Unpacking the potential of the zero-waste movement

An assessment of the level of support for mainstream zero-waste retail from the perspective of key actors

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ABBREVIATIONS

GHG   Greenhouse gas emissions
EV   Electric vehicle
ZWIA   Zero-Waste International Alliance
MiWa   Minimum waste
USD   United States Dollars
UNEP   United Nations Environment Programme
NGO   Non-governmental organisations
DEFRA Department for Environment, Food and Rural Affairs

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ABSTRACT

The modern supermarket is characterised by unprecedented abundance, seasonally unchanging selection and low prices. However, concerns surrounding its non-renewable resource consumption, greenhouse gas (GHG) emissions, the contamination of ecosystems and end of life packaging management have resulted in a widely recognised need for a shift to a more sustainable supermarket system. As a reaction to this, mainstream supermarkets have begun to incorporate zero-waste retail, a new sustainable form of retail. The retail concept offers unpackaged produce, often via reuse and refill systems. Despite zero-waste retails emergence, there is currently a significant lack of research on the rationales for key actors within the mainstream supermarket sector to support such a system. Hence, this thesis aims to understand the rationales of key actors to support or not support the transition to zero-waste retail. Due to a lack of context specific studies in previous zero-waste retail literature, this thesis limited its geographic scope to the UK.

The phenomenon is analysed by assessing expectations, interests and activities, which Bakker (2014) argues are important to assess in determining actor rationales. Actors level of support was measured by the alignment of their long-term interests and highly positive expectations. Key stakeholders involved government, industry and societal actors. Consumers and consultants had previously not been assessed within expectations literature and were an additional actor, since they were deemed to influence the configuration of the socio-technical system. In-depth, semi-structured interviews (16) were conducted to gain a direct insight into the rationales of key actors to support zero-waste retail. The interviews were transcribed using Nvivo. Coding and thematic analysis was conducted in order to analyse the data generated from the interviews. The findings outlined highly positive expectations associated with zero-waste retail.

However, interests and activities proved difficult to measure since zero-waste retail is in its infancy and companies have only begun piloting the concept. Therefore, actors have not shifted their resources to a large extent to support zero-waste retail. This thesis argues that support can be present without the need for companies to have long-term interests associated with a new socio-technical system. For example, multiple actors outlined engagement in supportive strategies, in order to help facilitate the transition without shifting its resources. Practical implications of the findings suggest the lack of consumer convenience and current unsupportive supply chain infrastructure are significant barriers to the transition. Innovation, supportive policy, and industry and consumer action are all noted as being key to facilitating the transition to zero-waste retail.

EXECUTIVE SUMMARY

This research has investigated the rationales of key actors to support or not support the transition to zero-waste retail within the mainstream supermarket sector in the UK. In order to accurately gauge the level of support for zero-waste retail, this thesis engaged with multiple actors who have a direct and indirect influence on the conventional supermarket sector and on the zero-waste movement. Consumers, retailers, suppliers, packaging consultants, policy experts and NGOs were interviewed accordingly. The range of actors, coupled with the deeply complex and recent nature of the zero-waste retail movement made for multi-faceted findings.

From a societal perspective, consumer convenience is expected to be the key hurdle to integrating zero-waste retail into the mainstream supermarket sector. The challenge presents a double-edged sword. Consumers must accept and adapt their behaviour for zero-waste retail, since there are significant differences, compared to current shopping practices. On the other hand, zero-waste retail must become more accessible and convenient for the consumer. Current zero-waste solutions require a great deal of organisation, increase customer's shopping time and lack practicality for the consumer. Multiple actors expect innovations to help achieve a high-level of convenience within zero-ware retail. Innovative deposit-return schemes are expected to eradicate the need for consumers to bring reusable containers to every shop. Digitalised dispensers and laser tagging of fresh produce are expected to significantly quicken the time it takes to shop. Dry mist is expected to be a key solution to tackle the risk of food waste in-store, since it prolongs the life of fresh produce.

The supply chain represents a key challenge due to the inability of current supply chains to adopt zero-waste retail. The cost and technicality of creating efficient and supportive supply chains are hindering zero-waste retail from becoming a commercially viable proposition. Rebound effects are expected to become a threat from a carbon and material usage perspective. Sustainable transport must be integrated into the zero-waste offering and appropriate systems and regulations must be in place to ensure reusable containers are not supplied in excess.

Both in-store and online zero-waste retail solutions are expected to be equally relevant in the transition. It is undetermined how far zero-waste will go with its product offering in-store or online. The overall level of support for zero-waste proved inconclusive. Actors have not integrated zero-waste retail into their business models. However, actors expressed largely positive expectations that zero-waste retail will be integrated into the modern supermarket sector. For the movement to progress and encompass wider retailers and suppliers, the research suggests supportive policy and industry collaboration are fundamental in order to make zero-waste retail commercially viable.

1. INTRODUCTION

1.1 PROBLEM CONTEXT

The modern supermarket is characterised "by unprecedented abundance, seasonally unchanging selection and low prices" (Forssell and Lankoski, 2018, 46). This is especially attributed to the production of single use plastic packaging after the Second World War which has allowed for the preservation and protection of food for a much longer time, and allowed products to be safely imported and exported between different parts of the world (Zeiss, 2018). In accordance with The Sustainable Consumption Roundtable (2006) we are now living in a consumer society, where convenience, comfort and a plethora of choices have become the everyday expected norm.

However, this norm is coming under increasingly more scrutiny. Concerns surrounding non-renewable resource consumption, greenhouse gas (GHG) emissions and the contamination of ecosystems have resulted in a widely recognised need for a shift to a more sustainable grocery system (Accorsi et al., 2014; Forsell and Lankoski, 2018; Spaargaren et al., 2012). Of particular concern is end of life packaging management (Accorsi et al., 2014). This is since a recent study published by The Science Advances journal found that between 1950 and 2015, humans produced 8.3 billion metric tons of plastics, with 6.3 billion tons ending up in landfills (Geyer et al., 2017). Accordingly, it is currently estimated that 91% of plastic globally is not recycled (Geyer et al., 2017). To put this into context, if we continue along this trajectory, by 2050, there will be more plastic in the ocean by weight than fish (MacArthur et al., 2016). These findings represent a systemic failure in recycling infrastructure, and the current global supermarket system since the sector accounts for two-thirds of the global total of packaging waste (Geyer et al., 2017).

It is now widely understood that new and radical socio-technical systems, which refers to "radical technological infrastructure used within a societal context" (Leonardi, 2012, 38), are necessary to transform the current grocery sector, characterised by its excessive use of single-use plastic, into a more sustainable one (Beitzen-Heineke et al., 2017; Geyer et al., 2017). According to UNEP (2010), to achieve true sustainability within the supermarket sector would require a waste prevention strategy. Both the EU and UK government have also emphasised the need for waste prevention (DEFRA, 2013; EU, 2018) as a way to solve the current plastics crisis. The strategy ultimately entails the elimination of waste altogether, meaning nothing is sent to landfill or to be incinerated (ZWIA, 2009).

From an economic perspective, The Ellen MacArthur Foundation suggests that following a waste prevention strategy by replacing single-use plastic with reusable packaging and eliminating unnecessary packaging where possible represents a USD 10+ billion innovation opportunity that can deliver significant user and business benefits (Lendal and Wingstrand, 2019). The report states that innovations within reuse models, increasing societal acceptance of reusable models and evolving consumer use patterns are creating a new

market opportunity for reusable and zero-packaging retail models (Lendal and Wingstrand, 2019).

1.2 SOCIETAL RELEVANCE

Putting the waste prevention principle forward, a number of grocery stores renouncing plastic and unnecessary packaging have opened across Europe (Beitzen-Heineke et al., 2017). These retailers are aptly coined zero-waste retailers, and fully aligned with the waste prevention strategy. The retail concept follows the Zero-Waste International Alliance's definition of zero-waste, which means:

> "designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them" (ZWIA, 2009).

With these principles in mind, zero-waste retailers have emerged, offering a new form of sustainable consumption that addresses resource use from product design to disposal (Buchanan, 2019). Shopping at a zero-waste retail store is seen by both consumers and retailers as a way of avoiding the environmentally problematic materials that go into packaging (Zeiss, 2018). In accordance with Fuentes et al. (2019, 258), within this discourse, "single-use packages are framed as unsustainable objects which need to be completely removed." For retailers adopting zero-waste practises, this means implementing an altogether new form of shopping, "rather than greening existing products and objects" (Fuentes et al., 2019, 258).

Zero-waste stores are typically characterised by reuse and refill (often via a dispenser system) and package free methods (Beitzen-Heineke et al., 2017). Consumers are typically required to bring in reusable containers and/or reusable grocery bags and to weigh their container or bag before filling it with the desired product and pay according to the weight (Beitzen-Heineke et al., 2017). Dispensed products typically include staple foods such as rice, pastas, cereals and dried fruit, while fruit and vegetables are package free (Howell, 2019).

The benefits of this are two-fold. Firstly, packaging waste is reduced dramatically through consumers using a reusable container as opposed to single-use plastic. Secondly, food waste is reduced since consumers are able to buy the exact quantity of any desired item (Schweitzer and Janssens, 2018). Consumers are also able to bulk buy without adding to their material usage and are able to save costs (Buchanan, 2019), as opposed to buying small packaged items more frequently, as is the case within the current supermarket system. The concept is reminiscent of the pre-1950 grocery sector, where reusable packaging was the norm and the concept of disposability did not exist (Leahy, 2019).

However, zero-waste stores have typically been limited to a niche. This is since the stores have typically been characterised as small-scale and appeal to a specialised market, associated with environmentalists and green citizens (Beitzen-Heineke et al., 2017). Accordingly, despite representing a new and promising socio-technical system within the sector, the concept has previously represented a counterculture (Howell, 2019), rather than an easily accessible lifestyle choice. Scholars have argued the movement has been limited to a niche due to both supply chain challenges and since it requires consumers to rethink the way they shop (Beitzen-Heineke et al., 2017). Supply chain challenges include retailers having

to adapt their entire supply chain, including their suppliers (Beitzen-Heineke et al., 2017). An additional hurdle here is food waste, since packaging helps preserve products, especially fresh produce and increases their shelf life. It is therefore important for retailers to ensure they do not create unintended consequences from adopting zero-waste practices. From a consumer perspective, consumers must break old habits and establish new ones, acquire new competencies and willingly forego the convenience regular shopping provides (Fuentes et al., 2019). This is due to slower shopping operations and a more limited product variety (Beitzen-Heineke et al., 2017; Sandano, 2016).

In recent times, however, zero-waste stores have risen considerably (Saladino, 2018). While 19 zero-waste retailers were counted in Europe and North America in 2015 (Beitzen-Heineke et al., 2017), 300 zero-waste retailers now exist in Europe alone (Bepakt, 2019). This is arguably due to increased consumer awareness on the unsustainability of the current supermarket system (Fuentes et al., 2019) and demonstrates the rapid growth of the zero-waste retail movement. However, while the expansion of zero-waste stores outlines the growth in demand for sustainable retail, Beitzen-Heineke et al. (2017, 1540) argue that "the adoption of zero-waste retail by conventional supermarkets and the introduction of zero-waste online delivery services are required to penetrate the mainstream and achieve a sustainable paradigm shift within the sector." Similarly, Lendal and Wingstrand (2019) argue that to unlock the full potential of zero-waste, innovative reuse models must be enabled, through digital technologies and by meeting shifting user preferences, such as offering online platforms, better designs and more functional packaging. Accordingly, mainstream supermarkets have recently begun to incorporate zero-waste retail and have adopted zero-waste practices both in-store and online, particularly in the United Kingdom (Howell, 2019).

1.3 IN-STORE

In the UK, a large number of supermarkets have begun trialling plastic free initiatives (Grant, 2019; Smithers, 2019). Supermarket chains including Morrison's, Sainsbury's, Iceland, Waitrose, Asda, Tesco and Marks and Spencer have all begun trialling plastic free fruit and vegetable aisles (Grant, 2019; Smithers, 2019). Aldi and Morrison's have both committed to 100% recyclable, reusable or compostable packaging by 2025 (Jackson, 2019). Sainsbury's have also provided reusable drawstring bags for grocery goods and are also encouraging consumers to bring their own containers to meat and deli counters (Jackson, 2019).

Of particular note, however, is Waitrose. The supermarket, largely associated with an affluent demographic (Wood, 2018), launched Unpacked in April 2019: a packaging free trial in order to gauge consumer acceptance of zero-waste retail (Smithers, 2019). Plastic packaging has been replaced with green infrastructure in the form of dispenser stations for dried products and self-service weighing scales have been provided (Buchanan, 2019). Other unpackaged items include a frozen fruit 'pick and mix' section, wine and beer refills, unpackaged meat and dairy, and washing up liquid and detergent (Waitrose, 2019). Reusable cotton bags have been provided for loose fruit and vegetables, and a deposit return scheme has been set up to incentivise the use of reusable containers (Smithers, 2019). The trial was initially tested in one store in the UK and is currently being launched in three more stores across the UK due to a positive consumer uptake and response (Waitrose, 2019). The

supermarket also aims to extend the refillable range of products available following customer feedback (Waitrose, 2019).

Following on from this, ASDA have announced a similar trial with the launch of a 'sustainability store' in Leeds (Simpson, 2020). The trial, commencing in May this year will allow customers to fill their own containers with own brand groceries, and will be supplying staple goods, such as pastas and rice, along with Kellogg's cereal products and tea and coffee through a dispenser system. The branch will also include a reverse vending machine, where consumers will be able to recycle plastic bottles (Simpson, 2020). The trial represents an opportunity to test the unpackaged concept with an untested customer demographic, since ASDA's consumer profile is skewed towards a lower socio-economic demographic, compared with Waitrose (Pechey, 2015).

Figure 1: *In-store refill and reuse system used within zero-waste retail (Buchanan, 2019, 8). Graph from: Buchanan, E. (2019). The Smart Supermarket – how retailers can innovate beyond single-use plastics and packaging. Greenpeace. Available from: https://www.greenpeace.org/usa/wp-content/uploads/2019/11/SMART-SUPERMARKET-How-retailers-can-innovate-beyond-single-use-plastics-packaging.pdf*

A recent report from Greenpeace, argue that for this retail model to expand, retailers must actively work with suppliers to reduce packaging at the manufacturing stage to ensure the system works efficiently throughout the whole supply chain (Buchanan, 2019). Other key recommendations from Buchanan (2019) include:

- designing deposit and reward schemes to ensure customers return or reuse containers, and to subsequently increase brand loyalty;

- utilising equipment, such as commercial dishwashers and sanitisers, to ensure hygiene assurances and cleanliness;
- ensuring dispenser systems are easy to use, with clear instructions and staff on hand to assist customers.

The report also touches on innovations to tackle the aforementioned logistical challenges, as well as convenience. Laser food labelling is recommended, which removes a microscopic area of skin on fruit and vegetables to imprint a label with product information instead of a sticker (Buchanan, 2019). The system, also referred to as natural branding is expected to save the equivalent of 200km of plastic 30cm wide (Pullman, 2017) and increase convenience substantially. This is since it will allow consumers to put fruit and vegetables straight into their trolleys without having to place the products on weighing scales and print a sticker.

Another innovation tackling packaging and food waste is "food in the nude" (Buchanan, 2019). Created by a retailer named Foodstuffs in New Zealand, food in the nude provides a refrigeration system that sprays mist to keep produce fresh, "ensuring that the shelf life of products is maintained without single use packaging" (Buchanan, 2019, 7). Since its introduction, sales of fruit and vegetables have increased by 300% (Chow, 2019). Dutch Supermarket chain, Albert Heijn are currently testing this in over 150 of its stores across the Netherlands (Albert Heijn, 2019). According to Ogg (2019), misting can also enhance the customer experience due to it being visually appealing and produce having a better appearance.

MiWa, short for 'minimum waste' represents another in-store innovation. The concept focuses on reducing consumer waste before the point of purchase and to increase convenience (MiWa, 2019). The company delivers bulk staples to stores, which are then set up in-store in modular stands (Buchanan, 2019). An app is used for customers to order and pay for the exact amount they require and is then collected from the store in reusable containers (Buchanan, 2019). A smart system is integrated between the containers, the app and the dispenser, so the exact quantity of goods the customer ordered is easily dispensed into the container (MiWa, 2019). While the concept offers a viable solution to single-use packaging within staple goods from a practical perspective, the level of organisation required would arguably be a challenge for consumers, since customers would be unable to top-up shop.

