expectations of Technology	Would you say that past developments have created expectations that influence investment decisions in reusable packaging development?
Institutional	Collective Action	Does collective action among stakeholders influence the scalability of reusable packaging solutions? - If so, in what ways?
	Adaptive Expectations of Institutions	How do adaptive expectations of institutions affect the regulatory environment surrounding reusable

		packaging adoption and expansion? - Are there institutional barriers or incentives that impact the scalability of reusable packaging solutions, - If so, how can they be addressed?
	Institutional Learning Effects	Do you notice enhanced recognition of RPS, through experience, to contribute to development of policies and regulations governing reusable packaging practices? - Can you provide examples of such effects that have influenced the scalability of reusable packaging solutions?
	Power Asymmetries	(How) Would you say an imbalance in power between stakeholders influences the scalability of reusable packaging solutions? - What strategies can be employed to mitigate power asymmetries and promote more equitable participation for reusable packaging ecosystems?
Discursive	Unchallenged Ideas	Would you say that RPS initiatives often try to stick to certain standards of conventional packaging in their designs? - Can you identify any assumptions that may be constraining the scalability of reusable packaging solutions?
	Co-optation	Would you say that co-optation by established industry players impacts the development of reusable packaging initiatives?
	Incumbent's Agency	How do incumbents in the packaging industry shape the competitive landscape for reusable packaging solutions? - What strategies can startups and smaller players employ to navigate and potentially disrupt the influence of incumbents in the reusable packaging market?
Additional/ interest		All things considered, what do you think is the main barrier that needs to be overcome for adoption and constant use of reusable packaging systems in NL?
		What will the future hold for reusable packaging systems in the Netherlands by 2030?

Table 5: Interview guides example stakeholder group "Government"

Theoretical concept	Subject	Question
General starting questions		- Could you introduce yourself in terms of your background, expertise, interest and current projects?
		Do you think the Netherlands is on track to reach its goal to half its resource input by 2030? - And in terms of a CE by 2050? - Would you consider reusable packaging systems able to tackle this problem for certain consumer goods? - If so, which ones? - If not, why so?
Dilemmas of scaling sustainable alternatives	Balancing Niche and mainstream	Does your organisation notice a difficulty in the balancing between alternative (RPSs) and mainstream forms of packaging?
	Maintaining sustainability	Do you think there is a risk in using reusable alternatives in terms of reaching sustainability goals (could it be compromised)?
	Dealing with power dynamics	Would you say there are power differences between actors that operate in the same packaging market? - Does your organisation influence this in any way? - Is this helping so far / what are the current results?
Effective Transition Governance	Defining the transition goal and its scope	What would you say is the current transition goal in terms of reusable packaging in the Netherlands?
	Mapping the landscape	Do you feel your organisation is including required parts in the landscape for a transition to be reached? - If not, which other parts should be considered (more)? - If so, which are the most important parts according to your point of view and why so?
	Identifying Frontrunners and intervention points	Who do you consider the frontrunners in Dutch reusable packaging systems? - How do you determine what actors are the frontrunners in Dutch reusable packaging?

	Designing the governance process and fostering multi-level learning	Is there an absence of a 'level playing field'? What is your take on this? - Who would you say is responsible and able to tackle such a problem? - How would they do so?
	Monitoring and continuous evaluation	In what way is progress measured and who is responsible for steering this with policy governmental institutions?
Additional/ interest		All things considered, what do you think is the main barrier that needs to be overcome for adoption and constant use of reusable packaging systems in NL?
		What will the future hold for reusable packaging systems in the Netherlands by 2030?

Table 6: Interview guides example stakeholder group "Consultancy"

Theoretical concept	Subject	Question
General starting questions		Could you introduce yourself in terms of your background, expertise, interest and current projects?
		Do you think the Netherlands is on track to reach its goal to half its resource input by 2030? - And in terms of a CE by 2050? - Would you consider reusable packaging systems able to tackle this problem for certain consumer goods? - If so, which ones? - If not, why so?
Dilemmas of scaling sustainable alternatives	Balancing Niche and mainstream	Does your organisation notice a difficulty in the balancing between alternative (RPSs) and mainstream forms of packaging?
	Maintaining sustainability	Do you think that there is a risk in using reusable alternatives in terms of reaching sustainability goals (could it be compromised)?
	Dealing with power dynamics	Would you say there are power differences between actors that operate in the same packaging market? - Does your organisation influence this in any way?