1.4 ONLINE

Online shopping has been steadily rising since 2011 in the UK (Statista, 2020). In 2021, approximately 93% of UK internet users are expected to be participating in online retail (Statista, 2020). Of particular relevance is the emergence of online grocery shopping, which currently represents the fastest growing purchase channel, both in terms of value and growth (Statista, 2019). In accordance with Statista (2019), online groceries have skyrocketed since the 1990s within the UK and are forecasted to become the second largest online grocery market worldwide in 2020, after China. However, online grocery retail relies on a huge amount of single use packaging, as well as protective packaging consisting of cardboard boxes and

air-filled plastic bags (Buchanan, 2019). Cardboard represents a particular packaging issue (Peters, 2018). It is currently estimated that 165 billion packages are shipped in the U.S. each year, which equates to more than 1 billion trees (Limeloop, 2018). This outlines the need for alternative solutions to unsustainable packaging within the online sector.

Accordingly, online zero-waste retail has recently emerged online, in a bid to harness the growing market, while avoiding the environmental repercussions (Figure 2). Of particular interest is UK supermarket chain Tesco who have begun to engage with zero-waste retail online. The supermarket chain has recently announced it will be the retail partner of Loop (Selwood, 2019). Loop, owned by waste management company Terracycle, represents an innovative new business model and online shopping platform for premium, durable and reusable packaging, where goods are delivered directly to the consumer (Makower, 2019). Customers pay a refundable deposit for the container (Buchanan, 2019). After use, customers arrange pick-up, typically when they need a refill. The containers are then collected by a delivery and pickup service partner. The container is then cleaned and refilled for resale (Selwood, 2019). The model is referred to as "the milkman model" since it follows the same reuse concept as the traditional milkman.
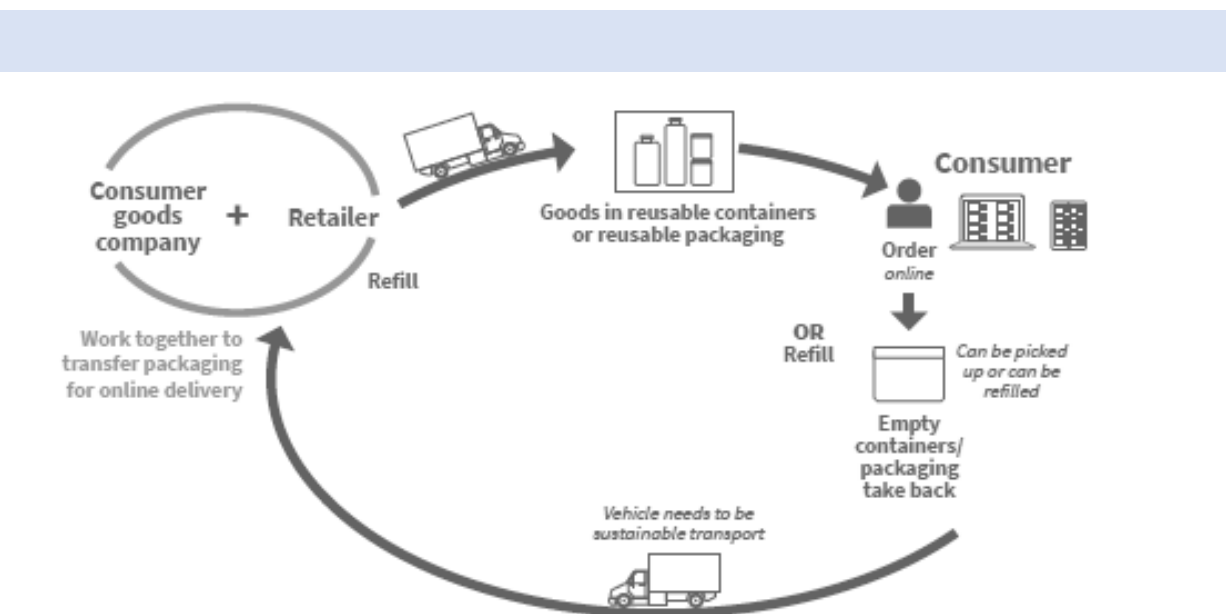
Figure 2: *Online zero-waste retail system (Buchanan, 2019, 16). Graph from: Buchanan, E. (2019). The Smart Supermarket – how retailers can innovate beyond single-use plastics and packaging. Greenpeace. Available from: https://www.greenpeace.org/usa/wp-content/uploads/2019/11/SMART-SUPERMARKET-How-retailers-can-innovate-beyond-single-use-plastics-packaging.pdf*

Launching in 2020, Tesco will be conducting a pilot project with select products. Consumer goods firms Procter & Gamble, Unilever, Nestle, PepsiCo, The Body Shop and Mondelez are all contributing products for the trial (Hope, 2019). Loop claims the scheme

could result in lower prices and better functionality and design than single use packaging (Sykes, 2019). While Loop is in its very early stages, in accordance with Buchanan (2019), it does represent a potential way to systematically change the way products are packaged. Accordingly, Sky's impact investment fund, Sky Ocean Ventures has committed $2 million to Loop (Sky, 2019) suggesting there is high expected market potential of the concept.

Buchanan (2019) further highlights key recommendations within the online zero-waste sector. The author emphasises the need for sustainable transport "to ensure that reverse shipping requirements are carbon neutral" (Buchanan, 2019, 16). From a logistical perspective, the report recommends working with local rather than national logistics companies "to ensure both environmental and economic feasibility" (Buchanan, 2019, 17). Deposit-reward schemes are also suggested to incentivise the return of packaging (Buchanan, 2019), in order to ensure customer retention and to avoid unintended consequences such as consumers accumulating reusable packaging rather than reusing. From a consumer perspective, online zero-waste retail provides key benefits, such as having more practical and aesthetically pleasing containers, and the convenience of not needing to accumulate packaging or having to remember to bring it to the shops (Buchanan, 2019).

The emergence of mainstream retailers interacting with zero-waste retail, and the associated societal attention and policy involvement (see Section 1.1) outlines the increasing relevance of the movement. However, due to the recent emergence of zero-waste in the mainstream, the significance of the movement is largely unknown.

1.5 SCIENTIFIC RELEVANCE

While sustainable consumption is a much-researched area, zero-waste retail remains a vastly understudied concept (Fuentes et al., 2019), despite its prominence within the public domain. Studies have only begun to emerge in the last four years (see Beitzen-Heineke et al., 2017; Sjölund, 2017; Gustavo et al., 2018; Sandano, 2016; Fuentes et al., 2019). This is due to the rise in zero-waste retail over the last four years, which has been attributed to the growing environmental concern associated with single-use plastic (MacArthur et al., 2016).

Scholarly attention has previously focused on niche, independent retailers situated within sustainability food retailing and sustainable food supply chain streams of literature (Saladino, 2018). This is arguably due to the recent emergence of zero-waste within the mainstream. Beitzen-Heineke et al. (2017) are the most credited scholars within zero-waste retail (see Saladino, 2018; Sjölund, 2017; Gustavo et al., 2018). The scholars outlined the social and environmental impacts of zero packaging on the supply chain, and found that the stores induce resource efficient behaviour among suppliers and consumers, due to the reduction of food and packaging waste. However, consumer convenience was reiterated as a key issue due to aforementioned slower shopping operations and limited product variety.

Other notable papers include Sandano (2016) who analysed the barriers and drivers to zero packaging food retail through a stakeholder approach. At the time of the study, the author outlined consumer demand as a key driver, while citing financial limitations due to the niche nature of the movement (Sandano, 2016). However, Sandano (2016) only researched retailers and acknowledged that excluding other stakeholders may have potentially resulted in a limited

set of data. Including further actor groups would have arguably provided a more holistic and representative set of results. Saladino (2018) further assessed zero-packaging from an entrepreneurial perspective, identifying the characteristics, operational process and potential of zero-waste retail by analysing independent retailers in Italy. The author further emphasised the need to create a 'mind-set shift' (Saladino, 2018, 80) in consumers, and for government regulations on single-use packaging and incentives to increase the uptake of zero-waste retail. Finally, Sjölund (2017) focused on the logistical aspect of zero-waste retailers, through a life cycle assessment between packaged and package free products. The scholar outlined the complexity of the concept in relation to the supply chain, since packaging is typically involved in every step of the supply chain.

While the aforementioned studies have provided valuable initial insights into the characteristics, drivers and barriers of zero-waste, there are numerous gaps in the literature. This is particularly from a geographical perspective and due to previous studies focusing on zero-waste retail from the perspective of a limited number of actor groups and from a niche perspective, focusing on independent stores, since the studies were conducted prior to the emergence of mainstream actors incorporating zero-waste retail methods.

Regarding the former, zero-waste studies have been previously noted as limiting since they have not been context specific, but instead set as global (e.g. Sandano, 2016; Sjölund, 2016) and European (Beitzen-Heineke et al., 2017). In accordance with Beitzen-Heineke et al. (2017), this limited the relevance and applicability of their research, since it did not allow for the influence of cultural, economic, social and regulatory context dependent factors. Saladino (2018) has, however, offered one context specific study in Italy.

Moving on, certain claims within zero-waste literature have become outdated. For example, Beitzen-Heineke et al. (2017, 1540) outlined "three pathways in order to penetrate the mainstream and increase convenience." These included "the expansion of zero-packaging stores in order to increase uptake, the introduction of online delivery and the adoption of zero-waste retailers by conventional supermarkets" (Beitzen-Heineke et al., 2017, 1540). However, the recommended pathways have since come to fruition and zero-waste retail has begun to emerge in the mainstream *(see section 1.2)*. The finding suggests the need to update existing literature, and assess the implications of zero-waste retail's recent emergence within the mainstream supermarket sector.

Accordingly, Saladino (2018) recommended for the perspective of key mainstream actors, namely retailers and consumers alike, to be analysed to determine zero-waste's market potential. Sandano (2016, 63) further stated how "further research is required to assess the implications of mainstream retailers use of zero-waste retail practices" due to its potential to aid waste reduction. The scholar acknowledged that incorporating retailers, suppliers, consumers and policy makers into their study would have created a more representative set of results.

Retailers are reliant on suppliers for goods and ultimately sales. Therefore, it is necessary to assess suppliers, as well as retailers since they directly affect the operations of retailers engaging in zero-waste retailers. For example, a retailer who is looking to fully integrate zero-waste retail would have to rely on its suppliers to transition along with it, if it is to be fully integrate zero-waste. Consumers are arguably necessary actors since they are

responsible for making the purchasing decision. Policy makers have the ability to incentivise zero-waste retail through regulation and therefore, it is necessary to gain an insight into how policy can directly affect the transition. Accordingly, Yan et al. (2018) note how NGOs are thus important to analyse as they directly influence governments through pressure groups, as well as the private sector, through activities such as boycotting unsustainable practices.

Despite these findings and the scholarly recommendations, there is a clear lack of research focused on the emergence of zero-waste retail and the level of actors' support to support the new phenomenon. While zero-waste retail represents a positive development according to NGOs, and a business opportunity for mainstream supermarkets, it is clear the zero-waste retail requires a shift in consumer habits, and in the operations and supply chain of supermarkets. It is therefore important to understand the level of support there is for zero-waste retail from key actors. The recommendations, coupled with the lack of research on zero-waste retail's emergence and on its support within the supermarket sector, have therefore created a viable research gap to explore**.**

1.6 RESEARCH AIM

The aim of this study is therefore to understand the rationale of key actors to support (or not to support) the transition to zero-waste retail within the mainstream supermarket sector. By analysing the rationale of key actors involved in the sector, this study hopes to shed light on the potential of zero-waste retail practices to influence the mainstream supermarket sector. Due to the lack of context specific studies, this thesis will also limit its scope to the UK. Accordingly, the following research question has been formulated:

What are the rationales of key actors to support or not to support the transition to zero-waste retail within the mainstream supermarket sector in the UK?

1.7 RESEARCH RELEVANCE

From a scientific perspective, the relevance of this research lies in its contribution to the lack of literature analysing zero-waste's recent prominence among mainstream actors. Further, since zero-waste retail offers a way to operationalise a waste prevention strategy within the grocery sector, the practical implications of this study from a sustainability perspective are significant. By analysing the rationales of key actors to support zero-waste retail, this thesis will also help determine its potential significance within the grocery sector accordingly. In turn, this will update existing zero-waste literature with regard to zero-waste retail's potential to influence the mainstream grocery sector. From a practical perspective, since this thesis hopes to give a better insight into actors' rationales for supporting zero-waste retail, the study may be helpful to understand which direction the transition is heading. In doing so, key actors will be able to assess whether to mobilise more or less support accordingly.

2. THEORETICAL BACKGROUND

In accordance with Hockerts and Wustenhagen (2010) and as has been shown within zero-waste retail, it is new market entrants and small firms (e.g. independent zero-waste shops) who initiate sustainability transformations and first engage in niche socio-technical systems, before incumbents (e.g. supermarket chains) adopt the socio-technical system. As is the case within zero-waste retail, pioneering large retailers have begun to integrate certain zero-waste product lines within specific stores, primarily in the form of pilot projects. In line with Hockerts and Wustenhagen (2010), these retailers are known as early adopters and represents a stage where retailers are testing the system's commercial viability, after its early growth in the niche has been recognised.

Accordingly, while zero-waste retail has somewhat entered the mainstream, this thesis considers zero-waste retail as an emerging and niche socio-technical system. A niche socio-technical system refers to "emerging social or technical innovations that differ radically from the prevailing socio-technical system and regime (which refers to the existing system), but are able to gain a foothold in particular applications, such as geographical areas, or markets" (Geels et al., 2017, 465). Geels (2011, 27) further states that niches are: "protected spaces such as R&D (research and development) laboratories, subsidised demonstration projects, or small market niches … where users are willing to support emerging innovations." Since retailers are only piloting and engaging within zero-waste retail within specific locations and markets, it is therefore evident the system is currently being held within a protected space by retailers. This is because pilot projects are an effective and efficient way to learn hands-on about a transition pathway and its possible consequences, before committing to a transition (Bakker, 2014). For this reason, the socio-technical system of zero-waste retail can be considered both niche and emerging.

In order to understand the rationale of key actors to support an emerging and novel socio-technical system, Bakker (2014) argues that actors' interests and expectations are important to assess. Bakker (2014) argues that analysing actors' expectations for an emerging socio-technical system helps to understand their rationales for what is likely to happen. On the other hand, analysing actors' interests help to understand their rationales for how the emerging socio-technical system will affect them. This thesis will elaborate on the theory of expectations and interests. This thesis will further argue for the inclusion of consumers, arguably a previously under-valued actor within the previous applications of the conceptual framework (see Bakker, 2014; Bakker et al., 2014). This will be elaborated upon in *section 3.1* in determining a more accurate depiction of the overall actor rationales to support zero-waste retail, and in responding to the aforementioned research gaps *(see section 1.3).* Stakeholder mapping will further be added to the existing conceptual framework in order to more easily translate the shared level of support for zero-waste within the mainstream supermarket sector (see *section 3.2*). This will involve clearly outlining the rationales of support of each of the actors, in order to identify similarities and differences between the actor groups.

2.1 EXPECTATIONS

Bakker (2014, 64) summarises expectations as "ideas about the potential of an emerging socio-technical system, [such as zero-waste retail] which provide rationales for individuals and groups of actors in their decision to engage with a socio-technical system or not." The author argues that "widely shared positive expectations of an emerging socio-technical system are crucial to its development and success" (Bakker, 2014, 62). Expectations suggest the future is not passive, but can impact and predict future outcomes through visions from actors in the present (Van Lente and Rip, 1998). Borup et al. (2006, 285) state that this is relevant for emerging socio-technical systems, since they "do not substantively pre-exist themselves, except and only in terms of the imaginings, expectations and visions that have shaped their potential."

Accordingly, it is widely understood that expectations play an important role in determining the direction of technological change and the rate at which novel socio-technical systems are adopted (Alkemade and Suurs, 2012; Berkhout, 2006; Hekkert et al., 2007). Scholars have highlighted a variety of contributions of expectations. Firstly, expectations' function as a coordination mechanism among actors and activities (Alkemade and Suurs, 2012; Konrad, 2006). As previously noted, widely shared positive expectations help attract actors to a socio-technical system and subsequently help to align interests and guide activities (Bakker, 2014; Eames et al., 2006). This process of alignment and coordination can also provide legitimacy and structure for the new socio-technical system (Alkemade and Suurs, 2012). Borup et al. (2006, 286) highlights how expectations give "definition to roles, clarifies duties, offers a shared shape of what to expect, and how to prepare for opportunities and risks."

Geels and Smit (2000) further indicate that key actors' positive expectations and visions are critical for the success of an emerging socio-technical system. For example, positive promises of new socio-technical systems are known to help mobilise support (Geels and Smit, 2000). Accordingly, the scholars argue that support for a niche is created through positive expectations, which protects the niche, subsequently enabling it to evolve and grow (Geels and Smit, 2000). An example of expectations being used to rationalise participating in an activity is "governments who subsidise not yet profitable innovations in the expectation that they will become important for realising specific societal or collective goals in the future" (Schot and Geels, 2008, 539). The example outlines the importance of expectations to help rationalise actors engaging in the early phases of a socio-technical transition, since expectations are required to deal with the uncertainty of emerging socio-technical systems.

Accordingly, if many actors allocate their resources towards the same socio-technical direction, the potential of the emerging socio-technical system will become greater (Truffer et al., 2008). Bakker et al. (2014, 55) state this occurs when there are collective expectations which refer to the "dominant discourse within a specific actor's industry and throughout wider society." This is since it exerts pressure on key actors, forcing them to cooperate in the transition (Bakker et al., 2014). However, within the zero-waste movement, while there is an emerging discourse within wider society regarding the need for zero-waste, the relevance of the discourse among key actors remains more or less unknown. The conceptual framework in the latter section will account for this. Bakker (2014) further argues that while actors'

individual expectations are influenced by collective expectations, they are also influenced by their own interests, which creates divergence among actor's individual expectations.

2.2 INTERESTS

Interests refer to the "goals, resources, capabilities and the institutional context in which actors operate" (Bakker, 2014, 64). The importance of interests in understanding rationales in transitions has been widely acknowledged in the transitions literature (Bakker, 2014; Bakker et al., 2014; Unruh, 2000; Smith et al., 2005; Avelino and Rotmans, 2009; Meadowcroft, 2009; Smith et al., 2010; Geels, 2012). Bakker (2014) argues that the willingness for an actor to engage in an emerging socio-technical pathway depends largely on their own internal interests, along with their expectations regarding a socio-technical transition. Bakker (2014) argues that actors whose interests align with a proposed transition are likely to act as leaders, while other actors take up a modest role, and focus on learning first or limit themselves to image shaping efforts.

However, Bakker et al. (2014) argue that all actors who help to create and sustain an emerging socio-technical system do so because the system aligns with their current or anticipated interests. Such interests may relate to business, social or environmental opportunities. The role of interests aids in identifying the primary motives of mainstream actors to engage in a transition. In accordance with Bakker (2014, 62), "interests have typically related to the distinction between the vested interests of mainstream actors, and the emerging interests of niche companies." However, the distinction is not this clear.

Bakker (2014) argues that mainstream actors may have both authentic motives for a transition or have vested interests which are merely a matter of greenwashing. Bakker (2014) explains this through differentiating short term and long-term interests. Short term interests can refer to a desire-to-learn by doing, or a desire to engage in an activity due to the potential impact it may have on long term interests. For example, an actor may pilot a new emerging socio-technical system with the intention of transitioning to it, if the pilot is successful. On the other hand, an actor may engage in a project aside from its main agenda for positive publicity or competitive advantage in order to align with collective expectations. With regard to the latter, it is important to ensure companies are not merely image building when analysing the level of support for a transition. This may occur if an actor's long-term interests are significantly different from collective expectations, since companies may want to protect their reputation, but not want to risk their profit margin by engaging in a new socio-technical system.

It is also worth noting some actors must prioritise certain interests over others (Bakker, 2014). Government and business have to prioritise economic interests while tackling environmental and social issues. In the case of zero-waste, retailers must ensure there will be consumer demand for associated products, ensure profit margins are not compromised, while ensuring the values of zero-waste are abided by. It is therefore also acknowledged that interests are also dependent on other actors, such as retailer interests aligning with those of consumer interests.

Accordingly, this suggests the interests of actors are necessary to analyse alongside expectations, to, as Budde et al. (2012) notes, measure the 'talking from the doing.' This is in

order to improve the validity of actors' rationales to support zero-waste retail within the mainstream. In accordance with Bakker (2014), this is done by assessing the potential short and long-term impact the emerging socio-technical system will have on an actor. Bakker (2014) also argues assessing companies' current activities and future plans helps to differentiate the 'talking' from the 'doing.' This refers to outlining the extent to which company's current and future activities are supportive of the emerging socio-technical system. Accordingly, Bakker (2014) argues analysing interests along with activities helps give a more internal and direct insight into actors' rationales for supporting a transition, and helps ground the hypothetical nature of expectations.

3. THEORETICAL FRAMEWORK

In accordance with the theoretical background, this thesis will use Bakker's (2014) conceptual framework (*see figure 3*) in using individual and collective expectations, and short and long-term interests to assess actor rationales.
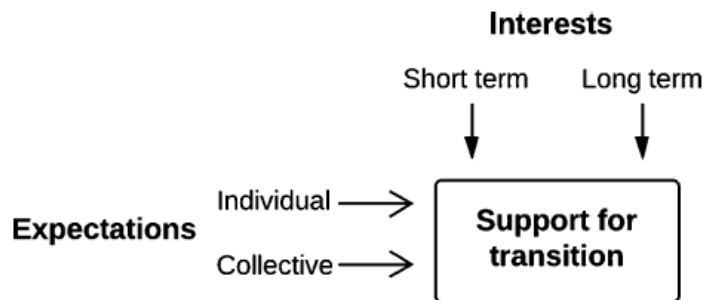
Figure 3: *Conceptual framework for explaining actor rationales for supporting a transition (Bakker, 2014, 64)*

With regard to expectations, as highlighted, collective expectations refer to the influence of other actors and the wider discourse on an actor's decision to engage with a transition. This can push actors to engage in a transition, even if the individual actor does not hold positive expectations. The implications of this can relate to short term interests, such as image building, or long-term interests such as trialling a system with the intention of incorporating it in the long-run. Individual expectations on the other hand typically refer to the actor's long-term interests, and are likely to inform an actors decision making process, such as long-term investments (Bakker, 2014).

The most amount of support for a transition typically occurs "where there is a strong alignment of long-term interests and positive individual expectations, regardless of positive or negative collective expectations" (Bakker, 2014, 65). This is since it refers to the actor's intrinsic desires and matches the company's internal operations, and hence if support is implemented, it is likely to be sustained (*see Table 1*).

Table 1: *Rationales for supporting a transition informed by an actor's interests and expectations (Bakker, 2014, 65)*

	Short term interests	Long-term interests
Positive individual expectations	Desire to learn-by-doing about the transition pathway(s) and the potential impact on long-term interests.	Profound desire to make the transition happen and to reap benefits. Desire to influence the configuration of the emerging system.
Positive collective expectations	Desire to learn-by-doing about the transition pathway(s) and the potential impact on long-term interests. Pressure to support the transition for image building.	Desire to influence the configuration of the emerging system (just in case the transition does take place).

In these instances, Bakker (2014) argues that actors can have the ability to contribute to institutional structures such as favourable regulation and collective expectations (Musiolik and Markard, 2011; Konrad et al., 2012), since these actors represent the ability to fully adopt a specific emerging socio-technical system. The table above will be used to clarify the level of support there is for zero-waste retail.

In accordance with Bakker (2014), within this thesis, expectations will be assessed by analysing actors' views on the technological and market potential, and the perceived obstacles for wide-scale adoption of the emerging socio-technical system. This will help to understand what the actors expect to happen. On the other hand, interests will be assessed by the threats, opportunities and the level of alignment an emerging socio-technical system brings to actors' goals, resources and capabilities. This will help to understand the direct influence the socio-technical system may have on the actor (see Table 2).

Table 2: *Operationalisation Table*

Actors expectations	Potential impact upon actors' interests	Actors zero-waste activities
Expected technological development	The threats that zero-waste poses	Current activities
Expected market potential	The opportunities zero-waste provides	Future plans
Perceived obstacles to the introduction and large-scale adoption	The conditions where zero-waste aligns with an actors' interests	

Adopted from Bakker (2014, 67)

In order to determine the level of support, will determine the amount of support for the socio-technical transition by the extent to which positive collective expectations and long-term interests are aligned (see Table 4). Accordingly, positive expectations, opportunities and areas of alignment will be coupled together to represent support (e.g. long-term interests and collective expectations). Obstacles to growth, threats and areas will be where there is not alignment have been coupled together to represent a lack of support for zero-waste retail.

Despite not being acknowledged within the conceptual framework, Bakker (2014) further analyses the current and future activities of key actors. Within this thesis, activities have been acknowledged to help determine the extent to which key actors are involving themselves within the zero-waste retail movement, which will subsequently help, as mentioned, to ground the claims made by actors. However, activities are integrated into the interests of actors within the results to back-up claims on the resources and capabilities of actors to support and influence zero-waste retail. Therefore, activities will not be directly visible, but will act more to supplement interests.

4. THEORETICAL CONTRIBUTION

4.1 ADDITIONAL ACTORS

A key finding from transition studies is that niche socio-technical systems will only successfully create systemic change if other key actors are supportive (Smith, 2007; Mylan et al., 2019). "Support gives niches protection in order to grow and evolve" (Budde et al., 2012, 1073). With the theoretical framework in mind, Bakker et al. (2014) and Bakker (2014) have previously argued key actors who are fundamental within emerging socio-technical systems include Governments (through R&D programs, pilot projects and favourable policies), industry actors, (such as firms who are directly involved or affected or may be affected by an emerging transition) and non-governmental organisations (NGOs) who can leverage support to pressurise actors to engage in transitions.

However, this thesis argues consumers are a previously undervalued key actor within transition studies. As was highlighted in *Section 1*, Saladino (2018) and Sandano (2016) both argued consumers are a necessary actor group to be analysed, since they directly influence the success of emerging socio-technical systems through their purchasing decisions. Accordingly, it can be argued that consumer rationales of an emerging socio-technical system are fundamental to assess the overall level of support for a transition. In accordance with Schot et al. (2016), consumers are deemed important stakeholders within socio-technical transitions, since they play a crucial role in shaping new routines, enacting system's change and ultimately enabling the stabilization of new socio-technical systems.

Accordingly, far from being external to impacting socio-technical transitions, consumers are central to them (Franke and Shah, 2003; Shove and Pantzar, 2005). Shove and Walker (2007, 7) outline how "the literature on innovations in practice demonstrates that manufacturers and producers are unable to control the fate and fortune of the things they make." Instead, it is the consumers who must willingly adopt the new usage-practices and routines of an emerging socio-technical system (Schot et al., 2016) for the system to be sustained. Since consumers also express their status and identity by attributing symbolic meanings to new socio-technical systems (Shove and Walker, 2007), the system must also be positively associated with status and identity. The finding suggests that while consumers do not create the socio-technical system, they are key facilitators of it. Therefore, existing consumers of zero-waste and regular consumers are arguably necessary to include as key actors. The two actor groups are also likely to have different rationales for supporting or not supporting the transition.

Consultants have been included as an additional stakeholder. Rapoport and Hult (2017) argue that consultants help to create and circulate sustainability norms and best practises, which impact the way local, regional and national greening initiatives are shaped. Bolton and Hannon (2016) also outline how consultants often offer technical expertise which are required within sustainability transitions. Accordingly, in the context of zero-waste retail, consultants are argued to be a necessary key actor since they influence actor groups by assessing the

feasibility of an emerging socio-technical system, such as the operational and market potential of zero-waste retail.

Accordingly, the conceptual framework for thesis (Figure 3) is outlined below:
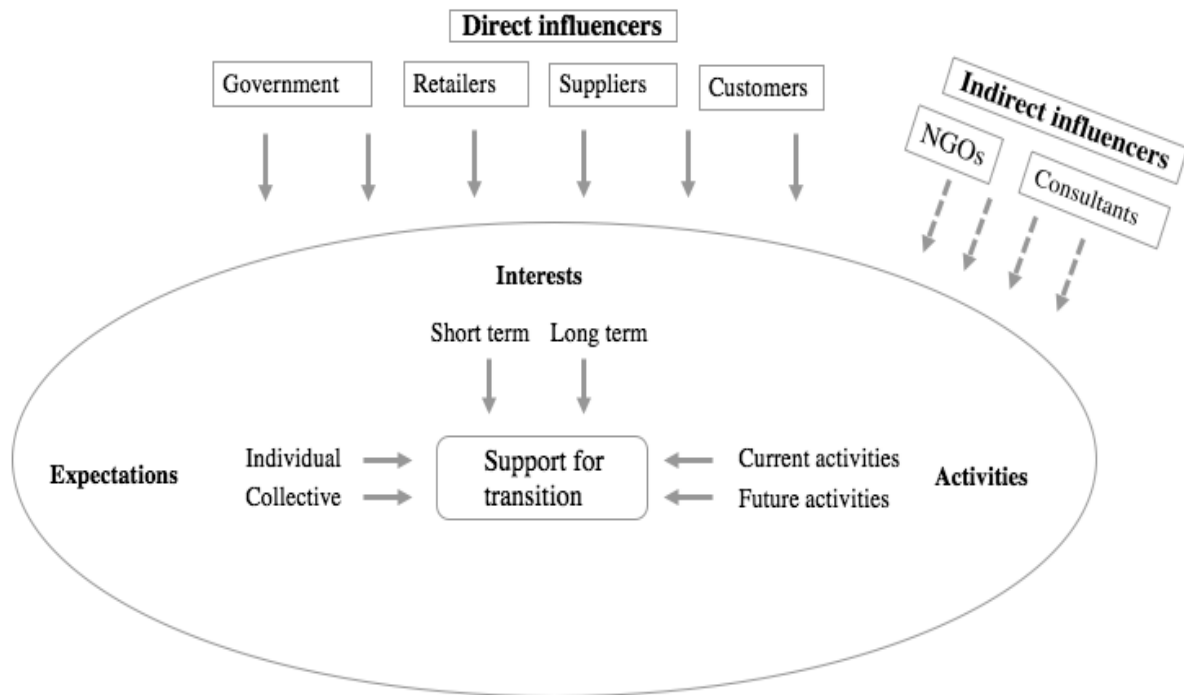
Figure 4: *Conceptual framework for explaining rationales for supporting a socio-technical transition within the mainstream supermarket sector. Adapted from Bakker (2014, 64).*

The framework differentiates between direct and indirect influencers. Direct influencers refer to actors who have a direct impact on the configuration of a socio-technical system. For example, Governments can implement regulations to support or not support a transition, retailers and suppliers can implement infrastructure to support or not support a socio-technical system and customers have the purchasing power to ultimately influence the fate of the socio-technical system. However, NGOs and consultants are only able to influence the socio-technical system through direct influencers. For example, NGOs can only advocate for systems change and must influence actors to change the configuration of a socio-technical system (e.g. advocating for consumers to boycott unsustainable practises). Similarly, consultants are only able to advise actors on their decisions to influence the socio-technical system. Therefore, indirect influencers are dependent on direct influencers to impact the configuration of the socio-technical system.

5. METHODOLOGY

This section will examine the approach used to conduct the primary research within this study and analyse the data collected to effectively answer the main research question.

5.1 RESEARCH DESIGN

The research design was supported through multiple methods of data generation, collection and analysis. In order to understand the current state of zero-waste retail and its level of integration into the mainstream supermarket, background research was firstly applied. This gave the research a foundation to build from. Scientific literature, grey literature, newsletters and websites all helped to analyse the zero-waste movement and the current activities retailers are engaging in. This subsequently aided in understand the current level of support associated with zero-waste retail. The background research and theoretical framework were then used to shape and guide the primary research. Qualitative interviews were conducted from key actors involved within the supermarket sector and zero-waste retail. An interview guide was generated accordingly *(see Appendix 1)*. Questions were derived from the operationalisation of the theoretical framework. However, it is worth noting, while a generic interview guide was used, questions for each actor group were occasionally adapted and sub-questions were used to probe interviewees further.

To get an effective insight into the view of key actors within zero-waste retail, semi-structured interviews have been used within the study. This method was used as opposed to structured interviews as of the need to explore each actor's opinions, clarify interesting and relevant issues and explore unique, in depth opinions with reference to zero-waste. Face-to-face interviews were preferred as opposed to telephone or email exchanges due to the importance of body language in interpreting the meaning and validity behind given information (Edwards and Holland, 2013).

Expectations, interests and activities have been included within the conceptual framework. While expectations and interests have been discussed extensively, it was deemed important to understand the activities of key actors, since the success or expected success or failure of current and future activities will likely influence actor rationales for supporting the zero-waste movement. As highlighted, activities will be integrated into the interests of actors. Due to the variety of actors involved within the study, the results were expected to be both rich and divergent, and it was acknowledged that not all respondents will touch on the same issues, nor on all the aspects covered on the interview guide.

It is also worth noting that the research process has been described chronologically. It was instead an iterative and complex process. For example, during the interview process, additional desk research was carried out, for various reasons such as participants citing relevant research reports, which had not previously been assessed.