		- Is this helping so far / what are the current results?
Material	Scale Economies	What strategies or approaches do you believe could be employed to leverage economies of scale or drive down the costs currently observed in reusable packaging systems?
	Technological Learning Effects	Compared to conventional packaging do you feel a need for more involvement of reusable packaging systems to contribute to its development? - Could you give examples of learning procedures that have positively influenced the reusable packaging system you are involved with?
	Network Economies	Are there challenges associated with building and leveraging network economies for packaging systems within the FMCGs industry?
Institutional	Collective Action	Could collective action among FMCG producers and other involved stakeholders facilitate the development and adoption of reusable packaging systems on a larger scale?
	Institutional Learning Effects	How would you say the institutional norm affects the retail sector in development and implementation of sustainable packaging practices, including reusable packaging systems?
Discursive	Unchallenged Ideas	Are there prevailing ideas or assumptions within the FMCG industry that may be inhibiting scaling of reusable packaging systems? - How can FMCGs companies challenge and disrupt unchallenged ideas hindering progress towards more sustainable packaging practices?
	Co-optation	Could you think of any cases in which an FMCG company leveraged its agency to co-opt or assimilate emerging reusable packaging innovations into existing business models?
Additional/ interest		All things considered, what do you think is the main barrier that needs to be overcome for adoption and constant use of reusable packaging systems in NL?
		What will the future hold for reusable packaging systems in the Netherlands by 2030?

Table 7: Interview guides example stakeholder group "NGOs"

Theoretical concept	Subject	Question
General starting questions		Could you introduce yourself in terms of your background, expertise, interest and current projects?
		Do you think the Netherlands is on track to reach its goal to half its resource input by 2030? - And in terms of a CE by 2050? - Would you consider reusable packaging systems able to tackle this problem for certain consumer goods? - If so, which ones? - If not, why so?
	Habituation	What influence does habit play in the problems we are facing caused by single-use packaging?
	Risk Avoidance	The avoidance of risk could be attributed to the choice of consumers not to adopt alternative packaging forms. - How do you best overcome this type of hurdle?
	Social Structure	How would you address the societal stance on RPSs from your (organisation's) point of view? - How is your organisation acting on this?
	Unchallenged Ideas	Do you think that the absence of challenge to societal values in what packaging should have the priority can be recognised in society? - Is the current trend in sustainable options/views going to change this altogether? - Could this be enough for consumers to switch?
	Co-optation	In terms of the alternatives, would you say that there is a lot of reproduction of the same ideas and that this hinders the new ideas from being successful/ accepted?
	Defining the transition goal and its scope	What would you say is the current transition goal in terms of reusable packaging in the Netherlands?

	Mapping the landscape	Do you think your organisation in general is including all required parts in the landscape that are required for a transition to be reached? -If not, which other parts should be considered (more)? -If so, which are the most important parts according to your view and why so?
	Identifying Frontrunners and intervention points	Who would you identify as the frontrunners in reusable packaging systems in the Dutch market? - Why would you select these as such?
	Designing the governance process and fostering multi-level learning	What do you think about the presence of interaction between different actors that facilitate reusable packaging systems? - What role do you think that governance should play in this?
	Monitoring and continuous evaluation	Who is responsible for monitoring and steering the development of reusable packaging systems? - How could they influence the development of these systems in the best possible way?
Additional/ interest		All things considered, what do you think is the main barrier that needs to be overcome for adoption and constant use of reusable packaging systems in NL?
		What will the future hold for reusable packaging systems in the Netherlands by 2030?

Table 8: Interview guides example stakeholder group "Retail"

Theoretical concept	Subject	Question
General starting questions		Could you introduce yourself in terms of your background, expertise, interest and current projects?
		Do you think the Netherlands is on track to reach its goal to half its resource input by 2030? - And in terms of a CE by 2050? - Would you consider reusable packaging systems able to tackle this problem for certain consumer goods? - If so, which ones?

		- If not, why so?
Institutional lock-in	Collective Action	Do you think that collective action among retailers can facilitate development and implementation of large-scale reusable packaging systems? - If so, what can be done?
	Institutional Learning	How would you say the institutional norm affects the retail sector in development and implementation of sustainable packaging practices, including reusable packaging systems?
Behavioural lock-in	Habituation	To what extent do consumer habits and preferences influence retail in a decision to use alternatives (e.g. reusable packaging systems)?
	Risk Avoidance	What are factors of risk associated with adopting reusable packaging systems for a retailer? - How can these concerns be alleviated?
	Social Structure	Can you identify social structures or norms that either support or impede the adoption of reusable packaging systems among retailers? - What role can retailers play in influencing and shaping this to promote the adoption of reusable packaging systems?
Discursive lock-in	Unchallenged Ideas	What prevailing ideas or assumptions within the retail industry may be inhibiting the adoption and scaling of reusable packaging systems? - Are there examples of retailers successfully challenging conventional packaging?
	Co-optation	What strategies can emerging entrepreneurs in the retail sector employ to avoid co-optation and maintain autonomy in promoting reusable packaging solutions?
Additional/ interest		All things considered, what do you think is the main barrier that needs to be overcome for adoption and constant use of reusable packaging systems in NL?
		What will the future hold for reusable packaging systems in the Netherlands by 2030?