5.2 CASE SELECTION

The outcomes of the literature shaped and dictated the actors which were targeted to interview within this thesis. Accordingly, this thesis targeted every actor group which has a direct or indirect influence on the potential for zero-waste retail to enter the mainstream supermarket sector. Different actors were interviewed to gain different perspectives on the rationales to support the zero-waste movement. From an industry perspective, retailers, suppliers and packaging consultants were interviewed. For retailers and suppliers, this included both retailers and suppliers who have and have not engaged in zero-waste retail. Participants ranged from environment and CSR (corporate social responsibility) managers to store and packaging managers. Consumers who are both engaged and not engaged in zero-waste were also interviewed. This was in order to ensure representation from both demographics.

For regular consumers, this research aimed to determine their expectations of zero-waste retail and their current level of demand for sustainable retail and zero-waste options. Zero-waste customer insights were used to gain a more in-depth idea of their rationale to support the movement and to gain direct insights on their experience of the current zero-waste offering. Policy experts were chosen based on their experience within packaging policy. Areas of expertise included taxes, regulations and any associated incentives to support the transition. NGOs involved in advocacy for zero-waste retail were chosen to assess their expectations and insights on the movement and their activities to support it.

Purposive and snowball sampling was used to recruit participants. The reason for choosing purposive sampling was due to its suitability for qualitative research, since it allowed for specific actors to be chosen. Snowball sampling has been used to recruit relevant participants for a study by "sampling through referrals made among people who share or know of others who possess some characteristics that are of research interest" (Biernacki and Waldorf, 1981, p.141). This method allows access to individuals who are otherwise very difficult to contact (Atkinson and Flint, 2001). Despite the effective nature of gaining respondents quickly within a specific research area, it is evident there may be bias within this research through contacts potentially recommending people who share the same view on zero-waste retail (King and Horrocks, 2010). The method could therefore result in correlating results purely due to the bias nature of the original contact. However, this research ensured it interviewed key actors with varying levels of support for the transition, such as retailers and consumer who are and are not engaging with zero-waste retail. This helped to ensure balanced and reliable results.

Accordingly, 16 interviews were conducted, which lasted 45 minutes on average. 42 stakeholders were originally contacted for interviews with 16 responding and accepting. The aim was to continue adding respondents until a point of saturation had been reached, where no new information is coming out of the results, and the same concepts and themes are being repeated. An equal number of interviews was also originally desired within each actor group, in order to gain an accurate and fair understanding of the different rationales on zero-waste retail within the mainstream and the associated level of support from each group. However, the size of the case selection was largely determined by the practical restrictions of time and relevant contacts, so an equal number of interviews was not feasible. Despite this, the

participants of this research were all deemed significant and influential actors within the supermarket zero-waste sector.

Within this thesis, all participants have been kept anonymous. Therefore, within the results, acronyms have been used within each actor group as opposed to names. Accordingly, the characteristics of each actor, along with their associated acronym are highlighted in Table 2 below:

Table 3: *Overview of characteristics of participants within each actor group*

Government	Retailers	Suppliers	Consumers	Consultants	NGOs
Participants: **pol1:** Over 20 years working within environment and policy Gender: Female	Participants: Regular retailer: **ret1:** Over 20 years as Head of Sustainability Gender: Male Zero-waste retailers: **zret1:** Over 5 years as an Environment Manager Gender: Male **zret2:** Over 20 years as a Store Manager Gender: Male **zret3:** Over 5 years working within CSR Gender: Female	Participants: **sup1:** Over 10 years as a supply chain manager Gender: Female: **sup2:** Over 20 years as CEO of a zero-waste retail supplier Gender: Female	Participants: Regular customers: **cus1:** Regular shopper and frequently top-up shops Gender: Male **cus2:** Shops at conventional supermarkets. Mainly shops ethical (e.g. Fairtrade and organic) produce Gender: Female Zero-waste consumers: **zcus1:** shopped at zero-waste stores for the last year. Gender: Female **zcus2:** Has adopted a zero-waste lifestyle for the last three years Gender: Male	Participants: **con1:** Over 5 years as a sustainability Consultant specialising in packaging Gender: Male **con2:** Over 20 years as a sustainability consultant, specialising in reuse and refill and zero-waste Gender: Male **con3:** Over 5 years experience as a sustainability consultant, specialising in packaging Gender: Female	Participants: **ngo1:** Over 20 years experience in the packaging industry. Works for an international environmental NGO and is directly involved with advocacy against single-use plastic and for reuse and refill methods within the UK. Gender: Female **ngo2:** Over 10 years of experience within an international environmental NGO. Is involved with direct advocacy to ban single-use plastic and incentivise zero-waste retail methods.
Expertise includes UK policy associated with packaging. This covers: - Current policies - Current taxes - Current incentives	All actors had expertise within: - Financial resources - Human resources - Supply chain - Logistics - Operations	All actors had expertise within: - Supply chain - Logistics - Operations - Innovation			

Both retail and consumer actor groups have incorporated participants who are involved and not involved within zero-waste retail. It is however worth highlighting that retailers referred to as zero-waste retailers (zret) simply means that they have engaged with zero-waste retail. For example, zret1 and zret2 have only engaged in pilot projects, and their general operations still represent that of a conventional supermarket, while zret3 is yet to launch its zero-waste offering in the UK. Therefore, it is acknowledged that no actor within this thesis has fully integrated zero-waste retail into its core business model. Accordingly, the characteristics of each retailer has been provided in to show in greater depth what extent each supermarket has introduced zero-waste retail (see *Table 3*).

Table 4: *Characteristics of each retailer*

Retailers	Geographic scale	Demographic	Characteristics
ret1	- **National** Branches are located though-out the UK	- Low-cost UK based in-store and online supermarket chain	- Has not engaged at all in zero-waste retail activities. However, has committed to being plastic free by 2023.
zret1	- **Regional** Branches are predominantly located in the South-East of England.	- Middle-cost UK based in-store and online supermarket chain	- Piloting zero-waste retail within specific categories within four stores. - Zero-waste product range includes dispensed items such as pasta, cereals, grains, dried fruit and others. Other food items include fresh fruit and vegetables and meat and dairy products. Non-food items include household products, ground coffee and wine and beer
zret2	- **Regional** Branches are predominantly located in South England.	- High-cost UK based in-store and online supermarket chain	- Installed zero-waste retail within specific product categories within one of its stores. - Zero-waste product range includes dispensed items such as pasta, cereals, grains, nuts and others. Other food items include fresh fruit and vegetables. Non-food items include package free soaps and shampoo.
zret3	- **National** Non-physical store. Will be available nation-wide.	- Middle-cost online supermarket operating across Europe and North America	- Will be launching in the UK in partnership with a UK based supermarket chain with an online zero-waste retail offering in 2020. - Products will include: staple food items, household and personal care items. Other product categories may be included before it is launched.

From a demographic and geographical perspective, it is worth noting that it was largely unattainable to have an entirely balanced and representative sample of zero-waste retailers in the UK. This is because retailers engaging within zero-waste retail have so far only been retailers associated with having higher price points, with the majority of trials taking place in the South of England. *Figure 5* below gives a visual overview of the number of participants involved within each actor group.
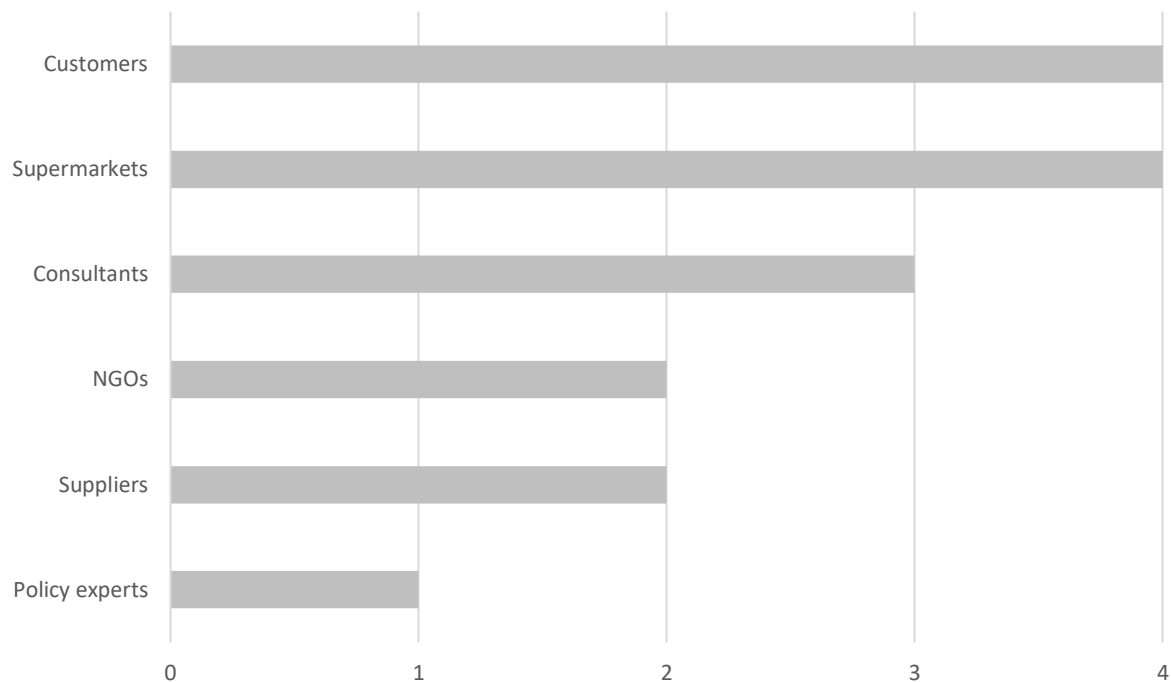
Figure 5: *Overview of relevant stakeholders*

It is acknowledged that the actors' expertise often overlapped across different actor groups and could arguably have been applied to more than one category. This thesis avoided double counting by associating the participant with their primary function. During the analysis, a theoretical saturation point was reached when the findings were no longer generating new themes and insights on the rationales for support of the zero-waste movement.

5.3 DATA ANALYSIS

The interviews were transcribed and analysed using Nvivo. Coding and thematic analysis has been conducted in order to analyse the data generated from the interviews. Codes were developed both deductively from the literature review and desk research, and inductively, by deriving new codes directly from the findings (Fereday and Mui-Cochrane, 2006). The generated insights and themes were analysed in order to look for similarities, differences and areas of possible tension among individual actors and actor groups to determine actors' rationales for supporting the socio-technical system.

5.4 DATA QUALITY

Validity was ensured by cross-referencing data from multiple sources, including scientific literature, company websites, news websites, policy documents and interviews. As an example, this was used to ensure the credibility of participants claims within the interview process. This subsequently helped to reduce the potential for results to be biased and subjective. Reliability, referring to the repeatability and replicability of research (Bryman, 2016) was ensured within this research by following a step by step process. Accordingly, this thesis followed Bakker's (2014) research process on actor rationales in sustainability transitions. Interviews were also recorded and transcribed, ensuring the traceability and transparency of the information collected.

5.5 DUTY OF ETHICS

Typical ethical protocol was followed within this research through:

- An explanation of the interview procedure for each participant.
- Ensuring participants are comfortable in the set location.
- Ensuring participants are kept confidential unless agreed otherwise.
- Ensuring participants have given consent for the recording of an interview.
- Giving the interviewee the opportunity to skip any question participants are uncomfortable with and the opportunity to stop the interview at any time.

The ethical principles used within this research are consistent with ensuring the free consent of participants to participate, protecting the confidentiality of the material, and guarding interviewees from any harm that may arise from their participation (Josselson, 2007; Smythe and Murray, 2000). Verbal consent was used to clarify participants approval.

6. RESULTS

The following section will outline a summary of the data collected from the interviews with the key actor groups. The overall themes which have emerged will be identified and assessed to determine the rationales for support from key actors within zero-waste retail. In accordance with Bakker (2014), the results have merged expectations and interests and will determine the amount of support for the socio-technical transition by the extent to which positive collective expectations and long-term interests are aligned (*see Table 2*). For clarity, positive expectations, opportunities and areas of alignment have been coupled together to represent support (e.g. long-term interests and collective expectations). Obstacles to growth, threats and areas where there is not alignment have been coupled together to represent a lack of support for zero-waste retail. The activities of actors were discussed within the expectations and interests section, and helped to give a greater depth to understanding actor's perspectives.

The results were framed through the key categories which emerged throughout the literature analysis and from the new findings identified. These include societal, market (including policy and economy), technological and supply chain factors. Most interestingly, there were no significant differences among actors and actor groups, with regard to their level of expectations for zero-waste retail. While it was expected that actors would have diverging expectations, especially zero-waste retailers and consumers compared to the regular actor groups, all actors shared positive individual and collective expectations, as will be elaborated on. Similarly, the vast majority of actor groups were found to have short-term interests within zero-waste retail, largely due to the recent emergence of the phenomenon. However, conflicts of interest did emerge. Actors have not shifted their resources to support the transition, since it is not yet fully developed, or trusted by key actors.

Some key obstacles and threats included the operational and habitual challenges the movement poses to both business and consumers. A range of expected solutions, however, were presented. Since the movement directly affects retailers and consumers, the majority of the implications are focused on these two stakeholders. The results suggest the emergence of zero-waste retail is likely to influence the configuration of the emerging system. However, due to the recent emergence of the transition and actor's recent engagement in zero-waste, it was difficult to establish how it will influence the current system. The overall level of support for the transition was also difficult to establish, due to the recent emergence of the transition. An overview of the strategic rationales for supporting and not supporting zero-waste retail and how they are related to interests and expectations are outlined below. The remainder of the results will go into a more in-depth analysis of the main themes that arose.

Table 5: *Overview of strategic rationales for supporting and not supporting a transition to zero-waste retail*

Rationales for supporting/not supporting the transition	Relation to interests	Relation to expectations
Consumer demand for sustainable retail	This is currently a short-term interest, since consumers have only voiced their demand. Sales of packaged produce within supermarkets have not declined. In order to become a long-term interest, results suggest consumers must commit to sustained support for zero-waste retail and outline their demand with their purchasing power. It is acknowledged that zero-waste consumers are exempt from this finding.	Positive collective expectations of consumer demand increasing as awareness on sustainable retail increases. However, individual expectations, associated with retailers outline that demand must translate to action for consumers to convince retailers to transition.
Positive PR for retailers	The results suggest there is currently pressure to support the transition for image building purposes. Zero-waste retailer's reputation has increased considerably. The finding currently represents a short-term increase, since retailers have only begun to pilot zero-waste retail and have not incorporated into their overall business model.	Positive collective expectations on the continued positive publicity of zero-waste retail. However, not necessarily positive individual expectations of it helping create the transition. Retailers must ensure their motives for engaging in zero-waste are legitimate. If not, NGOs are expected to boycott retailers who appear to only take part in zero-waste for reputational benefit.
Retailers reducing plastic waste	Similar to the above, supermarkets have short-term interests to address consumers' concerns around plastic waste. This is evident since zero-waste retailers have only reduced packaging in a select few shops. Retailers are threatened by long-term interests associated with maintaining their current supply chains due to the technical difficulty and costs associated with creating a zero-waste supply chain	Positive collective expectations that retailers will successfully integrate zero-waste retail into the supply chain to reduce plastic waste. However, individual expectations from suppliers and retailers also suggest there is uncertainty into technical solutions to create a supportive supply chain.

Retailers using innovation to provide convenience and commercial opportunity	Supermarkets currently have short-term interests since innovations are only being tested on a small-scale. However, it is likely to become a long-term interest. Since supermarkets have only begun to engage in pilot schemes and package free technologies, they are still going through a testing phase, and the commercial opportunity has not yet been truly recognised or adopted.	Highly positive collective expectations for innovative advances within zero-waste retail both through online and in-store channels. All actor groups expect innovation to bridge the convenience gap and make zero-waste retail accessible to a wider market.
Lack of consumer convenience associated with zero-waste retail	Zero-waste retail threatens the status quo and current norm of shopping, since it offers a lower level of convenience. For this reason, supermarkets are hesitant to shift their resources, since consumers may not adopt zero-waste usage practises.	Overall positive collective expectations from actors believing that innovation and technology will help to overcome consumer convenience. However, expectations suggest convenience cannot be fully matched.
Level of supportive policy	Current lack of supportive regulation for zero-waste retail allows retailers to have short-term interests, associated with image building and disincentives supermarkets to adopt zero-waste retail. However, policy could ensure it becomes a long-term interest. Further regulations on single-use plastic and supportive policy could incentivise actors to adopt zero-waste retail.	Overall positive collective expectations that advocacy will significantly increase to inspire regulatory change, specifically on banning single-use plastics and incentivising reuse and refill models. Retailers, zero-waste consumers and NGOs discussed this, and their involvement with advocacy. If there are financial incentives for retailers to adopt zero-waste retail, the movement is expected to occur far more quickly
Current supply chain and logistical challenges and associated costs (inc. labour and retail space)	Retailers current supply chain is a long-term interest, since retailers and suppliers have assets and fixed costs associated with current supply chains and logistics, which are not currently supportive for zero-waste retail. However, if a company can confirm a return-on-investment (ROI) from adopting a zero-waste supply chain, this would likely threaten the current norm.	Expectations proved inconclusive. Positive collective expectations were associated with innovation helping adapt existing supply chains. However, the findings do not clarify how entire supply chains can be transitioned successfully. However, EVs are expected to be key from a logistical perspective.