Appendix II

Table 9: Overview of the interviews per stakeholder category

Stakeholder	Number	Organisation	Role
Consultancy	2	C1	Consulting firm focusing on waste prevention especially for companies (including retailers and producers)
		C2	Consulting firm focusing especially on design of sustainable packaging
Government	3	G1	Policy employee on department circular waste
		G2	Policy employee specified on reusable packaging theme
		G3	Researcher working for organisation independent practical information to consumers with help of government funding
NGO	3	N1	Movement focusing on social aspect and promoting a zero-waste society
		N2	NGO focusing on plastic waste in Oceans and campaigns on education and prevention
		N3	Civilian initiative to collect and monitor waste on land, and educate both society and governance
Retailer	2	R1	Purchasing organisation for multiple Dutch supermarkets
		R2	Wholesaler that is also responsible for introducing reusable jars
Entrepreneur RPS at Niche level	3	E1	Industrial washing facility that washes glass packaging for a selection of retailers
		E2	Zero waste supermarket using a refillable concept
		E3	Company selling cleaning products in reusable bottles and using concentrates
Total	13		

Appendix III

Table 10: Exemplified strategy of the coding method

Transcript	Coding	Thematic topic	Common insight	MLP-level
X	New regulation leads to finding alternative materials (fixing problem with another)	Goal and Scope	Regulations are not inclusive for the right product categories and materials	Landscape
X	Exceptions for other materials than plastics in PPWR should not be made			
X	Governance should choose which R-ladder strategy will be used and the intensiveness on focus	Goal and Scope	A need for more ambitious targets in CE governance	Landscape
X	Target for SUP reduction percentage should be more ambitious			

Appendix IV

Information Sheet

Introduction
You are invited to take part in this study on *the transition towards reusable packaging*. The purpose of the study is to learn about the challenges that are faced in transitioning to reusable packaging systems. The study is conducted by *Jim Halmans* who is a student in the MSc program Sustainable Business and Innovation at the Department of Sustainable Development, Utrecht University. The study is supervised by Dr. Arturo Castillo Castillo.

Participation
Your participation in this interview is completely voluntary. You can quit at any time without providing any reason and without any penalty. Your contribution to the study is very valuable to us and we greatly appreciate your time taken to complete this interview. The questions will be read out to you by the interviewer. Some of the questions require little time to complete, while other questions might need more careful consideration. Please feel free to skip questions you do not feel comfortable answering. You can also ask the interviewer to clarify or explain questions you find unclear before providing an answer. Your answers will be noted by the interviewer in an answer template. The data you provide will be used for writing a Master thesis report and may be used for other scientific purposes such as a publication in a scientific journal. Only patterns in the data will be reported through these outlets. Your individual responses will not be presented or published.

Data protection
If accepted by the interviewee, the interview will be audio taped for transcription purposes. The audio recordings will be available to the Master student and academic supervisors. We will process your data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).
[In case audio recordings will be deleted: Audio recordings will be deleted when data collection is finalised and all interviews have been transcribed.]
In case audio recordings will not be deleted: Audio recordings will only be stored on a secured and encrypted server of Utrecht University]
[In case of anonymous interview: Everything you say in this interview will be confidential and completely anonymous. This means that we will not ask for your name, date of birth, or other personal information that can be traced to you by us or a third party]. We will process your data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act)]

Informed consent form (interview)
In this study we want to learn about *a transition towards reusable packaging models*. Participation in this interview is voluntary and you can quit the interview at any time without giving a reason and without penalty. Your answers to the questions will be shared with the research team. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act). Please respond to the questions honestly and feel free to say or write anything you like.

[Only in case of anonymous handling: Everything you say or write will be confidential, and anonymous. This means that we do not ask for your name, and no one will know which respondent said what.]

I confirm that:

- I am satisfied with the received information about the research;
- I have no further questions about the research at this moment;
- I had the opportunity to think carefully about participating in the study;
- I will give an honest answer to the questions asked.