On-boarding external suppliers	Zero-waste retailers have cited inefficiencies in the supply chain due to the small volumes they are currently operating with. Therefore, third party suppliers working with retailers who are engaging in zero-waste retail are threatened since supplying goods through such a system compromises cost. Zero-waste retail is therefore not a long-term interest for external suppliers. This subsequently threatens zero-waste retailers, since they rely on external suppliers for their product offering.	Similar to the above explanation, expectations are inconclusive due to a limited amount of information on the commercial viability of a zero-waste supply chain. However, there are positive expectations associated with supportive policy and industry collaboration to create a supportive zero-waste supply chain.
Zero-waste retail is an unproven business model. Lack of a blueprint or frontrunner.	No UK supermarket has long-term interests within zero-waste retail. Retailers have only adopted in-store zero-waste retail through pilot schemes to test its viability and online zero-waste retail offering is yet to launch. It is currently unclear whether companies plan to integrate zero-waste business models fully in the future. This is because the traditional form of retail has still not subsided to any real extent within any UK supermarket.	Largely positive collective expectations of a successful integration of zero-waste retail within the mainstream. However, individual expectations outline concern over the feasibility of the transition from an operational and consumer adoption perspective.

6.1 SOCIETY

> *"It has to be convenient, low cost and easy for the stupid, the lazy and the downright overwhelmed, over stressed and over worked"* (ngo1)

All actors discussed the societal implications of integrating zero-waste retail into the mainstream supermarket sector. Actors' overall expectations were positive of the transition, however numerous obstacles for growth, most notably achieving consumer convenience, have been documented and a range of opportunities and threats have been highlighted.

6.1.1 OBSTACLES AND THREATS TO GROWTH

6.1.1.1 CONVENIENCE

It was unanimously agreed among actors that consumer convenience will be the key societal hurdle to integrating reuse and refill methods. Organisation was highlighted as the biggest challenge within convenience. According to customers, zero-waste retail requires additional planning and preparation, and for consumers to be more conscious when they shop. This is since customers are currently responsible for providing their own reusable grocery bags and containers in order to purchase goods. The inability to top-up shop was mentioned in relation to this, since consumers will be unable to spontaneously purchase goods, since they will be required to have their own container, unless a deposit-return scheme is in place. Due to a lack of convenience, consultant and NGO actor groups highlighted a possible rebound effect. One consultant highlighted:

> *"the customer may be trying to do the green thing by using a reusable container but it is likely consumers may end up repeatedly forgetting to return their previous one, so their footprint and material usage may end up being far higher [as opposed to conventional retail]"* (con3).

The finding outlines the importance of creating incentives and deterrents which encourage consumers to reuse, such as deposit-return schemes. The time-consuming nature of zero-waste retail was also cited as an expected barrier for its integration into the mainstream. Time was highlighted by all customers as an expected barrier for its integration into the mainstream, since shopping would typically take longer in-store. This is due to the time it takes to use a dispenser and weighing system, rather than using regular packaging as exemplified by this customer:

> *"At the moment, it is amazing. You only spend 10 minutes or 15 minutes, and you can do a weekly shop. Whereas with these containers, it will take a lot more time – you could not whizz around the supermarket"* (cus1).

Accordingly, the finding suggests time-poor consumers will be especially reluctant to willingly adapt to such a shopping system. Both consultants and retailers highlighted that increased shopping time may lead to congestion. The locations where zero-waste retail has

been trialled have all had a low footfall. The actor groups expressed concern that if such a system was integrated into a supermarket with a high footfall, it is likely you would get queues of people waiting to dispense a specific product. This outlines a specific consideration mainstream retailers must acknowledge if integrating such a system into stores with a high walk-through rate.

6.1.1.2 DEMOGRAPHIC

Following on from the previous remark, according to NGO and customers, from a demographic perspective, increased shopping time is expected to affect the lower-socio economically deprived the most. This is because they are typically the most time-poor. As an example, while discussing the issue, one NGO actor stated:

> *"you will probably get a lot of irate customers going, I can't believe you've done this, where have I got time. I've literally got half an hour between finishing work, picking up my kids and getting home to feed them." (ngo1).*

It suggests that zero-waste retailers should be mindful of the target market, and ensure the movement does not have a detrimental effect on society. Conversely, both sets of consumers and NGO actor groups associated zero-waste retail with premium shopping, appealing to an upper-class demographic. It was noted that retailers must ensure their zero-waste solutions are inclusive so to create a real impact, rather than appealing to one societal group. This is since it could arguably lead to inequality if it results in higher prices and lacks accessibility. According to consultant and NGO actor groups, young people are expected to be more adaptable, and likely to adapt to zero-waste retail in a shorter space of time. However, elderly consumers are expected to be less likely to adapt quickly, since they are typically more resistant to change. With this said, they are still expected to adapt. One consultant highlighted how they would have used a refill and reuse system back in the 60s and therefore, those who experienced that form of retail would be able to revert. The results suggest a need to offer more guidance to the elderly to help them become accustomed to the new shopping system.

6.1.1.3 CHANGING HABITS

In alignment with the convenience debate, behavioural change was the second most cited code. All actor groups talked of the habitual challenge of consumers to switch to zero-waste retail. The majority of retailers discussed how the supermarket sector has well-established consumer buy-in patterns. Both sets of retailers outlined how product models are set up for ease of purchase, such as packaged apples. For example, retailers expressed how whenever you sell loose produce, you sell less, since consumers are accustomed to buying goods in typical unitary formats which are consistent across the marketplace. When faced with a choice between loose and packaged, customers will therefore choose packaged since it is both the norm and provides immediate, guaranteed convenience. The issue is what has led to a so-called "two-way blame game" (ngo2). Consumers are openly blaming businesses and government for the lack of uptake within reuse and refill systems, but industry is arguing that consumers beliefs are not translating to action, since they have not changed their buying habits.

The results here suggest a dual-need. Consumers must be willing to compromise on convenience and retail must risk the uncertainty of adopting new practises. The results also outline how raised consumer awareness does not necessarily translate into behaviour change, as exemplified here:

"retailers have been under threat by the … customer correspondence letters they are getting around plastic, but the level of noise from consumers is not necessarily translating into behaviour change" (ngo1).

This outlines the need for consumers to make conscious purchasing decisions to influence retail to a greater extent.

6.1.1.4 COMMUNICATION

Communication was highlighted as another key barrier to growth. NGOs and retailers touched on how consumers have typically been misinformed with previous sustainable forms of packaging, such as compostable. It was noted that there is often a lack of communication and guidance to the consumer. Accordingly, consumers may not know to put compostable packaging into the compost or food bin instead of their regular bin for example. Accordingly, retail, NGO and consultant actor groups all discussed the importance of effective communication, coupled with guidance to motivate consumers to try new ways of shopping, and to ensure they do so correctly.

6.1.1.5 HYGIENE CONCERN

Hygiene represents both an expected obstacle and threat to consumer uptake. The majority of actor groups touched on consumers' hygiene concern within zero-waste retail, since products are not protected by packaging. NGOs, along with both sets of retailers highlighted meats and household products as specific areas of concern, due to the particular risk both these product categories carry towards health and safety. However, actors did highlight that consumers are likely to trust established retailers with a known reputation in this domain, as opposed to new market entrants, even with more innovation. It is worth noting one retailer who had incorporated meat and household products into its zero-waste offering claimed they followed stringent hygiene and environmental standards, and that risk of health and safety is minimal. The implication of this suggests retailers must better communicate hygienic assurances with their customers to gain trust to overcome hygiene concerns.

6.1.2 POSITIVE EXPECTATIONS AND OPPORTUNITIES

6.1.2.1 CONSUMERS DRIVING DEMAND

While numerous obstacles have been cited, there were a number of positive expectations towards achieving consumer convenience and behaviour change. Two particular streams of reasoning were derived. Firstly, on the local level, customers touched on the feel-good factor associated with zero-waste retail:

"people are conscious of the problem with plastics. It's appealing in the sense that it feels good to be sustainable and friendly to the environment" (cus1).

The power of the collective was also discussed as a driving force for zero-waste retail from a consumer perspective. Customers touched on growing trends in relation to sustainable forms of shopping and the growing pressure consumers feel to shop sustainably. Customers expect the continual uptake of sustainable forms of retail to simultaneously influence others to shop sustainably, since it is expected to be the norm. Accordingly, the media has also been highlighted as an influential platform encouraging re-use. Multiple consumers outlined how plastic pollution has created consumer awareness and directly influenced them to look for sustainable alternatives. Accordingly, one supplier working directly with a supermarket incorporating zero-waste retail outlined how their BYO (bring your own) container scheme has seen great traction, with over 50% of consumers bringing their own container. The finding demonstrates the level of consumer demand. Accordingly, a zero-waste retailer highlighted how it is customers driving the demand and the transition:

"Customers are asking for it and interested, so we have hit it at a good point. If we had have done it 5 years ago, we might not have got the traction that we have today and certainly would not have got the buy-in, but it is because customers are expecting it and asking for it that it functions" (ret1).

All actor groups expressed the growth in awareness by consumers, brands and retailers. Waitrose Unpackaged store and Loop's e-commerce offering were frequently highlighted to back up this claim. Multiple stakeholders outlined the growth in momentum of the movement, and how the level of demand justified the viability of zero-waste retail. Both retailers and NGOs outlined how having frontrunners for the online and in-store proposition will start to pave the way for refill and reuse systems, and motivate more supermarkets to enter into the market. However, it is noted that both Loop and Waitrose have only recently emerged and are largely associated with an upmarket demographic, so it is currently unclear whether they will be deemed as frontrunners.

6.1.2.2 OVERCOMING THE CONVENIENCE ISSUE

Customers and NGOs advocating for the movement touched on the importance of price-points and ensuring that this did not mean compromising on quality. Actors outlined how zero-waste retail must be the same price, if not more affordable, accessible and the same quality of product. Two actor groups (NGOs and customers) outlined the potential to reach the lower socio-economic demographic of customers by offering competitive price points:

"if they know that they will be able to feed their family for … two pounds less or five pounds less if they just take that extra bit of time to go for that refill solution, then there will be demand" (ngo1).

This recommendation was echoed by two of the regular shoppers to make the proposition more appealing. While the finding outlines a potential solution to counter-balance the issue of convenience, it is noted that retailers must still ensure a healthy profit margin. Accordingly, the feasibility of the finding is questioned.

6.1.2.3 REPUTATION

The majority of actor groups cited the reputational benefits of switching to reuse since it immediately increases the brand reputation and credibility of a company. While consumers expect retailers to be engaging in sustainable forms of retail, retailers engaging in zero-waste retail are expected to, in accordance with one consultant: "get an extra bright green halo" (con2). This was evidenced by a mainstream retailer piloting a refill and reuse scheme:

"from a PR perspective, we have seen an 800% uplift in customer queries around plastics. It has been one of the most successful external facing pieces of work we have ever done as a business. The press coverage … has been phenomenal. It has improved our brand perception" (zret1).

Accordingly, both sets of retailers expressed the opportunity zero-waste retail provides in establishing a leadership position, and being a frontrunner within sustainability. Actors outlined how it shows retailers were going above and beyond environmental standards and therefore, lessens the noise from NGOs, and provides an additional pull factor to entice more consumers. While the positive PR associated with zero-waste retail can be seen as a short-term interest, a supplier outlined how even if a company is engaging with zero-waste retail for positive PR, providing they show long term commitment, the motive does not matter.

6.1.2.4 THE SHOPPING EXPERIENCE

From a consumer perspective, the shopping experience of zero-waste retail was seen as an opportunity by both consultant and consumer actor groups. According to the actor groups, zero-waste retail is seen as an aspirational form of shopping, which has aesthetic appeal and is now "trendy" (con2). According to a regular customer describing a zero-waste retail experience:

"the customer has a delightful and tactile experience of smelling and feeling what they are going to buy before they buy it" (cus2).

Consumers outlined the enjoyment of shopping in a more interactive and immersive way. This suggests the shopping experience of zero-waste retail and its positive consumer perception are both driving forces for consumer adoption.

6.1.2.5 HEALTH

Customers saw opportunities from a health perspective, since it incentives organisation, makes you more conscious of what you would like and puts the customer in control of the desired amount of a given product. Accordingly, bulk buying was also considered as an opportunity since consumers can buy as much of a product as they desire without increasing their material usage. Consumer and consultant actor groups also touched on how bulk buying lessens the inconvenience of the added time taken to shop, since it lowers the frequency of how much a consumer does shop.

6.1.2.6 ADVOCACY

The policy maker expressed that pressure within government is mounting to implement supportive policy for sustainable packaging and reuse methods. Both NGOs outlined how they are continually attempting to justify the case to raise regulations on single-use plastic, and to implement supportive policy for zero-waste retail. While the overall level of advocacy towards zero-waste retail has not been quantified, advocacy is expected to increase, particularly as zero-waste retail solutions continue to develop. This alongside retail adoption and innovation is expected to pave the way for government to integrate supportive policy.

6.2 MARKET

"Somewhere along the way you are trying to be an economically sound business. We have to find a way which works financially, works for the customer, works environmentally and works for the supply chain" (zret1)

From a market perspective, all actor groups associate zero-waste retail with having strong market potential, largely driven by consumer demand and emerging innovations to achieve consumer convenience and competitive price points. However, the investment and costs associated with the transition are key barriers to growth. Along with this, current policy frameworks are unsupportive and the lack of cannibalisation of pre-packaged products and current exclusivity rights have been cited as other key threats to market growth. However, opportunities exist through the unsaturated nature of the market and for retailers to become market leaders within zero-waste retail.

6.2.1 OBSTACLES AND THREATS TO GROWTH

6.2.1.1 DIRECT RETAIL COSTS

Economic factors were termed the biggest obstacle for growth. All retailers cited financial constraint in transitioning towards the movement. Retailers cited concern in investing in an unproven system. There were four main economic hurdles cited being: the initial cost of infrastructure, cost of shifting own brand supply chain, 3rd party supplier collaboration and increased labour costs. The CAPEX (cost of investment) to transition is therefore extremely high. Retailers have accordingly deemed zero-waste retail as a long-term investment, especially since after overcoming the four hurdles, retailers must ensure they are price competitive and ensure a healthy profit margin:

"If a supermarket undergoes a transition and shifts everything you have been used to working with for years to a different model, it is obviously going to take a bit of time to be economically rewarding for everyone" (zret2).

This outlines the economic challenge of transitioning to zero-waste retail. The challenge is further exacerbated since there is not a proven zero-waste retail blueprint to adopt. Linking back to labour costs, NGOs and zero-waste retailers reiterated the increased labour costs,

and the cost of training staff and having more staff permanently to help on-board consumers. These additional costs and resources hinder the scalability of the transition considerably.

6.2.1.2 THE RETAIL MARKET

Following on from the direct costs associated with the zero-waste transition, the retail market in general is under threat according to all retailers. This is due to intense competition from supermarkets and other, new market entrants, such as online grocery delivery and takeaway platforms. Accordingly, one retailer stated:

"we're all closing shops or at least thinking about it to try and cut costs and save money where we can. In that sense, it [zero-waste retail] has come at really bad timing for the retail industry because everyone's cash-strapped for lack of a better word" (zret1).

For retailers, due to the aforementioned upfront investment required, the current climate of the retail market exacerbates the issue considerably. Both sets of customers took a less sympathetic viewpoint, citing that it is there responsibility to implement sustainable practises. According to consumers, retailers must accept short-term losses, in order to reach long-term gain.

6.2.1.3 CURRENT POLICY

While supportive policy is expected, current policy frameworks are unsupportive. The policy expert, along with NGOs and zero-waste retailers highlighted the lack of governmental support for retailers adopting zero-waste retail practises. Actors outlined the lack of taxation on single-use plastic, which is hindering both adoption rates of zero-waste retail methods and the competitiveness of zero-waste retail. The lack of incentives for zero-waste retail and regulation significantly hinders the competitiveness of the movement, since up-front costs associated with zero-waste retail, such as containers, are far higher than single-use packaging.

6.2.1.4 REPUTATIONAL THREATS

Actor groups highlighted a number of threats for retailers. Firstly, retailers are threatened by not adopting zero-waste retail practises. All actor groups highlighted a reputational threat of lagging behind competitors, due to risks of lowering consumer demand and boycotting if the transition does takes place. This is an expected threat for the future as zero-waste emerges into the mainstream.

Of particular note, actors have expressed concerns of retailers engaging in greenwashing. NGOs and customers argue that specific companies are engaging in zero-waste retail for short term reputational gains, rather than integrating it into their long-term business strategy, due to the aforementioned increased brand credibility and positive PR companies receive. One stream of logic for this concern is elaborated in the following section.

6.2.1.5 LACK OF CANNIBALISATION OF PRE-PACKAGED PRODUCTS

The lack of cannibalisation of pre-packaged products highlights a key prohibiting factor to the full integration of zero-waste retail to the mainstream supermarket sector. Both NGOs and consultants explained that within mainstream retailers where zero-waste retail is being offered, retailers are still offering the pre-packaged versions of dispensed goods. It has therefore been deemed an "incremental sales offer" (ngo1, ret1). Therefore, actors argued that it has not tackled the underlying objective of reducing single-use plastic, nor has it proved that zero-waste retail can survive as a stand-alone solution. Accordingly, NGOs argued there is still insufficient evidence to suggest there is a business case for zero-waste retail, at least in-store. Retailers are therefore urged to cannibalise packaged products to determine the true feasibility. In terms of market potential, it is predicted that the current in-store solution will find it extremely challenging to break out of a niche, until a mainstream retailer fully integrates zero-waste retail and cannibalises its pre-packaged products if it is already offering it through a zero-waste format.

6.2.1.6 EXCLUSIVITY

The issue of exclusivity has been termed another key issue. According to NGOs and zero-waste retailers, supermarkets have entered into exclusive partnerships with zero-waste retail solution partners which have meant that other supermarkets do not have access to that said solution provider. This subsequently limits other retailers to zero-waste solutions. The results suggest a need to increase inclusivity and collaboration within the supermarket sector to allow for a wholescale system's shift.

6.2.1.7 NEW MARKET ENTRANTS

Retailers and consultants expect further competition within the zero-waste environment. While there is opportunity within zero-waste retail due to a currently unsaturated market, new business models are expected to threaten traditional retail. New market entrants are expected to emerge, such as online supermarkets avoiding the cold chain. This refers to shops which do not require refrigeration. Smaller online zero-waste supermarkets avoiding the cold chain are expected to enter the mainstream with growing consumer demand, as they will be able to deliver premium products at a lower price, because they do not need to refrigerate and do not have a physical store. A growing company which was cited in accordance with this is the Good Club, who currently sell premium products at a more affordable price due to the avoidance of the cold chain. While the store does not offer zero-waste retail, it outlines the economic potential in avoiding the cold chain. Other online reuse delivery services are also expected to threaten the market share of supermarkets, due to the increasing amount of innovation and convenience companies are providing, particularly within hot food.

6.2.1.8 THE THREAT TO RETAILERS OF TRANSITIONING TO ZERO-WASTE

A key threat for front-running retailers within zero-waste retail will be providing enough of a customer proposition to entice customers to switch to zero-waste retail with them. Retailers highlighted that the customer has driven them to the point of providing zero-waste retail. However, going beyond customer demand presents a risk to retail, since it is uncharted territory. Retailers must ensure they do not compromise on shopping time, price, quality, product ranges, hygiene, organisation and all other convenience related issues. Retailers cited how it represents a particular risk if other retailers do not transition, since they may lose market share due to the uncertainty of consumer uptake. The many uncertainties for both actor groups represent a key hurdle and will only become less uncertain as solutions start to appear.

6.2.2 POSITIVE EXPECTATIONS AND OPPORTUNITIES

6.2.2.1 POSITIVE ECONOMIC ASSOCIATIONS WITH ZERO-WASTE RETAIL

Moving on, from an economic perspective, the ability for retailers to buy in bulk and directly from their supplier to the store was cited by consultants and retailers as a long-term cost saving, since goods do not have to be individually packaged, so the packaging manufacturer is cut out. Two consultants also used the increasing number of multinationals engaging in reuse and refill systems to outline the potential of the movement, such as the multinationals partnering with Loop, Body Shop and Lush.

"Lush have been doing reuse and refill packages – I mean Lush are at a billion-euro turnover … so it's already happening" (con2)

While Lush is a beauty and cosmetics company, the findings outline that zero-waste retail is commercially viable. The example again suggests the need for industry collaboration and supply chain transparency to assess how these companies have reached such economic efficiencies within their zero-waste offering. NGOs and the policy maker also outlined positive expectations associated with increasing legislative, regulatory and taxation pressures are also expected to help subsidise retailers shifting to zero-waste retail and increase the commercial viability of the movement.

6.2.2.2 UNSATURATED MARKET

Actors did not comment on market opportunities to a large extent. However, there were two frequent codes. The first is the unsaturated nature of the current zero-waste retail environment. NGOs and retailers themselves cited that those who move towards zero-waste now will benefit from little competition, and potential high demand depending on the offering.

"It's not like the market is already saturated and there is plenty of offers. I feel like as a consumer, it is not easy to find zero-waste options, so the more there are the better" (zret2).

As it is perhaps obvious, there is clear opportunity for a retailer to become a frontrunner and exploit the market, by integrating zero-waste where possible within its product offering and in reaching a wider audience. Currently, the two predominant players, Loop and Waitrose have not been accessible to a wider market and have only been used within a niche customer base.

6.3 SUPPLY CHAIN

"It is about it making it work through the whole supply chain. Otherwise, you are just greenwashing" (con3)

There were numerous expected obstacles to growth cited within the supply chain. These included the requirement to shift and adapt existing infrastructure, the challenge of on-boarding external suppliers, the risk of unintended consequences from a material and emissions perspective and the limited product range. However, the supply chain was positively associated with long term cost savings due to the retention of material (resource), and through channelling out waste. Regarding the in-store proposition, actors associate positive expectations with integrated smart systems, such as smart bins to provide a reverse logistics solution. However, online retail is expected to provide the biggest opportunity within the supply chain, since companies are able to maintain ownership of their containers or packaging, and offer a collection service which achieves consumer convenience.

6.3.1 OBSTACLES AND THREATS TO GROWTH

The supply chain was the second most cited category, behind societal factors. All retailers, consultants and NGOs cited obstacles with regard to the supply chain in the context of transitioning to zero-waste retail. This covers upstream, in-store and downstream infrastructure.

6.3.1.1 TRANSITIONING EXISTING INFRASTRUCTURE

The requirement to shift existing infrastructure was noted as the largest barrier across the aforementioned actor groups. As previously noted in section 4.2, supply chain systems have been set up for speed, efficiency and commercial viability. An NGO actor outlined how the largest challenge from an operational perspective is to unpick what is very established infrastructure and reliant on packaging and change its system entirely to conform to zero-waste. Retailers must ensure zero-waste is integrated through the whole supply chain, oppose to the consumer facing in-store infrastructure. This includes establishing efficient ways for products to go through the supply chain in bulk packaging without compromising quality.

6.3.1.2 ON-BOARDING EXTERNAL SUPPLIERS

External suppliers were cited by both sets of retailers and NGOs as a significant barrier also, since retailers do not have direct control over third party supplier operations. Due to the

scale of infrastructure change required, retailers working within the zero-waste retail space have cited inefficiencies in the supply chain due to the small volumes they are currently operating with. This is because they have only made incremental rather than wholescale shifts to zero-waste retail, through reuse and refill methods and unpackaged grocery sections. Own-branded goods have been and are expected to be the simplest goods to shift since the retailer is in control. However, retailers outlined concern over the lack of control they have on third-party suppliers, since they are unable to directly influence brands and suppliers supply chain and operations. Branded goods can amount up to an excess of 17,000 different product lines. Therefore, it is important for retailers to on-board suppliers, to ensure zero-waste retail can be offered across all products. It calls for wide-scale industry collaboration to increase zero-waste retails feasibility through creating economies of scale and improved efficiencies in the supply chain.

Accordingly, the threat of key suppliers not adopting zero-waste presents a double-edged sword. Retailers are threatened by both not reaching their desired state within zero-waste retail due to suppliers, and reduced demand if they terminate their relationship with a supplier. Suppliers are also threatened by supermarkets moving towards reuse and refill methods, specifically with regard to ensuring product integrity within a refill system. One supplier cited:

"we don't design our bottles to be refilled. Refillable bottles are often heavier and made of materials that can't stay strong enough to survive the supply chain and protect the product" (sup1).

This example represents a key threat to suppliers and retailers since current business models are not suitable for reuse and refill methods. It reiterates the scale of change necessary for a sustainability transition to reuse. From a supplier perspective, they have been struggling to cooperate with the pilot schemes currently in the UK due to the small volumes of goods resulting in inefficiencies. One retailer stated:

"The multinational corporate suppliers are not equipped to deal with the small volumes the supply chain is not really made for that, so everything is inefficient" (zret2).

This outlines the current struggle multinationals face in engaging with zero-waste, since they are unable to create immediate efficiencies. However, pilot schemes are deemed necessary to engage to test a concept or products' feasibility.

6.3.1.3 QUALITY ASSURANCES

Another concern cited across retail on the shift to zero-waste retail focused around ensuring quality. Retailers and consultants outlined how bulk packaging is liable to product damage. Multiple retailers touched on this. Innovation within bulk packaging was also cited as being novel by zero-waste retailers, and solutions currently do not ensure product protection within the in-store offering. Similarly, product segregation was cited as another issue in-store, particularly between organic and non-organic produce, due to the risk of cross-contamination without packaging. The majority of actor groups expressed concern on the conflict between

material usage and shelf life, since there are concerns zero-waste retail will create additional food waste, since packaging prolongs the life of produce:

> *"fundamentally, somewhere along the way that packaging is delivering shelf life into a product and reducing waste through a system. The challenge is how do you maintain that [with no packaging]" (ret1).*

The finding makes it evident that the operations of zero-waste retail must be rigorously checked to ensure the system avoids unintended consequences, such as creating additional food waste.

6.3.1.4 POTENTIAL REBOUND EFFECTS

Following on from the above, actors outlined the importance of ensuring materials which are planned to be manufactured for reuse should be tested and scrutinised through methods such as life-cycle and carbon footprint assessments to ensure they are not contributing more to carbon emissions than plastic. One zero-waste retailer stated:

> *"retailers have to challenge themselves to make something that delivers and does not create unintended waste by inadvertently driving a market position in reusable" (zret1).*

While it is acknowledged that rebound effects are likely to happen online and in-store, NGOs commented predominantly on online reuse platforms using certain materials within their reuse offering, such as aluminium, which according to one NGO will come with untold environmental impacts due to the carbon intensity of manufacturing it. It was also deemed important to ensure reusable products can still be recycled at the end of life, so not create more material waste. Accordingly, NGO actor groups stated that this was a specific area being monitored closely, due to the risk of greenwashing the consumer. This outlines an additional threat for retailers. Another retailer cited the unintended consequence of the implementation of 5p charge for plastic bags:

> *"the problem we face now is that even though everybody is using heavier reusable bags, the weight of plastic has still gone up because we still have this single-use approach to reusable bags" (ret1).*

This suggests that measures should be implemented to ensure reusable containers are not supplied in excess, so to ensure material usage and its associated carbon emissions does not increase from zero-waste retail. Aligned with this, is the issue of reverse logistics. As it has been highlighted, retailers are looking into collection systems. Actors have emphasised the importance to also ensure emissions do not rise from a transport perspective due to the need to collect packaging, as well as deliver. It suggests retailer should adopt 100% EV (electric vehicle) fleets. The findings call for companies to be environmentally rigorous within their supply chain and to ensure that their consumer facing products are geared towards a sustainable, rather than a single-use approach to reuse.

6.3.1.5 LIMITED PRODUCT RANGE

The limited product range of zero-waste retail was cited by the majority of consumers. Despite Waitrose expanding beyond pastas, grains, dried fruits and cereals to meat, dairy, alcohol, coffee and household products, pre-packaged and grab and go items are not currently an offering. Accordingly, the majority of actors cited that there is a limit to reuse, particularly for grab and go products, since consumers demand and require packaging for on-the-go items.

6.3.1.6 RETAIL SPACE

Retail is threatened by its current retail space. Zero-waste retailers and consultant actor groups outlined the issue of dispenser model systems taking up more retail space than current pre-packaged products. Retailers outlined how this was a specific issue for "discounters" (zret2), which refers to a supermarket selling goods at a less than usual price and convenience stores, since they often do not have the retail space to operate dispenser model systems. This also outlines a significant issue for the wide-scale distribution of refill and reuse systems for supermarket chains since they often operate additional smaller, convenience stores.

6.3.2 POSITIVE EXPECTATIONS AND OPPORTUNITIES

Within this section, positive expectations and opportunities have been merged, since the majority of actors' positive expectations related directly to opportunities for both consumers and retailers. Despite the vast array of expected obstacles to growth, there were positive expectations associated with the shift in supply chain infrastructure to reuse.

6.3.2.1 MATERIAL USAGE

From a direct supply chain point of view, the ability to reduce the material usage and effectively cut out the packaging manufacturer as previously highlighted was positively associated with transitioning the supply chain. Accordingly, two zero-waste retailers outlined the opportunities to lower their environmental impact and make cost savings by using reuse methods and convert what was previously thought as waste into resource:

"we're trying to shift the businesses perception of waste in general, whether that be food packaging or whatever. Because it is ultimately a resource" (zret2).

By companies being led in this direction by demand, zero-waste retailers have expressed that there are long term cost savings to be had. The supply chain associated with online retail also has high expectations compared with current in-store solutions, as from a reverse-logistic perspective, materials are more likely to stay in the system. This is because the onus is on the company to collect the containers, as opposed to the consumer as it is the case in-store, therefore providing far more convenience. However, NGOs highlighted the necessity of using sustainable transport if they are to provide a sustainable offering.

6.4 TECHNOLOGICAL INNOVATION

"There has to be innovation in business models to get the average consumer to purchase and consume these products" (Con1)

All actors had positive expectations of innovation within zero-waste retail to provide more convenient solutions. Laser tagging and digitalised dispenser systems are expected to provide convenience to consumers in-store. However, retailers cited additional upfront and labour costs as a key barrier to growth. Innovations within online retail was associated with the highest expectations, as the level of convenience is expected to match that of conventional retail. Conflicts of interest arose between retailers and consumers, since retailers cited technical issues and increased costs with the move to digitalisation, while customers believe it will create more convenience for their shop. Another conflict of interest arose between customers, as there is a fear the move to digitalisation will only cater to a younger demographic and deter an older demographic.

6.4.1 OBSTACLES AND THREATS TO GROWTH

6.4.1.1 THE COST OF INNOVATION

From an in-store perspective, a frequently cited obstacle to growth was the current lack of innovation with regard to the dispenser-model system. Consultants and NGOs cited how they are not particularly customer facing, and require more innovation through digitalisation to achieve high levels of convenience. However, retailers cited increased labour and infrastructure costs as key barriers to zero-waste retail's implementation. Retailers cited how increased digitalisation often requires additional trained employees to be present in the event of issues arising, and to on-board customers, resulting in high labour costs.

6.4.1.2 DEPOSIT-RETURN SCHEMES

According to NGO and consultant actor groups, deposit-return schemes are currently not in a place which provides adequate convenience for the customer. This is because the emphasis is on the customer to take home and bring back the containers. Actor groups outlined how retailers need to do more to incentivise customers to return containers. The issue highlights a significant barrier to the wide-scale adoption of zero-waste retail due to the habitual change necessary for consumers to use deposit-return schemes. This is since consumers are required to take their containers to and from the store, compromising convenience considerably.

The findings also outlined concern on the potential for schemes to provide reusable containers in excess. This is since schemes may make reusable containers overly accessible to entice consumers to shop in their stores. This may subsequently lead to an excessive and unsustainable number of containers circulating within the system creating an aforementioned rebound effect.

6.4.1.3 ONLINE ZERO-WASTE RETAIL

From an online perspective, actors have largely positive expectations towards technology providing reuse solutions. However, a key barrier to growth is expected to be its inability to provide immediate convenience and offer the same sensual experience as in-store. Three customers highlighted the inability for online shopping to be instantaneous. Since a large proportion of customers top-up shop, it is clear online shopping cannot cater to all consumer needs. Secondly, two consultants outlined how online retail is currently limited to 7% of the grocery market:

"the marketing effort and innovation required to shift 93% of a market to online is monumental" (con1).