I agree that:

- the data to be collected will be obtained and stored for scientific purposes;
- the collected, completely anonymous, research data can be shared and re-used by scientists to answer other research questions;

I understand that:

- I have the right to see the research report afterwards.

Do you agree to participate? o Yes o No

Appendix V

Transition goal

Transitioning the status quo of single-use plastic packaging into scaled reusable packaging systems usage for the Fast Moving Consumer Goods categories dry goods and cleaning products

Incumbent system

Key elements & interactions

- Actors: Producers, Retailers, Consumers
- Institutions: Fast-paced consumption with a focus on convenience. Cheap cost requirement. Western overconsumption
- Interactions: Highly optimised value chain. Economies of Scale. Lock-in due to immense investments in infrastructure production standards

Strengths & vulnerabilities

- Strengths: Social acceptance through habituation and match-up with lifestyle. Power dynamics of incumbent actors. Regulations which allow business as usual. Streamlined processes through automated technology
- Vulnerabilities: Increased critique of governance, social initiatives and therefore consumers. Resource depletion. Plastic related problematic, including plastic soup, littering, health related problems

Strategies from the incumbent system

To defend the incumbent system

- Intensive lobbying on regulations on national & EU level
- Bypassing legislation for circular practices with different material and composition usage of packaging
- Misleading eco-certification labels, greenwashing practices
- A focus on recyclability, using different material and reducing packaging (e.g. multi-layered refill pouch and tetra pack)

To inhibit the niche

- Co-opting and buy-ins of niche alternatives by multinationals
- Reinforcing convenient, fast-paced packaging focused on overconsumption
- Overruling retail in an environment with lacking alternatives

Niche system

Focus, key elements & interactions (present & missing)

- Focus: Fostering behavioural change in consumer's conception and handling in packaging waste. Presenting alternative delivery models types which would serve as substitutes of conventional single-use packaging. The RPS models would have to outperform the conventional system.
- Actors: Retailers (smaller scaled than incumbent retailer), Niche RPS entrepreneurs, consumers, NGOs or social initiatives
- Institutions: SUP-Directive, PPWR, movements in addressing consumer's waste management and consumption behaviour. Consumer's interest and awareness on sustainable packaging alternatives
- Interactions: Actors aiming to realise a shift in consumption patterns at consumer level and address change at a production and collection level

Strengths, vulnerabilities & uncertainties

- Strengths: success story of niche entrepreneurs. Gaining interest of retailers in alternative packaging. Increased awareness at governance/policy level in R-strategy orders of magnitude. Awareness in an underperforming recycling system. Technological development potential for RPS development
- Vulnerabilities: The lack of developed infrastructure and support in return-logistics. A need for capex-intensive investments for infrastructural developments. The general conception of RPS to be more costly, inconvenient and posing risks for food safety. The absence of standardisation for RPSs. A high return-rate required for sequential RPS
- Uncertainties: Which actors will take on the roles of washing, distributing and collecting in RPSs. Will regulations be made specific and inclusive for target product categories. Will retail cooperate in RPS uptake. Which actor will take the lead and align the stakeholders in a transition

Strategies from the niche system

To destabilize the incumbent system

- Lobbying by NGOs on national and EU level to promote alternative packaging and address consumer behaviour
- Addressing problematics at public societal level
- Increased awareness on addressing environmental claims

To strengthen the niche

- Promoting and collaborating with niche entrepreneurs to gain validation and target audience
- Implementation of new delivery models (e.g. concentrates, solid form cleaning products)
- Nudging consumers towards RPS alternatives

Strategic resources (present & missing)

To destabilize the incumbent system

- Increasing societal awareness and concern on a need in sustainable resource management
- Support in policies aiming at a CE end goal

To strengthen the niche

- Subsidies available for entrepreneurs with circular practices
- Scientific contributions to new delivery models and packaging systems
- More ambitious sustainability targets for retail than producer
- A well-developed RPS model with the BNR
- Close vicinity suppliers of supermarkets to use RPSs
- Increased interest in funding sustainable entrepreneurs

Landscape

- Upcoming outline of the possibilities for RPSs with the Roadmap Reuse 2030 for Dutch supermarkets
- Absence of long-term directed strategies in reaching product category specified circular packaging
- Difficulty in tracking CE-targets and implementing strict top-down regulations
- The Dutch market position on EU/global levelled produced FMCG
- A relatively limited budget at governance level to address reaching a CE
- Initiating novel RPS for alternate product categories