This outlines a key challenge within the online proposition to shift the market to an online platform. Actors outlined how it will challenge consumers' natural desire to touch and feel products and have that 3-dimensional experience. Accordingly, all actor groups cited how there will be a need for both in-store and online zero-waste retail.

6.4.1.4 INNOVATION AND LABOUR COSTS

There was a conflict of interest between retailers and consumers within innovation. While both sets of consumers are demanding it to achieve higher levels of convenience, retailers are threatened by the upfront cost of digitalisation and the associated labour costs. A direct example of this was echoed by a retailer who adopted a digitalised dispenser within household products:

"you can have all the jazziest tech behind it, but if it doesn't dispense the dam goods, then it doesn't stand a chance" (ret1).

The retailer was talking in relation to a broken-down dispenser. Both retail and NGO actor groups outlined the threat of digitalised dispensers, as they have to be practically fault proof in a retail environment due to high walk-through rates. Due to the complexity of the back-end of digital dispensers, retailers cited hiring full time technicians which significantly affected their bottom line. It was also suggested among consumer and NGO actor groups that increased innovation may negatively affect the elderly as they are not typically "technologically savvy" (cus1) and may therefore struggle to adopt digitalised technology, rather than the current, manual operating system on offer. This suggests a conflict of interest between the young and elderly and a potential hindrance for innovation depending on supermarkets demographic of customer.

6.4.2 POSITIVE EXPECTATIONS AND OPPORTUNITIES

6.4.2.1 INNOVATION

The majority of actor groups expect innovation and a system's shift to be the catalyst for behavioural change and to achieve convenience. The role of e-commerce especially is expected to play a fundamental role in implementing a behavioural shift, since it provides a

far stronger level of convenience to the consumer, rather than in-store retail. According to a zero-waste customer:

> *"That is where the convenience of the zero-waste lifestyle can meet and overcome the inconvenience and therefore overcome single use plastic packaging" (zcus1).*

Three retailers also touched on the growing level of e-commerce propositions within reuse, citing the new market entrant, Loop and their online-reuse system, the increase in online bagless deliveries and increased innovations within collection schemes. While the e-commerce proposition represented the most positive expectations, retailers and consultants were also hopeful of innovation in-store to improve and speed up the current in-store proposition through novel technological improvements and deposit-return schemes to achieve convenience.

6.4.2.2 ONLINE EXPECTATIONS HIGHER THAN IN-STORE

The online proposition was cited the most frequently by all actor groups. All actors expect the biggest potential for zero-waste retail to be through online retail. This is because it achieves consumer convenience, through delivery and collection programmes. Accordingly, Loop was frequently mentioned as an example of a system which can achieve this, since it provides a simple delivery and collection programme with aesthetic appeal. Consultants and suppliers expect to see a significant increase in online retail with the emergence of Generation Z and millennials entering the workforce and starting families, due to both demographics growing up in the digital era.

Actors also outlined high expectations for supermarkets' e-commerce offering to replicate a similar system through incorporating zero-waste retail into 'dark stores'. Dark stores refer to replica supermarkets where pickers collect goods for online orders. A zero-waste dark store would consist of dispensers and unpackaged produce where possible. Pickers would pick the products for the online order using reusable containers or bags.

From a geographical perspective, customers and consultants outlined how the online proposition provides access for zero-waste retail solutions to people who would typically not have access to mainstream supermarkets offering zero-waste. This outlines the potential for online retail to capture a wider proportion of consumers than in-store.

6.4.2.3 IN-STORE INNOVATION

From an in-store perspective, innovations within the digitalisation of dispensers and laser tagging have been frequently highlighted by consultants and retailers. Digitalised dispensers are expected to offer convenience to customers. The current zero-waste model requires consumers to manually weigh their empty container, fill it up with produce and then weight it again before attaching a label with a barcode to the container. Digitalised dispensers are expected to allow the consumer to choose the quantity of an item they need and dispense the produce right away. The system registers how much produce it has dispensed and print a sticker accordingly. The company, MiWa was highlighted multiple times as the frontrunner within digitalised dispensers. The technology has an integrated system between an app, its

dispensers and containers, allowing consumers to pre-order goods. The consumer then enters a MiWa store and scans their container on the relevant dispenser and the pre-ordered produce will dispense accordingly. Alternatively, consumers are able to order a collection, meaning that staff prepare the shop for the consumer instead. The expectations of the digitalisation of dispensers and the positive expectations associated with MiWa suggest the current dispenser model will be upgraded, in order to increase the accessibility and convenience of zero-waste retail. It is currently unclear how this innovation will enter the mainstream. Retailers are expected to either develop their own dispenser model solutions or adopt market-ready solutions.

Laser tagging systems were cited by suppliers, retailers and consultants and are expected to ease the convenience for both retailers and consumers. Linked in with the digitalisation of the dispenser, laser tagging is expected to tag products with a weight and price, without having to manually stick a label on it enabling further convenience for the customer. Consumers will subsequently be able to put fresh produce straight into their basket and allow produce to be easily differentiated. Accordingly, laser tagging is seen as a way to differentiate organic and non-organic produce, which has previously been cited as an issue since there is little visual difference.

For retailers, laser tagging is therefore expected to allow loose produce to be easily identified, which will allow them to differentiate between organic and non-organic produce. This will benefit consumers considerably, since they just have to put fresh produce into their basket. The process entails embedding non-physical codes on to products which allows them to be identified digitally.

Dry mist was highlighted by both retailer and consultant actor groups as another key innovation to increase the shelf life of unpackaged fresh produce. Mist, as previously highlighted (see section 1.2.1) is expected to sustain fresh produce for longer through retaining its freshness, colour and nutrients for a longer time. The technology is expected to save food waste to a large extent and add to the shopping experience of consumers due to the visual aesthetic.

The integration of smart bins into society is further expected to increase consumer convenience. Smart bins refer to bins where consumers put their empty containers after use. The bin detects the type and number of containers returned and the consumer is then paid back a deposit. The container is then washed and redistributed to retailers and consumers for reuse. Consumers are expected to have the ability to drop off their containers in a wider variety of locations and as mentioned, pay a deposit for a new container. In alignment with this, one retailer said:

"you should be able to buy it [a container] anywhere and drop it off anywhere and everything would be connected" (zret2).

This would represent a system's wide shift in retail and end of life management and would require industry collaboration. The result would substantially increase the convenience and accessibility of zero-waste. However, it is noted, all the innovations highlighted have not been incorporated into mainstream supermarkets in the UK, and therefore the practicality of these concepts are not determined. However, the collective expectations for these innovations

suggest there is great potential for these innovations to help overcome the key barriers highlighted within this research.

7. DISCUSSION

Numerous rationales for actor's support have been distinguished that have led to actors supporting and not supporting the transition. The date was both rich and diverse and signalled a mixture of support for the phenomenon. While overall expectations were largely positive of the transition, there was a number of obstacles and threats to growth. However, actor's expectations and current long-term interests suggest zero-waste retail is likely to change the online and in-store supermarket landscape in the future to a large extent. The rationales for supporting zero-waste retail ranged from consumer demand to innovative new technologies and systems to ensure convenience to positive PR, cost savings, and cultural changes towards more health and environmentally conscious shopping.

Both consumer convenience and, the cost and complexity associated with mainstream supermarkets transitioning their operations to zero-waste retail were the main challenges highlighted. The theoretical implications of the thesis will now be provided. A closer look at the results in relation to existing literature will follow, before the limitations of the research and recommendations for further will be outlined.

7.1 THEORETICAL IMPLICATIONS

The hypothesis that there are multiple rationales for actors to support a transition and that these can be explained on the basis of interests and expectations held true. As it has been highlighted, rationales for support for zero-waste retail has been driven by market-driven forces such as consumer demand, and technological innovation and positive publicity. The assumption that actor's individual and collective expectations are dependent on their interests was proven to be inconclusive. All retailers and suppliers who are not currently engaged with zero-waste activities outlined positive expectations with the zero-waste movement and highlighted future activities to encompass zero-waste retail methods. This is despite certain actor's resources and institutional context (namely one supplier and three retailers) not being in alignment with zero-waste retail. However, as Budde et al. (2012) has noted, actors may voice opinions and display future innovation activities to align with mainstream expectations without doing a lot. With regard to this theoretical implication, the relevance of it will only become apparent if these retailers and suppliers are seen to fully integrate the socio-technical system.

Accordingly, the accuracy of actor's support proved difficult to measure since the socio-technical system in question is in its infancy and companies have only begun to engage in the concept. Apart from one retailer whose business model is based around zero-waste, actors have shown incremental improvements, rather than commitment to a radical systems shift, largely due to the transition not currently competing on an economic, operational or convenience basis. The findings suggest that within an emerging socio-technical system, interests and activities do not signify a great deal, and are difficult to measure. This is since innovations break-through incrementally and do not immediately disrupt existing infrastructure. The implication this suggests for theory is that support should be more accurately defined. Support according to Bakker (2014) is based on the alignment of long-

term interests and highly positive expectations. However, this thesis argues support can also be present when long term interests are not adapted to a new socio-technical system. For example, multiple actors outlined engagement in advocacy strategies and investment in technology, in order to help facilitate the transition and ensure there was a viable business case to transition. Therefore, it could be argued support should be differentiated between initial support, referring to support such as advocacy and investment which does not directly affect the operations of a company, and direct support, which refers to a company actively changing its business model to suit a socio-technical system.

Expectations also proved difficult to measure. It proved difficult at times to establish positive expectations, since the framework measures expectations through general expectations and perceived obstacles to growth. For example, actors would often outline high positive expectations, and then key obstacles to growth. Therefore, it was difficult at times to establish whether a positive expectation was present. This thesis overcame this issue by establishing whether actors expected the obstacles they cited to be overcome. Accordingly, the finding implies that expectations should be clarified by assessing whether individual's expectations include overcoming the obstacles to growth.

Another related key finding is the constant state of flux between actor's positive and negative expectations and interests. Despite actors' overall positive expectations, it was evident that individual and collective expectations were not static but continuously alternating and conflicting between positive expectations and obstacles to growth. Actors would also often cite short term interests, such as the associated positive PR, while also expressing a desire to change their entire operations providing efficiencies increased and supportive policy was in place. The results suggest that interests and expectations are dynamic and are largely dependent on external factors being supportive of a socio-technical transition. Therefore, for clarity, this thesis proposes the theory to acknowledge the dynamic nature and constant interplay between positive and negative expectations and interests and the extent to which direct support is dependent on the state of the external environment. While Bakker (2014) outlines that expectations guide actors to engage in an innovation or not, it is arguably too simplified, since actors' overall level of support is largely dependent on the supportive nature of the external environment.

The value of adding consumers was significant within this thesis. Consumers gave multiple insights which reinforced both positive expectations and concerns of other actors, with regard to the socio-technical transition. The views of consumers grounded previous claims made by other actors, since the social implications previously touched on within zero-waste retail literature were hypothetical, because they were made by other actors, rather than consumers. This research was able to confirm and reinforce the rationales for supporting or not supporting zero-waste retail from a consumer perspective. Consumers outlined conditional support for zero-waste retail. This depended on two main factors including zero-waste retail achieving a similar level of convenience to conventional retail and products being offered at the same or lower price. The shopping experience was also frequently cited as a pull-factor. The findings outline how consumers dictate socio-technical transitions, since if these concerns are not met, consumers will not adopt the new usage-practises and routines, and therefore the socio-technical system will not occur. Accordingly, in line with Shove and Walker (2007), this thesis deems consumers central to understanding the rationales of socio-technical

transitions, since they can directly influence the configuration of the socio-technical system through their purchasing decisions.

The addition of consultants was also deemed significant. In accordance with Bolton and Hannon (2016), consultants offered great technical expertise which is required within sustainability transitions. Consultants outlined extensive knowledge into innovations within zero-waste retail to counteract the issue of convenience. However, it was hard to determine the level of influence the actor group has on actor's long-term interests since, as previously highlighted, consultants are dependent on other actors to enact their recommendations. As Rapport and Hult (2017) highlighted, it is however likely that consultants indirectly influence transitions through collective expectations by creating and circulating overarching norms and best practises to socio-technical transitions.

The findings also proved contradictory. This is since all actors outlined positive expectations with the transition, despite numerous obstacles and threats to growth being highlighted and supermarkets only engaging in pilot zero-waste stores. The findings perhaps imply emotional bias. When individuals were asked of their personal expectations on zero-waste retail, it was consistently positive. However, when actors, specifically retailers were asked of the implications of zero-waste retail on their company, they were immediately far more cynical on its potential. It is, however, unclear whether this affected the accuracy of the findings.

The rationales of support also marginally varied. While consumers expressed similar views to actors on the societal implications, all other actors expressed similar views from a societal, market and supply chain context. The finding suggests zero-waste retail is a desired form of retail, due to the consistent level of positive expectations associated with the movement.

7.2 SOCIETAL IMPLICATIONS

7.2.1 CULTURAL SHIFT

The literature and results outline how increasing consumer awareness on the effects of single-use materials are expected to continue driving demand for sustainable forms of retail (Fuentes et al., 2019). The results also align with Shove and Walker's (2007) findings who concluded that for a socio-technical transition to occur, it must be positively associated with status and identity, since zero-waste retail is associated with a trendy and aspirational lifestyle choice. This is arguably due to the sustainability benefits zero-waste provides, and therefore suggests that as consumer awareness grows, the more aspirational zero-waste retail will become. From a business perspective, retailers engaging with zero-waste are seeing phenomenal increases in brand reputation and credibility by both the media and consumers. When retailers are able to provide access to zero-waste retail, high demand is expected, however this is dependent on the extent to which they achieve a high level of consumer convenience.

The positive association with sustainable retail and zero-waste evidently represents a shifting market towards sustainability. Zero-waste retail solutions are expected to substantially increase accordingly. In accordance with Beitzen-Heineke et al. (2017), operational efficiencies and as mentioned, consumer convenience are the two associated biggest hurdles which are required to overcome to enable system's change. Current zero-waste supply chain solutions are not currently commercially viable from both a technical and cost perspective. This suggests the transition is not likely to occur in the foreseeable future, since supportive supply chains are key to the integration of a new socio-technical system within the supermarket sector.

Secondly, it is evident that zero-waste retailers will not be able to match the same level of convenience in-store. Therefore, for the transition to occur, it is acknowledged that consumers must accept changing their habits to encompass the socio-technical system. The implications of this finding will only become apparent as zero-waste retail is offered to a nationally representative demographic. While convenience is not expected to match the same level of convenience, compared to the conventional supermarket sector, there are multiple innovations which the findings suggest will both increase convenience and operational efficiencies. The following section will outline the main technological and policy solutions which arose from this thesis's findings.

7.2.2 TECHNOLOGY AND POLICY IMPLICATIONS

Technology is expected to play a vital role in the socio-technical transition, with the results aligning highly with current literature. Analysis from the results show that expectations from key actors within the transition are largely in line with the recent report from Buchanan (2019) on how retailers can innovate beyond single-use plastics and packaging. Accordingly, a systematic comparison is outlined below:

Table 6: A systematic comparison between Buchanan's (2019) research findings and the results of this thesis in progressing zero-waste retail forward

Aligned findings from the results and Buchanan (2019)	Implications from the findings
Deposit-return schemes can incentivise brand loyalty	It is expected that retailers will provide deposit-return scheme initiatives to ensure customer retention. The findings outlined concern however, on the potential for schemes to provide reusable containers in excess. This is since schemes may make reusable containers overly accessible to entice consumers to shop in their stores. The findings therefore suggest that measures must be implemented by retailers to ensure customers do not misuse or use an excess of containers. The implication creates an argument for policy to be implemented in order to ensure measures (e.g. financial measures) are in place to disincentive consumers to take more

	containers than they need. It also suggests retailers should retain ownership of containers to more easily track them.
Implementing in-store commercial dishwashers is recommended to ensure hygiene and cleanliness	Hygiene was highlighted as a key concern through-out the results, especially by consumers. Buchanan's (2019) recommendation therefore outlines a potential solution to lower the hygiene concerns of consumers. In-store commercial dishwashers will help localise logistical operations, subsequently helping to keep transport emissions low, as oppose to retailers sending off used containers to a regional or national hub.
Laser food labelling is recommended to increase convenience and material usage	Despite its promise, laser-food labelling represents a novel technology, which has not been applied within the mainstream supermarket sector. However, the positive collective associations associated with the technology imply retailers will soon be testing the concept's potential in-store within the UK.
Dry mist is expected to help prolong the life of unpackaged produce	While there are positive collective expectations associated with the movement, the energy, water consumption and efficiencies of dry mist was not clarified. The finding suggests that further research must be conducted on the practical application of dry mist to test its potential and ensure it is not associated with any unintended consequences.
Digitalised dispensers, such as the concept of MiWa are expected to minimise food waste and increase convenience	Digitalised dispensers outlined great promise. However, the literature and actor groups outlined concern over the technology negatively effecting actor's long-term interests: - Retailers could lose out on market-share by adopting innovative technologies unless they have an integrated on-boarding process in place, to ensure older consumers are familiarised with the system. - This is expected to come with additional labour costs, since more employees will be required to on-board consumers, especially the elderly - The increased cost of embedding technological infrastructure into supermarkets is further expected to be a financial burden to retailers. - The risk of faulty technology, especially with new innovations is high. Therefore, it is expected that large retailers will have to require on-site technicians to account for errors, so not to compromise on quality and retail revenue. The findings suggest supermarkets must accept short-term losses, while customers are on-boarded and efficiencies are increased in order to allow the innovation to develop and eventually provide ROI.

Pick-up and collection schemes, such as Loop represent a way to systematically change the way products are packaged and used.	The findings imply that online pick-up and collection schemes will achieve a high level of consumer convenience within zero-waste retail. Loop is highlighted as having the most promise within online zero-waste retail. The findings suggest that while there are positive collective expectations, Loop's initial trials with Tesco are necessary to determine whether the system can work on a commercial level.
Recommended sustainable transport to ensure reverse shipping requirements are carbon neutral	The findings suggest delivery and collection vehicles must be electrified to avoid an environmental rebound effect, due to increased carbon emissions. Local logistical points would also help to maximise efficiencies and keep the distance of travel as low as possible. This would involve having regional hubs or distribution centres, as opposed to one national distribution centre.

While these findings represent positive expectations and promise for the future of zero-waste retail, it is acknowledged that the findings do not equate to current support for the phenomenon, since the findings are grounded in expectations and not long-term support. However, the collective positive expectations associated with these innovations certainly imply that supermarkets will and should begin to engage with them and test both the operational potential, and potential to bridge the convenience gap and help increase consumer uptake.

7.3 LIMITATIONS AND FURTHER RESEARCH

There were some key limitations to this study. Firstly, the hypothetical nature of expectations theory makes it challenging to validate the long-term support of the socio-technical transition. This is because the research can only assess the current landscape, such as initial investment, operational changes, the level of advocacy and policies supporting the transition. The hypothetical nature of expectations also made it challenging to validate the results of the research, since actors would often fluctuate between positive expectations and key obstacles blocking the transition for an indefinite period of time. Therefore, in order to accurately measure the validity of expectations, it would have been beneficial to carry out an in-depth study over a specific period of time. This would have allowed the research to measure the accuracy of actors' expectations and long-term support, by assessing the development of the transition over a fixed-time period. However, due to time constraints, such a study was not possible. Further research is therefore suggested to allow for the findings to be reanalysed and compared at a later point in time to assess whether the level of support and positive expectations has led to a sociotechnical transition within the mainstream supermarket sector.

While a saturation point had been reached, it would have also been beneficial for the research to include more policy makers, suppliers and regular retailers in particular. The three

stakeholders were under-represented within the study. From a policy perspective, policy makers involved with sustainable packaging within the supermarket sector would have been able to give a greater depth into the types of supportive regulations in place and whether the government is or is not looking to provide long-term support for the transition. The underrepresentation of suppliers hindered this research's findings considerably, since transitioning company's operations was seen as a key barrier. The addition of more suppliers involved within sustainable innovation and zero-waste retail could have led to more technological insights on what a zero-waste supply chain for a mainstream supermarket would look like. Instead, findings pointed predominantly to the investment required, rather than innovation within the supply chain. This limitation suggests another research recommendation. Since transitioning the supply chain was seen as such as key barrier, future research is recommended to assess key actors within the supply chain of mainstream supermarkets and zero-waste experts to assess how such a system would successfully look and operate. Finally, additional regular supermarkets not incorporating zero-waste retail method would have arguably created more representative findings. Expectations may arguably not have been so positive if additional supermarkets were involved who were not incorporating zero-waste retail to any extent.

There were also resource constraints. While individual interviews were conducted with stakeholders, group workshops and focus groups would have helped to generate discussion and arguably helped different actor groups have more informed views on the varying aspects involved on the development of zero-waste retail.

Since this research is purely qualitative, there are also some key limitations related to ensuring reliability. Firstly, social desirability bias is acknowledged, since interviewees may have answered to project a favourable image of themselves and to avoid receiving negative evaluations, as oppose to giving an authentic answer (Lavrakas, 2008). It has also been acknowledged that words, perceptions and general views of participants change over time and therefore, the findings to this piece of research are time-bound and are likely to change and evolve in the future. A quantitative study would have arguably helped to further ground the interests and activities of actors, and could have provided a clearer insight into the current product offering of zero-waste retail. For example, data analysis could help to show the availability of zero-waste retail products compared to regular packaged products within certain product categories. Accordingly, further research is recommended to shed light on the current level of impact zero-waste retail products are having within stores, compared to packaged products.

8. CONCLUSION

This research has investigated the rationales of key actors to support or not support the transition to zero-waste retail within the mainstream supermarket sector in the UK. This was carried out by advancing Bakker's (2014) theoretical framework assessing actor's expectations, interests and activities. In order to accurately gauge the level of support, this thesis engaged with multiple actors who have a direct and indirect influence on the conventional supermarket sector and on the zero-waste movement. Consumers, retailers, suppliers, packaging consultants, policy experts and NGOs who are advocating for zero-waste were interviewed accordingly. The range of actors, coupled with the deeply complex and recent nature of the zero-waste retail movement made for multi-faceted findings. While there were numerous rationales for supporting and not supporting the transition, it was difficult to determine the overall level of support, since no actors had long-term interests associated with zero-waste retail. This is due to the recent emergence of the transition and actor's recent engagement in zero-waste retail. Accordingly, retailers and suppliers have not shifted their resources to support the transition, since it is not yet fully developed, or trusted by key actors.

Consumer convenience is the key hurdle to integrating zero-waste retail into the mainstream. From a consumer perspective, zero-waste retail is currently associated with increased shopping time, lacking practicality and requiring a great deal of organisation for the consumer, compared to conventional shopping. Consumers must therefore willingly adopt new habits and usage practises. Current zero-waste supply chain solutions are also not currently commercially viable from both a technical and cost perspective. Retailers and suppliers have assets and fixed costs associated with current supply chains and logistics, which are not currently supportive for zero-waste retail.

The overall positive rationales of support for zero-waste retail came predominantly from actors observing a cultural shift towards consumers adopting more environmentally conscious and healthier shopping habits, and innovations to overcome key barriers. Both in-store and online zero-waste retail solutions are also expected to be equally relevant in the transition, and it is undetermined how far zero-waste will go with its product offering. However, staple foods, fresh produce and groceries, and household products are the product categories currently in use within both channels.

Ultimately, while the support for the socio-technical transition of zero-waste retail is undetermined, expectations are high. Technological innovations, supportive policy and industry and consumer action are expected to facilitate the transition and overcome the aforementioned threats and obstacles for growth. However, the success of the emerging socio-technical transition is entirely dependent on current supply chain, operational and convenience-related barriers being overcome.

9. PRACTICAL RECOMMENDATIONS TO PROGRESS THE ZERO-WASTE MOVEMENT

This thesis highlights two further recommendations which were not discussed within the thesis. This recommendation is based on the collective expectation and literature that zero-waste retail will continue to emerge within the supermarket sector.

9.1 A NATIONALISED REUSE COLLECTION PROGRAMME

A reuse collection programme essentially refers to the same collection system as the UK recycling programme, but for reuse instead. It can also be envisioned as a scaled up and nationalised version of what Loop are currently offering. Consumers would have the ability to pick-up a container from the supermarket and later, place it in a reuse bin for collection once used. Such a system would help to collect and redistribute reusable packaging more efficiently nationwide. The concept would allow consumers to use the same practice as recycling for reusable packaging and a delivery service to pick up the reusable materials. This would arguably save a vast amount of plastic, due to the aforementioned inefficiencies associated with recycling.

Electrified collection vehicles would be advocated to ensure emissions are controlled. The programme would help take the emphasis off the consumer, and put the onus on retailers and government, which would help manage reusable containers in a more efficient way. Containers would be taken back to a local logistical station, washed and redistributed accordingly. Consumers would instead leave used containers outside their home, and pay a deposit for new containers upon arrival in-store. Additionally, smart bins could be integrated to allow people to eat with reusable packaging on-the-go. This would significantly increase the convenience of zero-waste retail, since consumers will more easily dispose of used containers.

9.2 THE STANDARDISATION OF REUSABLE CONTAINERS

As a follow on to the above, if all retailers engaging in zero-waste retail collaborated and provided a standardised container scheme across all supermarkets, it would significantly improve operational and environmental efficiencies. From an environmental perspective, this would help to ensure all containers in production adhere to strong environmental standards. Supportive policy should further ensure LCAs and carbon footprint assessments are conducted accordingly. If such a system was implemented, it would arguably also aid hygiene concerns, since containers would be standardised and quality checked. Consumers would be more likely to reuse their containers too, since they would be able to use the same container within different supermarkets. The standardisation of containers would also aid a reuse collection programme considerably. From a logistical perspective, it would minimise the

complication of redistribution. This is because standardised containers would not be limited to where they can be redistributed to.

It is acknowledged these recommendations largely rely on industry collaboration and policy to introduce such a system. Supportive policy would be required to logistically and financially support retailers and suppliers with the integration of delivery and collection systems.

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11. APPENDIX

11.1 INTERVIEW GUIDE

Interview Guide

General focus areas

- Expectations regarding zero-waste retail.
  - Expected technological development
  - Expected market potential
- The potential impact of zero-waste retail on the actor:
  - The threats that zero-waste retail could pose
  - The opportunities that zero-waste retail could bring
- Initiatives that that the actor is undertaking with regards to zero-waste retail:
  - Current initiatives
  - Future plans
- Perceived obstacles to the introduction of zero-waste retail and large-scale adoption

Note: Questions on actor's expectations and activities remain the same for each actor. In order to understand each actor's internal rationales for engaging with zero-waste retail, the questions have been adapted accordingly within the interests' section. For retailers, customers and policy makers, each question refers to the impact zero-waste retail will have on the actor's interest, since the uptake of zero-waste retail is expected to impact these actor's interests directly. Therefore, interests are deemed *internal*. However, for NGOs, the uptake of zero-waste retail does not directly affect their organisational practises. Therefore, questions on the threats and opportunities of zero-waste retail will be *externally* oriented, focusing on their insights on the threats and opportunities zero-waste retail provides to retailers. This will help uncover their own rationales for advocating for zero-waste retail.

1. Mainstream Retailers and suppliers

Interests – internal

Part 1: Acknowledging Expectations

1. Do you expect zero-waste retail to develop within the grocery sector? If so, how?
2. Do you expect to see technological changes or improvements to zero-waste retail?
3. What do you expect the market potential of zero-waste retail to be?
4. What do you expect will be the main obstacles to the introduction of zero-waste retail in the mainstream?

Part 2: Acknowledging actor interests

5. How do you foresee zero-waste retail affecting your organisation?
6. What are the threats that zero-waste retail poses to your organisation?
7. What are the opportunities that zero-waste retail brings to your organisation?

8. How do you foresee zero-waste retail influencing your organisation's overall retail practises?

Part 3: Acknowledging Actors current and future activities

9. What is your organisation currently doing with regard to zero-waste retail?
10. What are your organisations future plans with regard to zero-waste retail?

2. NGOs

Interests - external

Part 1: Acknowledging Expectations

1. Do you expect zero-waste retail to develop within the grocery sector? If so, how?
2. Do you expect to see technological changes or improvements to zero-waste retail?
3. What do you expect the market potential of zero-waste retail to be?
4. What do you expect will be the main obstacles to the introduction of zero-waste retail?

Part 2: Acknowledging actor interests

5. Why do you advocate for zero-waste retail?
6. What are the threats from retailers not adopting zero-waste retail practises?
7. What opportunities do you foresee by mainstream retailers switching to zero-waste retail?
8. How do you foresee zero-waste retail influencing mainstream retailers' overall practises?

Part 3: Acknowledging Actors current and future activities

9. What are you currently doing to influence zero-waste retail?
10. What are your future plans with regard to influencing zero-waste retail?

3. Customers

Background supplement

For zero-waste retail shoppers, it is assumed that they know what zero-waste retail means. For conventional shoppers, a brief explanation and definition of zero-waste retail will be provided.

Interests – Internal

3.1 Conventional customers

Prewritten script: Zero-waste refers to the conservation of all resources by means of responsible production, consumption, reuse, and recovery of all products, packaging, and materials, without burning them, and without discharges to land, water, or air that threaten the environment or human health. For shopping, this often means customers using reusable

containers, weighing it, filling the container (often via a dispenser) to the desired amount and paying according to the weight. It can also relate to online shopping if you are ordering off a site which delivers products in reusable containers. Once the products are used, the reusable containers are left outside to be collected, then washed, refilled and redistributed.

Part 1: Acknowledging Expectations

1. Do you expect zero-waste retail to develop within the mainstream grocery sector? If so, how?
2. Do you expect to see technological changes or improvements to zero-waste retail?
3. What do you expect the market potential of zero-waste retail to be?
4. What do you expect will be the main obstacles to the introduction of zero-waste retail?

Part 2: Acknowledging actor interests

5. If mainstream supermarkets incorporated more zero-waste retail practises, do you think it would affect your regular shopping habits?
6. What are the threats (problems) that mainstream zero-waste poses to you as a shopper?
7. What opportunities do you see mainstream zero-waste retail bringing to you as a shopper?
8. Do you expect mainstream zero-waste retail to influence your shopping practises?

Part 3: Acknowledging Actors current and future activities

9. Do you make any conscious efforts to reduce your waste when you shop?
10. Do you have any future plans to reduce your waste when you shop?

3.2 Zero-waste retail customers

Part 1: Acknowledging Expectations

1. Do you expect zero-waste retail to develop within the mainstream grocery sector? If so, how?
2. Do you expect to see technological changes or improvements to zero-waste retail?
3. What do you expect the market potential of zero-waste retail to be?
4. What do you expect will be the main obstacles to the introduction of zero-waste retail?

Part 2: Acknowledging actor interests

5. How will the growth of mainstream zero-waste retail affect your future shopping practises?
6. What are the threats (problems) that mainstream zero-waste poses to you as a shopper?
7. What opportunities do you see mainstream zero-waste retail bringing to you as a shopper?

8. How do you foresee mainstream zero-waste retail influencing your shopping practises?

Part 3: Acknowledging actors current and future activities

9. How do you abide by the principles of zero-waste retail?
10. Do you have future plans to improve your zero-waste retail shopping practises?

4. Policy Makers

Interests – internal

Part 1: Acknowledging Expectations

1. Do you expect zero-waste retail to develop within the grocery sector? If so, how?
2. Do you expect to see technological changes or improvements to zero-waste retail?
3. What do you expect the market potential of zero-waste retail to be?
4. What do you expect will be the main obstacles to the introduction of zero-waste retail?

Part 2: Acknowledging actor interests

5. How will the growth of zero-waste retail within the mainstream affect your future policy decisions?
6. What are the threats that zero-waste retail poses to policy making?
7. What are the opportunities that policy making will bring to zero-waste retailers?
8. How do you foresee your future policies within the grocery sector influencing zero-waste retail?

Part 3: Acknowledging Actors current and future activities

9. What policies do you currently have in place with regard to zero-waste retail?
10. Do you have any future policy plans for zero-waste retail?

5. Consultants

Interests – internal

Part 1: Acknowledging Expectations

1. Do you expect zero-waste retail to develop within the grocery sector? If so, how?
2. Do you expect to see technological changes or improvements to zero-waste retail?
3. What do you expect the market potential of zero-waste retail to be?
4. What do you expect will be the main obstacles to the introduction of zero-waste retail?

Part 2: Acknowledging actor interests

5. How do you see the growth of zero-waste retail affecting mainstream supermarkets?
6. What are the threats that zero-waste retail poses to supermarkets?

7. What are the opportunities that zero-waste retails bring to supermarkets?
8. How do you foresee zero-waste retail influencing mainstream retailers' overall practises?

Part 3: Acknowledging Actors current and future activities

9. What does your organisation do with regard to zero-waste retail?
10. Do you have any future plans for zero-waste retail?

11.2: CODING TREE